

Burden of Cataract and the Importance of Surgical Management at a Tertiary Care Hospital in Bangladesh

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ABSTRACT

Background

Cataract is one of the most common causes of blindness and visual impairment in the world, especially in developing countries. Cataract surgery is a well-established and commonly performed intervention in the management of cataract, yet many patients are found to have advanced stages of cataract due to lack of access to eye care services and lack of awareness.

Objective

The present study aimed at a detailed assessment of the socio-demographic profile, clinical features, and postoperative outcomes of patients with cataracts admitted to a tertiary health-care facility in Bangladesh, especially focusing on the extent of vision improvement after surgery.

Methods

This was cross-sectional observational study conducted in the ophthalmology department of a tertiary care hospital in Bangladesh. In total, 51 patients with cataracts were included in the study. Data were collection from September 1, 2024 to December 31, 2024. Visual acuity of the patients was assessed using the Snellen chart before and after cataract surgery.

Results

A total of 51 cataract patients were enrolled in this study. Cataract prevalence increased with age, with the highest prevalence in patients aged >69 years at 50.98%, followed by 27.45% in those aged 60-69 years, 11.77% in those aged 50-59 years, and 9.80% in those aged <49 years. The majority of cataract patients were from rural areas, accounting for 72.55%, whereas 27.45% were from urban areas, and some of these patients also had diabetes. Patients from urban areas were significantly more likely to achieve good visual outcomes compared to those from rural areas (AOR: 2.45; $p < 0.04$). Similarly, patients without diabetes had higher odds of improved post-operative visual acuity than diabetic patients (AOR: 2.75; $p < 0.03$).

Conclusion

This research indicates that cataracts predominantly affect older individuals, with a higher prevalence observed in rural populations. Additionally, a significant number of patients diagnosed with cataracts also had diabetes, suggesting that diabetes may be a risk factor. Following cataract surgery, patients reported an improvement in their vision. Multivariate regression analysis revealed that residing in urban areas and the absence of diabetes were two key factors associated with better surgical outcomes. This study emphasize the need for early detection and timely cataract surgery to prevent blindness. Increasing access to cataract surgery and improving public awareness are likely to alleviate the burden of cataract-related visual impairment in the country.

Keywords

Cataract; Visual impairment; Cataract surgery; Prevalence; Visual acuity.

INTRODUCTION

Cataract is one of the most common causes of visual disability and blindness. It is one of the most important public health challenges facing the world today, especially in low- and middle-income countries. Cataract is characterized by the opacification of the crystalline lens. This results in the gradual diminution of vision. If left untreated, it can lead to complete blindness. It has been estimated that cataract is one of the most important causes of blindness and severe vision loss in the world today, affecting millions of people around the world, especially the elderly population¹.

The burden of cataract appears to be more in developing countries, where access to eye care facilities, early detection, and surgical interventions are lacking. In addition, the aging population, increased life expectancy, and rising rates of chronic diseases are also contributing to the rising burden of visual impairment due to cataract. Several studies have demonstrated that a significant percentage of avoidable blindness is due to cataract, particularly in South Asia and other resource-constrained regions^{2,3}. In such regions, a lack of healthcare facilities, awareness, and socioeconomic conditions usually result in a late presentation of the disease, which is at an advanced stage.

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It has also been observed that age is the most significant risk factor that contributes to the development of cataracts. The degenerative changes that occur in the proteins of the lenses due to aging cause the transparency of the lenses to decrease, which increases the risk of cataracts with age. In addition, diabetes, exposure to ultraviolet light, smoking, nutritional deficiencies, and systemic diseases have also been identified as significant risk factors that contribute to the development of cataracts^{4,5}. Among these, diabetes has been identified as a significant risk factor that contributes to the development of cataracts due to metabolic disorders.

