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Article

Visual outcome after cataract surgery in a tertiary eye hospital of Chittagong district, Bangladesh

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Abstract: To evaluate the visual outcome in patients who have had their cataract surgery in a tertiary hospital of Chittagong district in Bangladesh. This is a clinic-based study of consecutive cataract-operated patients who had age-related cataract with vision less than <6/60 before surgery. A total of 228 patients who visited the hospital and met the eligibility criteria were included in the study. The mean age of the patients was 62.46± 10.14 years and 134 (58.8%) were female. A total of 456 surgeries were performed on 228 patients. The most common procedure was small incision cataract surgery (SICS) with intraocular lens (IOL) implantation, operated in 422(92.5%) eyes. Among cataract-operated eyes, 290 (64%) had presenting vision >6/18 and <6/60 were found in 11 (2.4%) eyes. In most of the cases, visual acuity has improved after best correction as the percentages with the best correction were 402(88%) and 7(1.55%) respectively. Analysis of multiple logistic regression shows that patient's older age (OR 9.101; 95% CI 3.331, 24.869), gender female (OR 2.374 CI 1.403, 4.017), literacy (OR 1.660; CI 1.009, 2.733) and SICS surgery technique (OR 3.540; CI1.298, 9.659) were significantly associated with poor visual outcome. Overall**,** this study demonstrates that cataract surgery can restore good visual acuity. However, the visual outcome needs to be improved to meet the WHO standard, and more attention should be directed towards monitoring of outcomes and correction of refractive error after cataract surgery.

Keywords: cataract surgery; visual outcome; Bangladesh

1. Introduction

Globally, cataract is considered one of the leading cause of blindness and visual impairment especially in developing countries (Farmer *et al.*, 2015; Yuan *et al.*, 2015). Bangladesh is a developing country situated in south-east Asia where 50%-80% of total blindness results from cataracts (Lindfield *et al.*, 2012). The first national blindness survey of this country was conducted in 2003, which found that about 650,000 people aged over 30 were blind due to cataract(Bourne *et al.*, 2003). It also reported that nearly 130,000 additional cataract-related blinding cases occur in every year (Dineen *et al*., 2003). This survey concluded that there is a need to establish a robust and sustainable national eye care service in order to reduce this large backlog of cataract blindness.

Cataract surgery is the most effective and common method of restoring vision from cataract blindness (Astbury, 2016). To assess the effectiveness of cataract surgery, indicators such as good visual acuity outcomes is essential to assess the quality of the service (Simon *et al*., 2014; Gogate *et al.*, 2011). Although cataract surgical technologies have advanced, outcomes of surgery are not satisfactory in low-income countries (Marmamula *et al.*, 2016; Murthy *et al.*, 2009). Cataract outcome related population-based surveys from India, Nepal and other developing countries have reported a poor outcome ranging from 9% to 41% (Hussen *et al.*, 2017; Ilechie *et al.*, 2012; Isawumi *et al.*, 2009; Thapa *et al*., 2011) but the World Health Organization (WHO) recommended that poor outcome should be less than 4 %. In Bangladesh, two studies conducted in a population setting also found

similar poor outcomes (Bourne *et al.*, 2003; Lindfield *et al*., 2008). However, one study in a clinical setting in Bangladesh nearly met the WHO standard, but this study only investigated the visual outcome of manual small incision cataract surgery (MSICS) (Masum *et al.*, 2015). Therefore, more studies are required to monitor the outcomes of cataract surgery in Bangladesh.

The aim of this study is to present the findings of the visual outcome in patients who have undergone age-related cataract surgery in a tertiary hospital in the Chittagong district of Bangladesh.

2. Materials and Methods

This is a hospital-based study conducted at the Chittagong Eye Infirmary and Training Complex. Annually this hospital performs approximately 20,000 cataract operations. Patients who had visited the cataract clinic between March and August of 2014 were invited to participate in this study. Cataract operated patients with age-related cataract and pre-operative visual acuity less than 6/60 in each eye were included in this study. These patients were preferred, as the purpose of this study is to assess the outcome of the age-related blinding cataract after cataract surgery. Consequently, complicated cataract, traumatic cataracts, and cataract combined with glaucoma, cornea emergency or vitreoretinal diseases were excluded. These patients were excluded because of poor prognosis for vision after surgery

All socio-demographic and pre-operative data were collected retrospectively from the discharge records, whereas presenting and best corrected visual acuity was collected prospectively from the patients. All the required data, including demographic and surgery related data, were recorded in a pre-tested standard questionnaire form. In addition, patients with ICCE surgery was excluded for statistical analysis as there was only one patient found with ICCE.

