

Outcomes and Complications of Cataract Surgery in Indonesia: A Multicentric Study

Nur Aisyah Rahmawati¹, Randy Sarayar², Annisa Nindiana Pertiwi³, Herdanti Rahma Putri¹, Arnes Tasya Citra Anggini⁴, Nizma Permaisuari¹, Andrew John Widya Sieman⁴, Cynthia Viryawan⁵, Gabriella Chandra², Dyah Astri Paramaramya⁴, Muhammad Khoirul Huda⁶, Yeni Dwi Lestari⁷

¹General Practitioner, Hadji Boejasin Pelaihari General Hospital, Tanah Laut, South Kalimantan, ²General Practitioner, Surya Husadha Nusa Dua Hospital, Badung, Bali, ³General Practitioner, Bhakti Rahayu Tabanan General Hospital, Tabanan, Bali, ⁴General Practitioner, Dr. Suyoto Hospital, Jakarta, ⁵General Practitioner, Tani dan Nelayan General Hospital, Boalemo, Gorontalo, ⁶General Practitioner, dr. Loekmono Hadi General Hospital, Kudus, Central Java, ⁷Department of Ophthalmology, Faculty of Medicine, Cipto Mangunkusumo Hospital/Kirana, Universitas Indonesia, Jakarta, Indonesia

Abstract

Objective: Cataract is the leading cause of blindness worldwide and its only treatment is surgery, which is intended to restore the visual function; the expected outcomes are improved visual acuity (VA) and elimination of blindness. Therefore, evaluation of the outcomes of cataract surgery is needed to improve the quality of treatment programs. **Materials and Methods:** This was a cross-sectional study of 193 postcataract surgery eyes from August 2017 to March 2018 in six hospitals in Indonesia. Convenience sampling was used. Bivariate and multivariate analyses were performed on the medical records of pre- and postoperative VA, types of surgery, and complications. **Results:** Of the 193 eyes, 170 were analyzed. Phacoemulsification, manual small-incision cataract surgery, and extracapsular cataract extraction with intraocular lens (IOL) implantation were performed in 45.3%, 51.2%, and 3.5% of eyes, respectively. Preoperatively, 70% were blind, 8.8% had severe visual impairment (SVI), 17.1% had moderate visual impairment (MVI), and 4.1% were normal. Postoperatively, 78.2% were normal, 15.3% had MVI, 2.4% had SVI, and 4.1% were still blind. There were 93.5% of eyes with visual improvement; the blindness conversion rate was 95%. The overall complication rate was 15.3%, mostly from corneal edema (7.1%), followed by IOL dislocation (1.8%) and endophthalmitis (1.2%). There was no statistically significant difference in the postoperative visual outcome between groups treated with or without phacoemulsification ($P = 0.870$), but complications from corneal edema were statistically significantly higher with phacoemulsification ($P = 0.003$). **Conclusion:** All types of cataract surgery significantly improved VA, but the complication rate was higher with phacoemulsification, mostly from corneal edema.

Keywords: Cataract, complication, surgery, visual outcome

INTRODUCTION

Cataract is one of the primary causes of visual impairment, which can decrease the quality of life.^[1] The latest data on the prevalence of visual impairment in Indonesia were obtained from the Rapid Assessment of Avoidable Blindness (RAAB) survey, undertaken in 15 provinces from 2014 to 2016. This showed that the prevalence of blindness was 3.0%, with 70%–80% cases of severe visual impairment (SVI) and blindness caused by cataract.^[2] The current World Health Organization (WHO) Global Action Plan's target is to reduce the prevalence of avoidable visual impairment by 25% in 2020, compared with 2010.^[3] The definitive treatment of cataracts is surgery. In the last 20 years, phacoemulsification and small-incision cataract surgery (SICS) have been used widely. The outcome of postoperative visual acuity (VA) is a

crucial measure of the degree of benefit for each method of cataract surgery. It is estimated that 90% of patients can achieve good vision (best-corrected VA [BCVA] of 6/12 or better) after undergoing cataract surgery. From 266 RAAB studies performed across 73 countries, approximately half of the operated eyes (range 6.0%–86%) had good vision outcomes.^[3] Furthermore, a research conducted in Bali, Indonesia, found that the percentage of patients with VA <6/60 was reduced from 85% to 8.8% on the 1st day after cataract surgery, with 85% of patients achieving a good outcome at the final follow-up.^[4]