The only option for restoring vision in a patient with a cataract is through cataract surgery. Advances in surgical techniques for cataract removal, including phacoemulsification and extracapsular cataract extraction with intraocular lens implantation, have greatly helped in achieving favorable surgical outcomes for cataract patients. Cataract surgery is considered one of the most successful medical interventions in restoring vision and enhancing the quality of life for patients with this condition⁷. Research studies have shown that timely cataract surgery can help in reducing blindness at both individual and community levels⁸.

Cataract is a leading cause of blindness in Bangladesh, even though surgical interventions are available for its treatment. Although Bangladesh has made substantial progress in enhancing eye care facilities, a substantial population still remains untreated due to a lack of awareness, financial constraints, and inaccessibility to specialized ophthalmological facilities. Awareness of the prevalence of cataract, as well as the assessment of surgical outcomes, are essential to improve eye care facilities, thereby reducing avoidable blindness in the population of Bangladesh⁹.

With this objective, the current study was carried out to evaluate the prevalence of cataract in various age groups of the population and to assess the importance of surgical interventions in the treatment of cataract based on pre- and post-surgical outcomes of patients visiting a tertiary care center in Bangladesh. The present study aimed at a detailed assessment of the socio-demographic profile, clinical features, and postoperative outcomes of patients with cataracts admitted to a tertiary health-care facility in Bangladesh, especially focusing on the extent of vision improvement after surgery.

METHODS AND MATERIALS

Study Design: This study was cross sectional observational study in a tertiary care hospital in Bangladesh. Data were collection from September 1, 2024 to December 31, 2024. The study was done in the ophthalmology department of the hospital where patients were screened for visual disturbances and treated accordingly by ophthalmologists.

Study Population: The study population will comprise patients diagnosed with cataract and attending the ophthalmology department for cataract surgery. Patients diagnosed with cataract and admitted for cataract surgery will form the population of the study. All patients who meet the inclusion criteria and are willing to participate in the study will be considered for the study population. In total, 51 patients with diagnosed cataract will form the population of the study.

Inclusion Criteria

Patients diagnosed with cataract will form the population of the study.

- Patients diagnosed with cataract and admitted for cataract surgery will form the population of the study.
- Patients of different age groups and different sexes will form the population of the study.

Exclusion Criteria

- Patients with other eye diseases that could cause significant visual acuity problems, such as glaucoma, diseases of the retina, and corneal opacity, were excluded from the study.
- Patients who did not want to participate in the study and those for whom there was inadequate clinical information were excluded.

Simple size calculation: In this study, the sample size has been calculated using a specific formula. This adjustment aims to ensure a more accurate representation of the population by accounting for the variability in the collected data. As a result, the findings will offer a stronger foundation for drawing conclusions

$$n = \frac{Z^2 \times p \times q}{d^2} \text{ recommended recommendations:}$$

Where:

- p = estimated prevalence
- $q = 1 - p$

- Z = standard normal deviate (for 95% CI, $Z = 1.96$)
- d = margin of error

If we assume:

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.14)^2} = \frac{3.8416 \times 0.25}{0.0196} = \frac{0.9604}{0.0196} = 51$$

Data Collection Procedure: A structured data collection form is used for collecting data for the study. Demographic variables like age, sex, literacy status, and place of residence (urban or rural) are collected using the form. Clinical variables like the presence of systemic diseases, such as diabetes mellitus, are collected using the form. An ophthalmic examination is conducted for all the patients in the study. The visual acuity of the patients is determined using a standard Snellen chart before the patients undergo surgery. This is done to determine the severity of visual impairment in the patients. The slit-lamp examination is conducted for the patients to confirm the diagnosis of cataract and to determine the severity of cataract. Other eye examinations are conducted as needed to confirm the absence of eye diseases in the patients.

Surgical Procedure: In this study, all patients underwent cataract surgery under the care of skilled and experienced ophthalmic surgeons. The conventional surgical procedures for cataract, such as extracapsular cataract extraction and phacoemulsification with intraocular lens implantation, were carried out based on the condition of the patients and the surgeons' judgment.