The World Health Organization (WHO) recommended manual for Monitoring Cataract Surgical Outcomes (MCSO) were followed to define the produces and cataract surgery outcomes (Gogate *et al.*, 2011; Matta *et al.*, 2016). Presenting distance visual acuity (PVA) was recorded by using illuminated Snellen charts, without spectacles or with spectacles if the patient was already using them and with best corrected visual acuity after refraction. The visual acuity of each eye was classified according to the WHO recommended standard cataract outcome grading where good vision indicates VA 6/6 to 6/18, borderline vision indicates VA less than 6/18 to 6/60, and poor vision is less than 6/60.

The ethics committee of Chittagong Eye Infirmary and Training Complex approved this study. Patients were provided with a consent form and asked for their oral consent before the interview.

3. Results

A total of 228 patients were enrolled in this study after meeting the inclusion criteria. Table 1 represents the socio-demographic characteristics of the cataract-operated patients. The mean age of the patients was 62.46± 10.14 years, ranging from 40 to 97 years old. Of these patients, female participation 134 (58.8%) was significantly greater than male 94 (41.2%). A large number of the patients 152 (66.75%)) lived in rural areas and only 76 (33.3%) patients were from urban areas. Patients' literacy status showed that 135 (59.2%) patients were illiterate and 93 (40.8%) literate. Among the patients, 194 (85.1%) were retired, and 34 (14.9%) were engaged with business, professional and non-professional work.

Overall 456 cataract operations were performed on 228 patients. Surgery-related information is presented in Table 2. In 256 (56.1%) eyes three years has been passed since the operation, while 200 (43%) eyes were found operated before three years. In terms of surgical procedure, two types of techniques with IOL implantation were found, SICS and PHACO, where SICS alone was found in 422 (92.5 %) eyes.

Visual acuity outcomes in Table 3 show that more than half of the cataract-operated eyes 290 (63.6%) had good presenting visual acuity (>6/18), while borderline (6/18-6/60) and poor outcome (<6/60) were found in 47 (10.3%) eyes and 11 (2.4%) eyes respectively. After best correction, good visual acuity outcome was present in 402 (88.2%) eyes, and the remaining 54 (11.8%) eyes had <6/18 vision.

Table 4 shows the outcomes of presenting visual acuity on patient's age, gender, area, educational status, working status, type of surgery and surgery period by using chi-square statistics. This table highlighted that patients who were young, male, literate, undergone PHACO surgery and surgery period less than 3 years had comparatively better visual outcome than the other group of people.

Further analysis of Multiple logistic regression was performed to investigate the risk factors for visual acuity less than 6/18 (Table 5). Regression results indicate that patient's older age (OR 9.101; 95% CI 3.331, 24.869), female gender (OR 2.374 CI 1.403, 4.017), literacy (OR 1.660; CI 1.009, 2.733) and SICS (OR 3.540; CI1.298, 9.659) were significantly associated with poor visual outcome.

Table 1. Demographic characteristics of the patients.

Variable	No	%
Age		
40-49	22	9.6
50-59	50	21.9
60-69	88	38.6
70-79	68	29.8
Gender		
Male	94	41.2
Female	134	58.8
Area		
Rural	152	66.7
Urban	76	33.3
Educational status		
Illiterate	135	59.2
literate	93	40.8
Working status		
Working	34	14.9
Not working	194	85.1
Total	**228**	**100%**

Table 2. Surgery related variables of the 456 cataract operated eyes.

Variables	Number	%
Type of the surgery		
PHACO+ IOL	34	7.5
SICS+ IOL	422	92.5
Surgery period		
<3 years	256	56.1
>3 year	200	43.9

PHACO: Phacoemulsification, IOL: Intraocular Lens SICS: small incision cataract surgery

Table 3. Visual acuity outcomes in 456 cataract operated eyes.

