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Original Research Article

Risk factors that associated with visual outcome of community based cataract surgery

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ABSTRACT

Background: Cataract is one of the leading cause of blindness in Indonesia and worldwide. Meanwhile the ability to carry out cataract surgery was not balanced by the increasing of cataract backlog of ± 70,000 per year. In addition to increase the number of cataract operations, it is very important to maintain the quality of surgery results by auditing the result of surgery. This study aims to evaluate post-operative visual acuity in social services organized by the Cataract Blindness Prevention Section of IOA Malang Branch in 2015-2017.
Methods: This study is a retrospective study based on medical record data of cataract patients underwent cataract surgery at a social service organized by the Cataract Blindness Prevention Section of IOA Malang Branch in January 2015 - December 2017 period. Data collected included demographic data, preoperative and postoperative visual acuity, type cataract surgery, and intraoperative complications.
Results: Cataract surgery carried out from 2015-2017 was 1,662 surgeries with 965 male patients (58.06%). Visual acuity before surgery was 1/300 in 583 patients (35.08%). The most cataract surgery procedure performed was SICS (60.17%). Vitreous prolapse was the most common complication found. There was a significant association between age and type of cataract surgery, with postoperative vision ($p < 0.05$, $\alpha = 5\%$). From the analysis, the progress of post-operative visual acuity was found in 85.93% of patients and the results were significant ($p < 0.05$, $\alpha = 5\%$).
Conclusions: Cataract surgery may provide significant visual improvement that elevates vision and quality of life for patients.

Keywords: Cataract, Post-operative visual acuity, Surgery

INTRODUCTION

Cataract or lens opacity of the eye is one of the most common causes of blindness in Indonesia and the world. The Indonesia population has a tendency to suffer from cataract 15 years faster than the population in the subtropical region, approximately 16-22% of cataract sufferers are operated under 55 year0073.[1] The cataract prevalence in each province in Basic Health Research 2013 was 1.8%, the highest was in North Sulawesi Province and the lowest was in DKI Jakarta. While the prevalence of cataract in East Java is 1.6%.[2]

It is estimated that new cases of cataract blindness will increase 0.1% of the total population or approximately 250,000 people each year. Meanwhile, the ability to carry out cataract surgery is reached 180,000/year as a consequently the cataract backlog increased 70,000/year.[3] IOA as an eye health sciences professional organization plays an active role in achieving VISION 2020 through the Cataract Blindness Prevention Section activities. The

Cataract Blindness Prevention Section is a division of IOA to overcome which is the most common causes of blindness in Indonesia. The IOA conducts cataract surgery for the poor (social service) which are mostly coordinated by the cataract blindness prevention section.[4]

In addition to increase the number of cataract surgery, it is very important to maintain the quality in achieving targets related to VISION 2020 goals. Surgery audit are carried out as one method to control the quality. To determine the quality of cataract surgery, indicators such as the proportion of intraocular lens implantation and postoperative visual outcome are very important.[5]

The results of good surgery are very important in reducing the number of blindness due to cataracts by promoting cataract surgery in the community. Poor surgery results will affect the willingness of the community to join and negatively impact people's perceptions of cataract surgery. The results of cataract surgery are measured as visual acuity in the operated eye in terms of function ability, quality of life, or economic rehabilitation.[6] The World Health Organization (WHO) categorizes post-operative visual acuity as follows: good (6/6 to 6/18), borderline (vision <6/18 to 6/60), and poor (vision <6/60).[7]

The types of routine surgery that are carried out include phacoemulsification, small incision cataract surgery (SICS), and extracapsular cataract extraction (ECCE), or intracapsular cataract extraction (ICCE) with certain indications.[8] This study evaluated post-operative visual acuity in social services organized by the Cataract Blindness Prevention Section, IOA in 2015-2017.

METHODS

This study is an analytical retrospective study. The research data used is secondary data obtained from medical records of cataract patients who underwent cataract surgery at a social service organized by the Cataract Blindness Prevention Section, IOA in January 2015-December 2017. Overall, the cataract surgery that had been carried out from 2015-2017 was 1,662 surgery.