Postoperative Assessment: Postoperative examination of patients is conducted to assess the outcomes of the surgical procedures performed on the patients. The visual acuity of the patients is reassessed after the surgery using the Snellen visual acuity chart. The visual outcomes of the patients are classified based on different visual acuity levels after cataract surgery.

Statistical Analysis: Descriptive statistics, such as mean, standard deviation, frequency, and percentage, were utilized in summarizing the data. Associations among categorical variables were done using the chi-square test. Pre- and postoperative visual acuity comparison was made to determine surgery effectiveness. Regression analysis was made to adjust other confounding variables. All tests were analyses using SPSS version 29, where a value less than 0.05 was set as statistical significance

Ethical Clearance

Ethical clearance for the study was obtained from the relevant authority in the institution from IRB Board of BMU. Participants were informed about the purpose of the study, and informed consent was obtained before the study began.

RESULTS

A total of 51 patients with cataract were included in the present study conducted in a tertiary care hospital in Bangladesh. It has been observed in the present study that with increasing age, the incidence of cataract increases in patients. The highest percentage of patients with cataract was observed in the age group of more than 69 years (50.98%), followed by those in the 60-69 years age group (27.45%). It has been observed in the present study that a smaller percentage of patients with cataract were in the 50-59 years age group (11.77%), and the least percentage of patients with cataract were in the age group of less than 49 years (9.80%). These findings suggest that the incidence of cataract is more in the elder population of the patients (Table 1).

Table-1: Prevalence of cataract among different age groups

Age group	N=51	%
<49 years	5	9.80
50 to 59 years	6	11.77
60 to 69 years	14	27.45
>69 years	26	50.98

In Figure 1 above, it was observed that a relatively larger number of patients had cataract and they were illiterate at 52.9% than those that had attained literacy at 47.1%. This indicates that there is a possibility of a higher prevalence of cataract among people with low literacy levels. Regarding gender distribution, the number of women having cataract was more compared to men at 58.8% and 41.2% respectively.

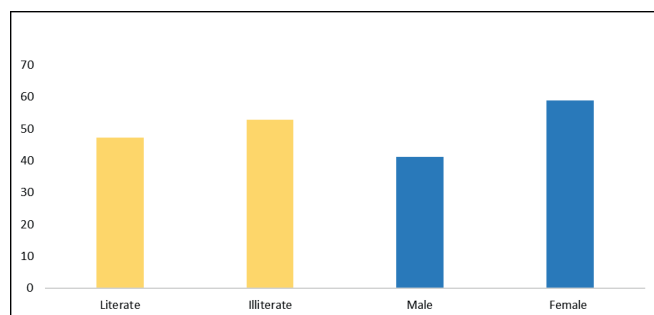


Fig-1: Prevalence of cataract based on literacy and sex

In the table2, the distribution of cataract patients based on the locality of residence, the majority of cataract patients came from rural areas, accounting for 72.55%. In contrast, 27.45% of the patients came from urban areas. This indicates that cataract was more prevalent in the rural population compared to the urban population.

Table-2: Prevalence of cataract based on locality

Locality	N=51	%
Urban	14	27.45
Rural	37	72.55

Figure 2, shows the percentage of diabetes in patients with cataract. It is evident that a significant number of cataract patients were suffering from diabetes as well.