Category of Outcome	Level of VA	Presenting VA		Best corrected VA	
		N	%	N	%
Good	6/6-6/18	290	63.6	402	88.2
Borderline	<6/18-6/60	155	34.0	47	10.3
Poor	<6/60	11	2.4	7	1.5
Total		456	100	456	100

PHACO: Phacoemulsification, IOL: Intraocular Lens SICS: small incision cataract surgery

Table 4. Test of independence of visual acuity of 456 operated eyes and background ground characteristics of patients.

Variable	All	6/6-6/18 N (%)	<6/18-6/60 N (%)	<6/60 N (%)	p-value
Age					
40-49	44	38 (86.4%)	6 (13.6%)	0	
50-59	100	74 (74.0%)	26 (26.0%)	0	
60-69	176	116 (65.9%)	56 (31.8%)	4 (2.3%)	p<0.001
70+	136	61 (44.9%)	67 (49.3%)	8(5.9%)	
Gender					
Male	188	132 (70.2%)	52 (27.7%)	4 (2.1%)	p<0.05
Female	268	158 (59.0%)	103 (38.4%)	7 (2.6%)	
Area					
Rural	304	192(63.2%)	107(35.2%)	5(1.6%)	P=0.162
Urban	152	96(63.2%)	49(32.2%)	7(4.6%)	
Educational status					
Illiterate	270	165(61.1%)	97 (35.9%)	8(3.0%)	P=0.526
literate	186	123(66.1%)	59 (31.7%)	4(2.2%)	
Working status					
Working	388	52(76.5%)	15(22.1%)	1(1.5%)	P=0.047
Not working	68	236(60.8%)	141(36.3%)	11(2.8%)	
Type of surgery					
PHACO	34	29 (85.3%)	5 (14.7%)	0	
SICS	422	259 (61.4%)	151 (35.8%)	12 (2.8%)	p<0.01
Surgery period					
<3 years	256	177 (69.1%)	75 (29.3%)	4 (1.6%)	p<0.01
>3 years	200	111 (55.5%)	81(40.5%)	8(4.0%)	

PHACO: Phacoemulsification, IOL: Intraocular Lens SICS: small incision cataract surgery

Table 5. Logistic regression analysis showing the risk factors for poor visual outcomes after cataract surgery.

Variable	Odd ratio	95% CI	p-value
Age			
40-49	Reference		
50-59	2.656	0.978,7.210	P=0.055
60-69	3.706	1.426,9.632	P<0.01
70+	9.101	3.331, 24.869	p<0.001
Gender			
Male	Reference		
Female	2.374	1.403, 4.017	p<0.001
Area			
Rural	Reference		
Urban	0.894	0.563, 1.418	P=0.633
Educational status			
Illiterate	Reference		
literate	1.660	1.009, 2.733	P<0.05
Working status			
Working	Reference		
Not working	1.049	0.504, 2.185	P=0.898
Type of surgery			
PHACO	Reference		
SICS	3.540	1.298, 9.659	P<0.05
Surgery period			
< 3years	Reference		
>3 years	1.493	0.975, 2.286	P=0.065

PHACO: Phacoemulsification, IOL: Intraocular Lens SICS: small incision cataract surgery

4. Discussion

This study focused on the outcome of visual acuity after cataract surgery. Being a hospital-based study, it was easy and quick to collect all the required data from 228 eligible patients. In addition, large sample size seems to

have been an advantage in this study as it is likely to be representative in terms of volume of cataract surgery performed at the hospital, CEITC. The number of cataract operations was seen to be higher in patients with an age range from 60 to 90. Studies from other developing countries also reported a similar age range to this study (Lundström *et al.,* 2013; Olawoye *et al.,* 2011; Thapa *et al.,* 2011). Cataract surgery rate was found to be greater in female patients than male patients, which was also evidenced in several studies (Yuan *et al.,* 2015). It has been reported that women have slightly increased the age-adjusted risk for cataract (Olawoye *et al.,* 2011) while another study claim that longer life expectancy of the female is the reason for this higher prevalence of cataract surgery (Marmamula *et al.,* 2016). This study has shown that a small number of patients had received a formal education, although it is not surprising for this age group when considering the educational context of Bangladesh and other developing countries where elderly is less educated.