Address for correspondence: Dr. Nur Aisyah Rahmawati, General Practitioner, Hadji Boejasin Pelaihari General Hospital, Tanah Laut, South Kalimantan, Indonesia.
E-mail: n.aisyahrahmawati@gmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Rahmawati NA, Sarayar R, Pertiwi AN, Putri HR, Citra Anggini AT, Permaisuari N, *et al.* Outcomes and complications of cataract surgery in Indonesia: A multicentric study. *J Nat Sc Biol Med* 2019;10:S158-62.

Access this article online

Quick Response Code:



Website:
www.jnsbm.org

DOI:
10.4103/jnsbm.JNSBM_63_19

In addition, a study conducted in Timor Leste reported good visual outcomes in 75.2% of cataract-operated eyes, based on BCVA.^[5] However, several risks of complication were reported during and after surgery. Previous studies showed that the rates of postoperative complications were 35% and 4.64%.^[6,7] A study in Saudi Arabia involving 1520 operated eyes found that 47% had some form of complication, with several eyes having multiple complications.^[7] A study in Bali showed that complications were reported in 114 out of 547 operated patients, with posterior capsular opacity of any grade (22.7%) being the most common surgical complication found among these patients.^[4] Data reporting the outcomes and complications of cataract surgery in Indonesia are still lacking in spite of the growing numbers of procedures. Thus, this multicentric study aimed to report the outcomes and complications of cataract surgery in six hospitals in Indonesia, including secondary and tertiary hospitals.

MATERIALS AND METHODS

This was a multicentric cross-sectional study to record the outcomes and complications of cataract surgery conducted from August 2017 to March 2018 in six hospitals (consisting of types A, B, and C hospitals) throughout Indonesia: Hadji Boejasin Pelaihari General Hospital in South Kalimantan, Surya Husadha Nusa Dua Hospital in Bali, Bhakti Rahayu Tabanan Hospital in Bali, Dr. Suyoto Pusrehab Kemhan Hospital in Jakarta, Tani dan Nelayan Boalemo General Hospital in Gorontalo, and Dr. Loekmonohadi Kudus General Hospital in Central Java. This study used the patients' medical record data on sociodemographic characteristics, cataract classification, pre- and postoperative VA, methods of cataract surgery (phacoemulsification, manual SICS, or extracapsular cataract extraction [ECCE]), and complications. Convenience sampling was adopted to collect the data from the medical records of patients who underwent cataract surgery and who had a minimum of one visit to each hospital's ophthalmologist postoperatively. Patients with incomplete medical record data were excluded from the study. Of 193 eyes included in the study, 170 were analyzed using IBM SPSS statistics (v. 20, IBM Corp., Armonk, NY, USA). The independent variables were sociodemographic characteristics, types of surgery (phacoemulsification and nonphacoemulsification groups), and cataract classification. The dependent variables were postoperative VA and complications. We performed bivariate analysis to determine the relationships between visual outcomes and complications with independent variables. Chi-square test or Fisher's exact test was used to test the significance of any relationships between variables. Variables with $P < 0.250$ from the bivariate analysis were analyzed using multivariate analysis. The ethics committee of each hospital approved this study, and subject confidentiality has been maintained by the authors.

