Original Article

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Assessment of surgical outcomes and factors affecting vision after cataract surgery: A cross-sectional prospective study at Al-Zubair general hospital, Basrah, Iraq

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ABSTRACT

Background: Cataract is the most common elective and ambulatory procedure globally, and its incidence continues to rise, leading to an increasing number of cataract surgeries aimed at eliminating the burden of cataract blindness in the aging population. Cataract surgery is safe, predictable, and cost-effective. **Aim:** This study aimed to evaluate the surgical visual outcomes and factors influencing vision in patients who underwent cataract surgery in the Al-Zubair district, Basrah, Iraq. **Methods:** A cross-sectional prospective study was conducted on cataract surgeries of all ages performed at Al-Zubair General Hospital between October 2014 and November 2022. Data based on demographic characteristics, preoperative risk factors, visual acuity, postoperative visual acuity, and surgical complications were collected, along with a review of the factors influencing vision after cataract surgery. The postoperative visual status was assessed and compared with the World Health Organization's (WHO) categories of Visual Impairment and Blindness. Standard parameters for assessing the outcomes of cataract surgery and WHO criteria for grading these outcomes were utilized. Evaluations of the outcomes over the years of the study were carried out. **Results:** A total of 2,710 eyes from 2,358 patients who underwent cataract surgery during the study period were studies. About 1,293 were included, with 1,293 females and 1,065 males. The mean age at the time of surgery was 62.74 ± 13.8 years. The primary surgical technique was phacoemulsification (1,786 eyes, 68.3%), followed by extra capsular cataract extraction (ECCE) (884 eyes, 31.6%), both with intraocular lens implantation. Significant improvement was observed throughout the study period, with 80.8% of eyes achieving good postoperative vision (Best Corrected Visual Acuity [BCVA] 6/6-6/18). Approximately 15.84% of the operative eyes had borderline outcomes (BCVA 6/24-6/60), while poor outcomes were observed in 34% of the eyes. Poor visual outcomes were significantly higher in patients with diabetic retinopathy and corneal Diseases glaucoma. Intraoperative and postoperative complications occurred in 9.88% of cases, with rupture of the posterior capsule, vitreous loss, and corneal edema being the major causes. **Conclusions:** Visual outcomes after cataract surgery (whether phacoemulsification or ECCE) are generally good, even in patients with risk factors. Patients with visually significant cataracts should be encouraged to undergo cataract surgery despite the potential for intraoperative and postoperative complications.

Keywords: cataract extraction, pre- and post-surgical visual outcomes, affecting factors.

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INTRODUCTION

Cataract remains the leading cause of reversible blindness and the second leading cause of visual impairment worldwide. Millions of people experience blindness or visual deterioration, with most residing in low- and middle-income countries.[1] As cataract leads to visual deterioration, many patients find their daily activities restricted. This diminished quality of life, along

with decreased physical activity and mental health issues, is associated with cataract patients due to reduced visual function. Poor visual function increases the risk of falls and traffic accidents, potentially resulting in hospital admissions and crippling states.[2] The definite treatment for cataracts is the surgical removal of the cataractous lens and intraocular lens implantation. Cataract surgery is the most common elective and ambulatory procedure globally, and its incidence continuously rises, necessitating an increasing number of surgeries to alleviate the burden of cataract blindness in the aging community. Cataract surgery is a safe, predictable, and cost-effective procedure that enhances the quality of life and visual function, with the patterns of cataract surgery delivery evolving to meet the growing demand. However, it is not uncommon to find visual impairment after cataract surgery. In India, for instance, approximately 30% of eyes that underwent cataract surgery remain visually impaired due to uncorrected refractive errors, posterior segment diseases, and surgical complications. About 22 million people worldwide are legally blind due to bilateral cataracts, a number expected to rise to 33 million. The safety and predictability of cataract surgery are of particular concern in developing countries, where the rate of postoperative blindness is significant. The vast majority of cataract-blind individuals reside in developing countries with limited resources. Several studies have indicated that the long-term visual outcomes of cataract surgery are often far from optimum, which can be attributed to associated sight-impairing eye diseases, operative complications, uncorrected refractive errors, or long-term complications. Patients who are blind due to cataracts frequently cite fear of poor vision after surgery as a major reason for refusing the procedure. In some areas of developing countries, outdated techniques, such as couching, are still employed for cataract extraction. In all fields of medicine, assessing outcomes is vital for various reasons. Specifically, publishing surgical outcomes is important for quality improvement and assisting patients in making informed decisions about their care. Analyzing their outcome data allows surgeons to compare their performance with peers worldwide and identify areas for improvement. Such outcome data from different countries and settings should be published to provide surgeons with a standard for comparison. Despite advances in technical equipment, surgical procedures, and lens design, complications can still arise.