Variable

Data obtained from patients includes name, gender, age, and visual acuity before surgery (counted from a distance of 3 m with finger counting, hand motion, and light perception). Types of surgeries performed include phacoemulsification, small incision cataract surgery (SICS), and extracapsular cataract surgery (ECCE) with intraocular lens (IOL) insertion, or intra capsular cataract extraction (ICCE) with certain indications. Post-operative visual acuity at the first follow-up day was recorded after patients were examined at a distance of 6 m from Snellen chart (without the best correction) then classified according to WHO criteria: good (6/6 to 6/18), borderline (vision <6/18 to 6/60), and poor (<6/60). Intra-operative complications are also noted. Data regarding the presence of ocular pathologies (such as corneal opacity, glaucoma, or retinal pathology), cataract type (congenital or senile), and systemic diseases (such as hypertension and diabetes mellitus) are not recorded. The follow-up period was carried out on the first postoperative day.

Statistical analysis

The outcome variable measured was post-operative visual acuity at the first follow-up day and recorded after the patient was examined at 6 metres from Snellen chart (without the best correction) then classified according to WHO criteria: good (6/6 to 6/18), borderline (<6/18 to 6/60), and poor (<6/60).

The correlations among age, sex, type of cataract surgery performed, and intra-operative complications with post-operative visual acuity were examined by Chi-square bivariate analysis. Differences in pre-operative and post-operative visual acuity were analyzed by paired T-test. SPSS 20.0 was used for data management and analysis.

RESULTS

In 2015-2017, 1,662 cataract surgeries were carried out by IOA Malang Branch. Table 1 showed demographic data and characteristics of patients underwent cataract surgery each year. Cataract surgery was performed in 965 male patients (58.06%) with the highest visual acuity before surgery was 1/300 (35.08%). The most cataract surgery procedure performed was SICS with IOL insertion (60.17%).

Complications found in 100 eyes (6.01%) with the most common complication found was vitreous prolapse. The post-operative visual acuity on the first day without the best correction was in the poor criteria (37.18%).

To find out the further relationship among sex, age, and type of cataract surgery performed with the results of surgery (post-operative visual acuity), bivariate analysis was carried out by Chi-square.

The analysis in table 2 concluded that there is a significant correlation between age and post-operative visual acuity ($p < 0.05$, $\alpha = 5\%$). Younger age provided a higher opportunity to get a better post-operative visual acuity compared to older age. Whereas the results of the analysis found that there was no significant relation between sex with ppost-operative visual acuity ($p > 0.05$, $\alpha = 5\%$). From the analysis of table 3, it was found that there was a significant correlation between the type of surgery with post-operative visual acuity ($p < 0.05$, $\alpha = 5\%$). The type of phacoemulsification surgery provides higher opportunity to get a better post-operative visual acuity compared to SICS and ECCE. Table 4 showed that patients who experienced poor grade postoperative vision were 86% from 100 patients (6.01%) who had intra-operative complications.

Table 1: Demographic data and characteristics of patients underwent cataract surgery each year.

	2015	Percentage	2016	Percentage	2017	Percentage
Operated Patients	158		716		788	
Age						
<50 year	7	4.43%	716	100%	59	7.48%
51-70 year	21	13.29%			400	50.76%
>70 year	17	10.76%			146	18.52%
No data	113	71.52%			183	23.22%
Sex						
Male	90	56.96%	434	60.61%	441	55.96%
Female	68	43.04%	282	39.38%	347	44.03%
Pre-Operative Vision						
LP+	30	18.99%	136	18.99%	128	16.24%
1/300	51	32.28%	296	41.34%	236	29.95%
1/60	30	18.99%	123	17.18%	162	20.56%
≥2/60	47	29.74%	161	22.48%	262	33.25%
Types of Surgery						
Fakoemulsifikasi+IOL	54	34.18%	264	36.87%	319	40.48%
SICS+IOL	98	62.02%	437	61.03%	465	59.01%
ECCE+IOL	6	3.80%	9	1.25%	3	0.38%
ICCE	0	0	6	0.83%	1	0.12%
Postoperative Vision						
6/6 s/d 6/18	94	59.49%	246	34.35%	75	9.51%
6-24 s/d 6/60	51	32.28%	238	33.24%	103	13.07%
<6/60	13	8.23%	214	29.88%	391	49.62%
No follow up	0	0	18	2.51%	219	27.80%
Complication						
VP	4		36		17	
Iridodialysis	1		5		0	
Aphakia	3		7		9	
Nucleus drop	1		3		0	
Iridoplegia	0		1		0	
PCR (without VP)	0		0		6	
Decenteration IOL	0		0		7	
Total of Complication	**9**	5.69%	**52**	7.26%	**39**	4.94%

Table 2: Cross tabulation between age and sex relation with postoperative vision.