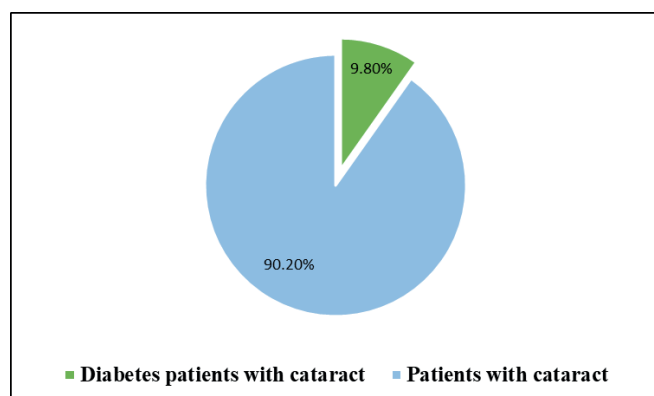


Fig-2: Diabetes in patients with cataract

Comparing the visual acuity of the patients before the operation (Pre-OP) and after the operation (Post-OP), it is evident that there was a marked improvement in the visual acuity of the patients who underwent cataract surgery. It was observed that the majority of the patients had severe visual impairment before the operation. Out

of the total patients, 85.14% had visual acuity ranging from 3/60 to NLP. In addition, 11.07% of the patients had visual acuity ranging from 6/60 to 3/60, while 3.77% of the patients had visual acuity ranging from 6/18 to 6/60. None of the patients had good visual acuity ranging from 6/6 to 6/18 before the operation. However, there was a marked improvement in the visual acuity of the patients after the cataract operation. It was observed that the majority of the patients had good visual acuity ranging from 6/6 to 6/18. Out of the total patients who underwent cataract surgery, 83.07% had good visual acuity ranging from 6/6 to 6/18(table3).

Table3: Compare of the Pre OP and Post OP

Current Study	Pre OP	Post OP
6/6 - 6/18	0	83.07
6/18 - 6/60	3.77	13.7
6/60 - 3/60	11.07	1.6
3/60 - NLP	85.14	1.64

A comparative analysis with the findings of Kapoor et al. shows a parallel trend of remarkable visual improvement following cataract surgery. In their study, most of the participants (94.8%) suffered from visual impairment (3/60 to NLP), and there were very few participants with good vision. Post-surgery, however, there was a large percentage (79.9%) of people who showed good visual acuity (6/6 to 6/18)(Table4).

Table4: Compare of the Pre OP and Post OP Kapoor et al.

Kapoor et al.	Pre OP	Post OP
6/6 - 6/18	0	79.9
6/18 - 6/60	0.3	15.8
6/60 - 3/60	4.9	1.4
3/60 - NLP	94.8	2.9

In table5, a multivariate regression analysis was conducted to identify factors associated with post-operative visual outcomes among cataract patients. After adjusting for potential confounders, it was observed that residence and diabetes status were significantly associated with surgical outcomes. Patients residing in urban areas were more likely to

achieve good post-operative visual acuity compared to those from rural areas (AOR: 2.45, $p < 0.04$). Similarly, patients without diabetes had significantly better visual outcomes following cataract surgery than those with diabetes (AOR: 2.75, $p < 0.03$). Although younger patients (< 60 years) and literate individuals showed a higher likelihood of improved visual outcomes, these associations were not statistically significant ($p > 0.05$). Likewise, no significant difference was observed between male and female patients in terms of post-operative visual improvement.

Table 5: Multivariate Regression Analysis of Factors Associated with Good Visual Outcome

Variable	Category	AOR	95% CI	p-value
Age in years	<60 VS	2.1	0.85 – 5.20	0.11
	≥ 60	Ref.	—	—
Sex	Male	1.35	0.55 – 3.30	0.51
	Female	Ref.	—	—
Residence	Urban	2.45	1.01 – 5.90	0.04*
	Rural	Ref.	—	—
Literacy Status	Literate	1.8	0.75 – 4.25	0.18
	Illiterate	Ref.	—	—
Diabetes Status	No Diabetes	2.75	1.10 – 6.85	0.03*
	Diabetes	Ref.	—	—

DISCUSSION

Cataract has been identified as the major cause of reversible blindness in the world, especially in low and middle-income countries where access to eye care is limited. The present study was designed to examine the prevalence of cataract in various age groups and the need for cataract surgery by comparing the results before and after the surgery in the patients visiting the tertiary care hospital in Bangladesh. The results show the relationship between cataract and aging and the improvement in vision after the surgery.