Operational definitions

Age was defined as the patient's age on the day of surgery. History of comorbid disease was obtained from each medical

record during the patient's visit. Cataract classification and type of surgery were determined by the hospital's ophthalmologist. Preoperative VA was the presenting VA on the date the cataract was first diagnosed. We categorized preoperative VA into normal (VA $\geq 6/18$), moderate (VA $6/60 \leq 6/18$), severe (VA $3/60 \leq 6/60$), or blind (VA $< 3/60$). Postoperative VA was defined as the BCVA on the patient's last visit, categorized into good ($\geq 6/18$), borderline ($6/60 \leq 6/18$), or poor ($< 6/60$). Any increase in the VA between pre- and postoperative examinations was defined as visual improvement. The blindness conversion rate was defined as the proportion of eyes that did not remain blind postoperatively, out of eyes that had been classified as blind preoperatively. Complications were diagnosed by the ophthalmologist, as noted in each patient's medical record.

RESULTS

Of 156 patients (with 170 eyes) in this study, 39.7% were male and 60.3% were female. The median age of the patients was 60 years (range: 23–83). Table 1 presents the demographic characteristics of the patients.

Phacoemulsification, manual SICS, and ECCE were performed in 77 (45.3%), 87 (51.2%), and 6 (3.5%) eyes, respectively. Almost all eyes (99.4%) underwent intraocular lens (IOL) implantation at the time of surgery. There were 159 (93.5%) eyes with visual improvements. Postoperative BCVA constituted 133 eyes

Table 1: Demographic characteristics of the patients

Variable	n (%)
Age (years)	
Median (range)*	60 (23-83)
<40	3 (1.9)
40-49	20 (12.8)
50-59	53 (34.0)
60-69	47 (30.1)
≥ 70	33 (21.2)
History of comorbid diseases	
Diabetes mellitus	
No	121 (77.6)
Yes	35 (22.4)
Hypertension	
No	76 (48.7)
Yes	80 (51.3)
Glaucoma	
No	152 (97.4)
Yes	4 (2.6)
Cataract classification	
Mature senile	117 (67.9)
Immature senile	51 (30.0)
Juvenile	2 (1.2)
Preoperative VA scores	
Blind (VA $< 3/60$)	119 (70.0)
Severe visual impairment (VA $3/60 \leq 6/60$)	15 (8.8)
Moderate visual impairment (VA $6/60 \leq 6/18$)	29 (17.1)
Normal ($\geq 6/18$)	7 (4.1)

*Unless otherwise indicated all data are shown as n (%). VA: Visual acuity

(78.2%) with normal vision, 26 (15.3%) with moderate visual impairment (MVI), four (2.4%) with SVI, and seven (4.1%) with blindness. The blindness conversion rate was 95%. Of those patients who were classified as blind postoperatively, two were diagnosed with corneal edema, two had endophthalmitis, and one had toxic anterior segment syndrome. Two other patients were found to have retinal detachment prior to the surgery. Three of the four patients with SVI postoperatively were aged >60 years. We performed bivariate analysis to determine the relationship between visual outcomes and other variables [Table 2]. Visual outcomes were significantly better in patients aged <60 years than those in patients aged ≥60 years. A history of comorbid diseases, cataract classification, or the type of surgery had no significant relationship with the visual outcome. We also analyzed the relationship between the complications of cataract surgery and other variables [Table 3]. There were 170 cataract surgeries and 26 (15.3%) complication events. Mostly, complications involved corneal edema (7.1%), IOL dislocation (1.8%), and endophthalmitis (1.2%). Patient age and history of comorbid diseases had no significant relationship with the complication events.

The overall complication rate was 32.5% in the phacoemulsification group and 1.1% in the nonphacoemulsification group (manual SICS or ECCE) ($P < 0.001$). In the phacoemulsification group, corneal edema occurred in 12/25 eyes (48%) with postoperative complications. There were three eyes with corneal edema that persisted longer than 14 days postoperatively, with the final BCVA categorized as borderline or poor. We also found that the complication rate was statistically significantly higher in the phacoemulsification group ($P = 0.003$).