	Postoperative Vision						Total
	Good (6/6 - 6/18)	**%**	**Borderline (6/24 - 6/60)**	**%**	**Poor (6/60 - 3/60)**	**%**	
Age of Patient							
< 50 year	15	22.73	17	25.76	34	51.52	66
51 - 70 year	55	21.65	53	20.87	146	57.48	254
> 70 year	26	18.98	27	19.71	84	61.31	137
No data	349	36.05	340	35.12	279	28.82	968
	Chi Square :	112,290	p =	0,000			
Sex							
Male	256	32.04	246	30.79	297	37.17	799
Female	187	29.87	189	30.19	250	39.94	626
	Chi Square :	1,270	p =	0,530			

Table 3: Cross tabulation between types of surgery and postoperative vision relation.

Surgery Type	Postoperative Vision								Total
	Good (6/6 - 6/18)	%	Borderline (6/24 - 6/60)	%	Poor (6/60 - 3/60)	%	No Data	%	
Phakoemulsification	209	32.81	118	18.52	207	32.50	103	16.17	637
SICS	203	20.30	271	27.10	396	39.60	130	13.00	1000
ECCE	3	16.67	3	16.67	9	50.00	3	16.67	18
ICCE	0	0.00	0	0.00	6	100.00	0	0.00	6
Chi Square : 56,491					p = 0.000				

Table 4: Amount of intraoperative complications that occur with postoperative vision.

Intraoperative Complications	Postoperative Vision						Total
	Good (6/6 - 6/18)	%	Borderline (6/24 - 6/60)	%	Poor (6/60 - 3/60)	%	
With Complications	3	3.00	11	11.00	86	86.00	100
Without Complications	433	32.68	419	31.62	473	35.70	1325

Table 5: Differences in preoperative vision with postoperative vision.

Different Test	Mean	N	Std. Deviation	t	df	p	Note
Pre-op Vision	0.031	938	0.055	-29.865	937	0.000	Significant
Post-op Vision	0.270	938	0.243				

Based on the results of the paired T-test in Table 5, it can be seen that the difference between preoperative visual acuity and postoperative vision is concluded that there was a significant difference between preoperative vision and postoperative vision ($p < 0.05$). This indicated that there was a significant progress in visual sharpness after cataract surgery. The progress of postoperative vision was seen in 85.93% of patients.

DISCUSSION

This retrospective study focused on the results of cataract surgery on the first postoperative day at a social service organized by the Cataract Blindness Prevention Section of IOA Malang Branch in 2015-2017.

The analysis concluded that there was a significant association between age and post-operative visual acuity ($p < 0.05$, $\alpha = 5\%$). Younger age provided a higher opportunity to get a better post-operative visual acuity compared to older age. In another study, older age was a risk factor for worst surgical outcomes.[9]

Besides the presence of ocular comorbidity, advanced age was one of the predictor factors for poor post-operative visual acuity. It is possible that patients with advanced age experience cataracts that are denser and harder. In addition, ocular comorbidities in elderly patients such as glaucoma, diabetic retinopathy, and age-related macular degeneration are often missed during preoperative selection.[10]

Sex was not significantly related with post-operative visual acuity ($p > 0.05$, $\alpha = 5\%$). In this study, men (37.17%) had a greater chance of having worse postoperative visual acuity than women. However, the results of the study in Pakistan and the Rajasthan study in India showed that women were associated with poor postoperative vision.[11]

The type of surgery affected post-operative visual acuity ($p < 0.05$, $\alpha = 5\%$), and it was found that phacoemulsification provided the best visual results. In 11 other studies involving 1,228 patients, it was found that subjects in the phacoemulsification group had a greater chance of achieving a 6/12 or more visual acuity with the best correction at 3 months post-operatively.[12]

Today, phacoemulsification is a cataract surgery method that is ideal for most ophthalmologists because of small wounds and a fast healing period. In a study conducted in Thailand, visual acuity of patients underwent different cataract surgery techniques (phacoemulsification and ECCE) was compared. Post-operative visual acuity increased significantly compared to pre-operative ($p < 0.05$) in all age groups. Cataract patients who underwent phacoemulsification had better post-operative visual acuity than the ECCE method.[13]

Most patients have a pre-operative visual acuity sharpness of 1/300 (35.08%) and this reflects the patients reluctancy in Indonesia to undergo cataract surgery unless they had blindness. This is similar to other studies

of Adio and Nwosu, each of which reported that 93% and 87.8% of patients had 3/60 vision or even less. Patients must be motivated to undergo cataract surgery earlier before had blindness to reduce the difficulties of daily activities and the patient's economic burden, the patient's family, even the community. A description of the availability of free cataract surgery and services provided at the eye hospital at the patient's closest location.[14,15]