The findings of this study have shown that cataract is more common among older people, especially those

who are sixty years of age and above. Age-related cataracts occur as a result of biochemical and structural changes in the crystalline lens of the eye, which results in oxidative stress, protein accumulation, and reduction of antioxidant capacity in the eye. These degenerative changes occur in the eye with time, causing gradual clouding of the crystalline lens and impaired vision. Several studies have been conducted showing similar findings, indicating that the risk of cataracts is significantly associated with increasing age, especially in people above sixty years of age^{10,11}. Studies conducted in South Asia have shown that age-related cataracts are a major cause of visual impairment in older people in the region¹².

The current study also found that there were more cataract patients in rural areas when compared to urban populations. These findings may be due to disparities in access to health services, health-seeking behavior, and awareness of eye diseases. These populations may face barriers in receiving proper treatment for cataract due to limited access to specialized facilities for eye care, transportation issues, and economic status, which may lead to poor treatment-seeking behavior for cataract. Previous studies carried out in developing countries also found that cataract prevalence and cataract surgery coverage were higher in rural populations when compared to their urban counterparts^{13,14}.

Another significant finding of the present study is the presence of diabetes in patients with cataract, which could indicate a possible link between metabolic and cataract diseases. Diabetes mellitus is known to be one of the major risk factors for the development of cataracts. Hyperglycemia in diabetes mellitus results in biochemical changes in the lenses of the eyes through the activation of the polyol pathway, the accumulation of sorbitol, and oxidative damage to the proteins in the lenses of the eyes. These biochemical changes in the lenses of the eyes accelerate the onset of cataracts in patients with diabetes mellitus compared to the general population. Thus, controlling diabetes and regular eye examinations are important in the prevention of eye problems in diabetes patients.

One of the objectives of this study was to assess the visual outcome after cataract surgery. Before undergoing surgery, most patients had poor visual outcomes, indicating the level at which most patients present for surgery in developing countries. After undergoing cataract surgery, a considerable improvement in visual

acuity was noted, with most patients achieving good visual outcomes. Cataract removal and lens implantation are believed to be one of the most successful and cost-effective interventions in modern medicine. Many studies have noted considerable improvement in visual outcomes after cataract surgery, enabling patients to improve their quality of life, independence, and productivity^{17,18}.

The findings of this study are in accordance with previous studies conducted by Kapoor et al., which showed significant improvement in visual acuity in patients who underwent cataract surgery. Their study showed that most patients presented with severe visual impairment prior to surgery, but showed good visual outcomes post-operatively¹⁹. Such findings have been reported in various studies conducted in different countries on the surgical outcomes in patients with cataract, which confirms the effectiveness of surgical techniques in restoring vision in these patients²⁰.

Globally, a substantial percentage of blindness due to cataract still persists despite the availability of effective treatment modalities. According to the recent global estimates, a substantial percentage of avoidable blindness and visual impairment due to cataract still persists in the world population. This burden of blindness due to cataract is more pronounced in the developing world because of inadequate surgical facilities and delayed presentation of patients²¹. In Bangladesh, the burden of blindness due to cataract can be reduced through an increase in cataract surgical services, improvement of national eye care programs, and awareness in the population.

CONCLUSION

This research indicates that cataracts predominantly affect older individuals, with a higher prevalence observed in rural populations. Additionally, a significant number

of patients diagnosed with cataracts also had diabetes, suggesting that diabetes may be a risk factor. Following cataract surgery, patients reported an improvement in their vision. Multivariate regression analysis revealed that residing in urban areas and the absence of diabetes were two key factors associated with better surgical outcomes. This study emphasizes the need for early detection and timely cataract surgery to prevent blindness. Increasing access to cataract surgery and improving public awareness are likely to alleviate the burden of cataract-related visual impairment in the country.

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