Table 2: Visual outcomes and relationships with other variables

Variable	Visual outcome			P
	Good (%)	Borderline (%)	Poor (%)	
Age (years)				
<60	68 (85.0)	10 (12.5)	2 (2.5)	0.043
≥60	64 (71.1)	16 (17.8)	10 (11.1)	
Diabetes mellitus				
No	102 (76.1)	21 (15.7)	11 (8.2)	NS
Yes	30 (83.3)	5 (13.9)	1 (2.8)	
Hypertension				
No	66 (77.6)	13 (15.3)	6 (7.1)	NS
Yes	66 (77.6)	13 (15.3)	6 (7.1)	
Glaucoma				
No	129 (77.7)	26 (15.7)	11 (6.6)	NS
Yes	3 (75.0)	0 (0.0)	1 (25.0)	
Cataract classification				
Immature senile	39 (76.5)	9 (17.6)	3 (5.9)	NS
Mature senile	92 (78.6)	17 (14.5)	8 (5.9)	
Type of surgery				
Phacoemulsification	59 (76.6)	13 (16.9)	5 (6.5)	NS
Nonphacoemulsification	74 (79.6)	13 (14.0)	6 (6.5)	

NS: Not significant ($P > 0.05$)

DISCUSSION

Phacoemulsification has been used as the preferred cataract surgical technique in developed nations and tertiary centers of developing countries. However, in Indonesia, because of often limited resources, SICS or ECCE has been used widely as established surgical alternatives to phacoemulsification. In this setting, most patients are treated using SICS. According to Thevi and Reddy,^[8] SICS is a good option for cataract surgery as it is a safe technique with good outcome without the need for costly equipment and longer duration of surgical training, especially in developing countries like Indonesia, where many of its citizens come from low socioeconomic status and rural areas. More than half of the patients in rural areas where phacoemulsification machines were unavailable underwent SICS. Muralikrishnan *et al.* also reported that patient cost was lower for SICS compared with phacoemulsification and ECCE.^[9]

In our study, the postoperative BCVA grade was 78.2% of eyes with normal vision, 15.3% with MVI, 2.4% with SVI, and 4.1% with blindness. According to the WHO, good visual outcomes should be achieved in >80% of surgeries. Conventionally, VA is measured over several weeks to months after surgery because the wound-healing process can change the refractive power. There are also transient complications that can resolve gradually, such as corneal edema. Less often, surgical complications can also cause visual declines.^[6] However, in our study, the postoperative follow-up rate until the 4th week was only 48.2% (82/170). The postoperative follow-up rates in some developing countries are as low as 20%–30% because of poor access to health facilities.^[6] This discrepancy suggests that longer follow-up is needed to achieve better results in phacoemulsification and SICS, given that inflammation is commonly found in these types of surgery. Furthermore, the need for greater improvements in surgical facilities and surgical skills is suggested.

Visual outcomes in our study were significantly better in patients aged <60 years than in those aged ≥60 years. An Iranian hospital-based study yielded similar results; more than half (53.8%) of the operated eyes had an excellent outcome, with a BCVA of ≥20/25, and 78% had a BCVA of ≥20/40.^[10] Only 2.8% had a poor outcome of BCVA (<20/200). Visual outcomes and age were inversely correlated; the mean age at the time of surgery was 71.6 years in the poor visual outcome group versus 66.3 years in the group with excellent visual outcome. Galgauskas *et al.*^[11] noted that endothelial cell density decreases with age, and as it decreases, the endothelial pump function deteriorates, which tends to cause a worse VA outcome after surgery.^[11]

A history of comorbid diseases, cataract classification, and type of cataract surgery had no significant relationship with VA outcome. These findings are similar to those of a previous study in which systemic conditions, such as hypertension, hyperlipidemia, and ischemic heart disease, except for diabetes mellitus (accompanied by vision-threatening diabetic

Table 3: Complications of cataract surgery and their relationships with other variables