WHO recommends that good surgery results having good criteria (6/6 to 6/18) must be >80% and with the best correction must be >90%, borderline criteria (<6/18 to 6/60) must be <15% and with the best correction should be <5%, and the poor criteria (<6/60) must be <5% and with the best correction should be <5%. The patient's visual acuity improved to 6/6 to 6/18 on the first post-operative day in 415 eyes (24.97%). In 618 eyes (37.18%) experienced <6/60 post-operative visual acuity even though there was a statistically significant post-operative improvement of visual acuity after cataract surgery ($p < 0.05$).

The results of operations performed on social services were less than WHO recommendations. This is because patients still had postoperative ocular inflammation on the first postoperative day. Visual acuity after surgery should also be examined with the best correction. Several studies have shown visual improvement over time. The Nwosu study stated that patients need about 2-3 months to achieve optimal post-operative visual acuity.[16] Preliminary studies by Chirambo reported that post-operative visual acuity with good criteria is 66.5% and with the best correction of 80.2% achieved between 1 and 7 weeks postoperatively.[17] Limburg et al also reported that 31% of eyes reached good criteria at 1 day postoperatively and increased to 69% in the 8-week postoperative period. The reason the occurrence of visual improvement at repair at 6 weeks postoperatively is the recovery of intraocular inflammation after surgery and correction of remaining refractive disorders.[18]

Other reasons for the lack of operating results are poor selection of patients, previous comorbidities, intraoperative complications, and uncorrected refractive disorders. The presence of other pathologists such as glaucoma, cataract complications due to uveitis, and age-related macular degeneration can be considered important risk factors for poor postoperative cataract outcome. Visual acuity improvement after cataract surgery with certain pathological factors depends on the severity of the disease.[17]

This indicated the presence of previous ocular disease could affect postoperative vision. A thorough ocular examination before surgery is very important for detecting ocular disease beforehand. It is important to inform patients about the risks and probabilities of postoperative adverse outcomes. Intraoperative and postoperative complications also had a major effect on postoperative visual acuity.

Intraoperative complications were found including posterior capsule rupture, vitreous prolapse, nucleus drop, iridodialysis, and vitreous prolapse which is the most frequent (57%). In a comparative study of various complications of cataract surgery, posterior capsule rupture occurred in 1.5-3.1%, vitreous prolapse in 0.8-1.39%, the nucleus dropped at 0.18-1%, and supracoroid bleeding at 0.07-0.14% cases.[18] Castells et al reported patients who underwent phacoemulsification had intraoperative complications compared to ECCE, especially for intraoperative iris.[19] The cataract surgery survey in Iran from 2000 to 2005 also reported the lowest risk of intraoperative complications in phacoemulsification (2.29%) and highest in ICCE (36.17%).[20]

From the patient's perspective, the fact that poor vision is more important than the reason why the results of surgery were not good. Patients may not be able to distinguish between visual impairments related with previously undetectable ocular pathology and those related to surgical complications. We should give our maximum efforts to provide complete vision recovery. Producing good cataract surgery results consistently is very important in patients in developing countries who want to undergo cataract surgery earlier before severe visual impairment occurs.[21]

The weakness of this retrospective study that the data was incomplete including the age of the patient (58.24%) due to lack of postoperative recording; and post-operative visual acuity (14.2%) because patient did not attend on the first post-operative day. Besides, some patient's pre-operative visual acuity were not measured by Snellen chart, systemic comorbidities and ocular pathologies were not analyzed, the post-operative visual acuity on the first day was not examined with the best correction, and the follow-up period was limited to the first post-operative day so the patient's visual acuity progress and post-operative complications could not be followed.

CONCLUSION

Cataract surgery may provide significant visual improvement that elevates vision and quality of life for patients. Good pre-operative patient selection, proper reduction in number of complications and management of complications, good surgical techniques to reduce postoperative astigmatism, and correction for postoperative refraction disorders are needed to produce good postoperative results.

Regular evaluation of post-operative visual acuity is needed. Ophthalmologists are motivated to evaluate the results of their surgery and to identify the causes of unfavorable results of surgery. Knowing the cause will increase the results of the next cataract surgery that gives better results. It is recommended to conduct further studies that evaluate comorbidity factors and post-operative visual acuity over a longer period of time.

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