Similar to other studies (Ilechie *et al.,* 2012; Murthy *et al.,* 2009; Yuan *et al.,* 2015), this survey found that SICS was the most preferred surgical procedure among the other techniques, despite the fact that overall better visual outcome was seen in PHACO surgery. SICS was highly preferred as it is cost-effective and can produce a considerably improved visual outcome. It also points out that there is a transition from intra capsular cataract extraction (ICCE) with aphakic spectacle correction to phacoemulsification and small incision cataract surgery with intraocular lens (IOL) implantation, as this study found only one patient with ICCE.

In this study, the overall outcome of good presenting VA (63.6%) was comparable and better than what was reported in other cataract-related studies conducted in Bangladesh (Bourne *et al*., 2003; Lindfield *et al*., 2008) and its neighbors such as India, and Nepal, Pakistan (Matta *et al.,* 2016; Thapa *et al.,* 2011). Nevertheless, this finding was poor when compared with developed countries (Lundström *et al.,* 2013). In addition, this study should produce a much better outcome as it excluded complicated cataracts and was conducted in a hospital setting, whilst population-based studies include all type of cataract patient. However, patients who underwent cataract surgery many years ago might have been responsible for this poor outcome, while in this study almost half of the patients had had their surgery three years before.

Nonetheless, this study shows that a significant improvement of visual acuity had been gained after best correction, as over two-thirds of the operated eyes (88.2%) had gained vision >6/18 with the best correction. A large number of cataract outcome studies also demonstrate that in many cases the outcome of visual acuity had improved after best correction. Studies claim that incorrect biometry calculation or IOL section might be the reason for this high amount of refractive error (Kandel *et al.,* 2010; Murthy *et al.,* 2009).

In 1998, the World Health Organization proposed guidelines to monitor the outcome of cataract surgery in terms of presenting and best corrected visual acuity (Matta *et al.,* 2016). It recommended that cataract surgery should restore visual acuity > 6/18 in 80% eyes, and after best correction this should be 90%. However, outcomes of this survey did not meet the WHO standard in terms of both PVA and BVA. On the other hand, a favorable result was found when comparing the poor outcome with the WHO recommended benchmark. This study had < 5% poor visual acuity outcome for both conditions, PVA in 2.4% eyes and BVA in 1.5% eyes.

In this study, the increased age of the patients was found to be one of the risk factors for visual outcome <6/18. A growing body of research also evidenced that there is an association between older age and poor vision outcome (Bourne *et al.,* 2003; Matta *et al.,* 2016; Murthy *et al.,* 2009). Studies suggest that denser cataract and ocular co-morbidities might be the cause of these consequences in this age group, though some studies found this relation even after controlling for ocular comorbidities (Gogate *et al.,* 2011; Murthy *et al.,* 2009; Sonron *et al.,* 2015). Poor outcome was also observed in patients who were female and had educational status illiterate. Although this study was unable to explain the reasons for the connection between illiteracy and vison, poor outcome in the female patient has been found in many studies (Lundström *et al.,* 2013; Matta *et al.,* 2016)**.** It is likely that females do not have equal access to surgery as males or are unaware of the possibility of surgery at an early stage. However, a contradictory result has been found, and even no gender difference has been reported in some studies (Gogate *et al.,* 2011; Kandel *et al.,* 2010).

Despite these findings, the current study had some limitations. Even though a considerable sample size was chosen for this clinic-based study, it was not representative when compared with other population-based studies. Furthermore, this study did not assess the ocular co-morbidity and PCO, but these are potential risk factors that may affect the stability of good visual outcomes after surgery (Thapa *et al.,* 2011). As a result, further studies are needed to evaluate the co-morbidities and their effects on outcome.

In conclusion, this study has demonstrated that cataract surgery improves visual acuity in patients who had a poor vision before the operation. Results also highlighted that a careful pre-surgical evaluation is necessary in order to avoid refractive surprise after surgery and to achieve a satisfactory outcome. However, in developing countries like Bangladesh, regular monitoring of cataract surgical outcome should be carried out at hospital and

population level so that obstacles can be identified in this area and appropriate measures can be taken to fill the gaps.

Conflict of interest

None to declare.

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