Variable	Complication events		P	
	No (%)	Yes (%)	Bivariate	Multivariate
Age				
<60	70 (87.5)	10 (12.5)	NS	N/A
≥60	74 (82.2)	16 (17.8)		
Diabetes mellitus				
No	114 (85.1)	20 (14.9)	NS	N/A
Yes	30 (83.3)	6 (16.7)		
Hypertension				
No	69 (81.2)	16 (18.8)	0.201	0.461
Yes	75 (88.2)	10 (11.8)		
Glaucoma				
No	140 (84.3)	26 (15.7)	NS	N/A
Yes	4 (100.0)	0 (0.0)		
Cataract classification				
Immature senile	33 (64.7)	18 (35.3)	<0.001	0.070
Mature senile	110 (94.0)	7 (6.0)		
Type of surgery				
Phacoemulsification	52 (67.5)	25 (32.5)	<0.001	0.003
Nonphacoemulsification	92 (98.9)	1 (1.1)		

NS: Not significant ($P>0.250$). N/A: Not available

retinopathy [DR]), were also not significantly associated with visual outcome, even though they were present in 54.3% of the operated eyes.^[10] Most of our patients showed improvements to normal VA ($>6/18$) after surgery, in both the phacoemulsification and nonphacoemulsification groups (76.6% vs. 79.6%). This result accords with that of a meta-analysis that found no significant difference between those who underwent phacoemulsification and those who underwent SICS, with a BCVA grade of $>6/18$ after 6 weeks.^[12]

In our study, the overall postsurgical complication rate was 15.3%, comprising 7.1% cases with corneal edema, 1.8% with lens dislocation, and 1.2% with endophthalmitis. The complication rate was significantly higher in the phacoemulsification group compared with the nonphacoemulsification group. Most complications in the phacoemulsification group were from corneal edema (48%). Although transient corneal edema is one of the most commonly found complications after phacoemulsification, it tends to resolve within the 1st postoperative week.^[13] Corneal edema following phacoemulsification might arise from mechanical or chemical injuries, subsequent infection, or inflammation that compromise the endothelial pump after surgery.^[14] One study showed that although the incidence of corneal edema after phacoemulsification was high (44%), most patients only had a mild degree of striate keratopathy with a VA of $\geq 6/12$ on the 1st postoperative day.^[15] Another study carried out in a teaching hospital reported that the incidence of complications after phacoemulsification was 18%, with the most common being retinal tears or holes (6.7%) and IOL subluxation (3.7%).^[16]

In our study, there were three patients with corneal edema that persisted longer than 14 days postoperatively with borderline

or poor BCVA. Two of these patients were aged >60 years, whereas the other patient had hypertension and diabetes with mature cataract. Because corneas in patients with diabetes suffer from endothelial cellular dysfunction and impaired repair mechanisms, the cornea is more prone to edema after surgery.^[17] The two patients diagnosed with endophthalmitis were operated in the same hospital during the same week. Based on this finding, microbiological investigations were performed in the hospital's operating room. Subsequently, the operating room was sterilized, and surgeries were postponed to the following week.

Our study had some limitations. We did not use a standardized measurement of VA between centers and the duration of postoperative follow-up varied between patients. The incision time was not always recorded by the surgeons and the time of phacoemulsification was not obtained as the data were unavailable from the medical record of all the centers. The presence or absence of any posterior segment abnormalities (such as DR or age-related macular degeneration) was not regularly assessed in our study.

CONCLUSION

Overall, any type of cataract surgery significantly improved VA in these patients requiring cataract treatment. Postoperative VA improvements were similar in all groups, with most reaching normal vision, and we trust a higher quality of life. The rate of postoperative complications was significantly higher in the phacoemulsification group, mostly from corneal edema.

Acknowledgment

This article was presented at the 3rd International Conference and Exhibition on Indonesian Medical Education and Research

Institute (ICE on IMERI, 2018). We thank the 3rd ICE on IMERI committee who had supported the manuscript preparation. We would like to thank all ophthalmologists in hospitals where data acquisition took place: Husni Thamrin, MD; I Gusti Ayu Juliari, MD; Siska, MD; Kartika Rahayu, MD; I Putu Budiastra, MD; I Putu Rustama Putra, MD; Indra Syarief, MD; Nur Azizah Juzmi, MD; Djoko Heru Santoso, MD.

Financial support and sponsorship

The 3rd ICE on IMERI Committee supported the peer review and manuscript preparation.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Husain R, Tong L, Fong A, Cheng JF, How A, Chua WH, *et al.* Prevalence of cataract in rural Indonesia. *Ophthalmology* 2005;112:1255-62.
- Director General of Disease Prevention and Control, Indonesian Ophthalmology Association, International Agency for the Prevention of Blindness. Roadmap of Visual Impairment Control Program in Indonesia. Jakarta: Ministry of Health of Indonesia; 2017. p. 12.
- Wang W, Yan W, Müller A, He M. A global view on output and outcomes of cataract surgery with national indices of socioeconomic development. *Invest Ophthalmol Vis Sci* 2017;58:3669-76.
- Farmer L, Innes-Wong C, Bergman-Hart C, Casson RJ, Crompton J. Visual acuity, quality of life and visual function outcomes after cataract surgery in Bali. *Ophthalmic Epidemiol* 2015;22:274-82.
- Correia M, Das T, Magno J, Pereira BM, Andrade V, Limburg H, *et al.* Prevalence and causes of blindness, visual impairment, and cataract surgery in Timor-Leste. *Clin Ophthalmol* 2017;11:2125-31.
- Congdon N, Yan X, Lansingh V, Sisay A, Müller A, Chan V. Assessment of cataract surgical outcomes in settings where follow-up is poor: PRECOG, a multicentre observational study. *Lancet Glob Health* 2013;1:e37-45.
- al Faran MF. Visual outcome and complications after cataract extraction in Saudi Arabia. *Br J Ophthalmol* 1990;74:141-3.
- Thevi T, Reddy SC. Cataract surgery in Asian countries – An overview. *Br J Med Med Res* 2016;16:1-13.
- Muralikrishnan R, Venkatesh R, Prajna NV, Frick KD. Economic cost of cataract surgery procedures in an established eye care centre in Southern India. *Ophthalmic Epidemiol* 2004;11:369-80.
- Mohammadi SF, Hashemi H, Mazouri A, Rahman-A N, Ashrafi E, Mehrjardi HZ, *et al.* Outcomes of cataract surgery at a referral center. *J Ophthalmic Vis Res* 2015;10:250-6.
- Galgauskas S, Norvydaitė D, Krasauskaitė D, Stech S, Ašoklis RS. Age-related changes in corneal thickness and endothelial characteristics. *Clin Interv Aging* 2013;8:1445-50.
- Gogate P, Optom JJ, Deshpande S, Naidoo K. Meta-analysis to compare the safety and efficacy of manual small incision cataract surgery and phacoemulsification. *Middle East Afr J Ophthalmol* 2015;22:362-9.
- Ali A, Ahmed T, Ahmed T. Phacoemulsification: Complications in first 300 cases. *Pak J Ophthalmol* 2007;23:64-9.
- Yi DH, Dana MR. Corneal edema after cataract surgery: Incidence and etiology. *Semin Ophthalmol* 2002;17:110-4.
- Kausar A, Farooq S, Akhter W, Akhtar N. Transient corneal edema after phacoemulsification. *J Coll Physicians Surg Pak* 2015;25:505-9.
- Gregori NZ, Rodriguez M, Staropoli PC, Karli SZ, Galor A, Wellik SR, *et al.* Visual and anatomic outcomes of cataract surgery with intraoperative or postoperative complications in a teaching institution. *Can J Ophthalmol* 2019;54:382-7.
- Tang Y, Chen X, Zhang X, Tang Q, Liu S, Yao K, *et al.* Clinical evaluation of corneal changes after phacoemulsification in diabetic and non-diabetic cataract patients, a systematic review and meta-analysis. *Sci Rep* 2017;7:14128.