The timing of cataract surgery depends on many factors, including the patient's age. Elderly patients with visually significant cataracts may be affected psychologically and exacerbate pre-existing mental disorders, such as Alzheimer's.[3] Even when behavioral changes are attributed to cataracts, concerns about potential poor visual outcomes in people with advanced age make families hesitate in pursuing surgery. Pre-existing ocular and general comorbidities, along with short life expectancy, may deter some ophthalmologists from recommending cataract surgery for very elderly patients, as such surgeries may be technically challenging due to dense nuclear cataracts. Additional surgical difficulties may arise when elderly patients cannot lie flat due to neck or back problems. The most common type of cataract is senile (age-related), but other causes include trauma, cataracts associated with intraocular inflammation (uveitis), congenital cataracts, and those induced by systemic or topical medications, as well as systemic and metabolic diseases. The cause of the cataract may be a predictive factor for the final visual outcome after surgery; for example, patients with traumatic cataracts may have associated retinal scars or hemorrhages that explain poor vision post-surgery. In planning medical services for cataract patients, it is essential to assess postoperative outcomes not only in terms of visual acuity but also for patient self-reported visual functioning and quality of life changes. The World Health Organization (WHO) recommends that poor (best corrected visual acuity [BCVA] <6/60) or borderline (BCVA <6/18) visual outcomes after cataract surgery should not exceed <10% to 20%. Moreover, some studies have shown that about 30%–50% of cataract-operated eyes cannot achieve 6/60 vision with available optical correction, indicating that the visual outcomes after surgery do not meet individuals' daily visual needs. This is a primary reason why patients with cataracts often avoid surgery due to fear of losing their sight.

Cataract surgery is the most commonly performed ophthalmic procedure and is generally safe and effective. However, it is not free of complications, which significantly impact visual outcomes and additional costs for managing these complications. This study evaluated the surgical visual outcomes and risk factors

affecting vision over nine years at Al-Zubair General Hospital in Al-Zubair district, Basrah, Iraq. The outcomes of cataract surgery can be measured using objective clinical indicators such as visual acuity (BCVA) assessed with a Snellen chart, which is more convenient for most patients, and/or subjective indicators such as quality of life (QOL) and visual functioning instruments. This study used the best corrected visual acuity (BCVA) to measure outcomes, as it is more convenient for most patients.

MATERIALS AND METHODS

Study Setting

This study was conducted at Al-Zubair General Hospital, a secondary healthcare facility located in the center of Al-Zubair district, the largest district in Basrah Governorate, which is the largest in the southern part of Iraq. This hospital serves as a major referral hospital for many rural areas with a population exceeding one million residents. The ophthalmology department at this hospital provides preventive, curative, and rehabilitative eye care services. The outpatient ophthalmology clinic has been serving the population for over four decades, with established cataract surgery services for more than two decades. This study was a hospital-based, cross-sectional prospective study involving patients who underwent unilateral or bilateral cataract surgery from October 2014 to November 2022. Although there were four ophthalmic surgeons at the hospital, this study included records from one qualified ophthalmologist, as the other surgeons were either inexperienced in performing cataract surgery or declined to participate without explanation. Local anesthesia was most frequently utilized, administered by the same surgeon under the supervision of an anesthesia specialist for any potential complications. An average of 8 to 10 cataract surgeries were performed weekly in the ophthalmology theater. After examination in the outpatient ophthalmology clinic, patients with visually significant cataracts of various types and ages were included in the study. Then, patients operated on by other surgeons and those who did not attend the presumed final visit at 28 days or had incomplete or missing data were excluded from the study. Candidates were evaluated preoperatively by checking intraocular pressure (IOP) with an air-puff tonometer (TOMEY Company, Japan) and conducting a fundoscopic examination of the posterior segment to exclude any retinal pathologies that could adversely affect postoperative visual outcomes. B-scan ultrasonography was performed with a NIDEK ophthalmic ultrasound machine (Echoscan US-4000) for patients with mature cataracts where difficult to examine the posterior segment was difficult. Biometric measurements (A-scan with TOMEY biometry; optical biometry was not available) were conducted by a qualified optometrist for every patient scheduled for surgery to determine the dioptric power of the intraocular lens (IOL) to be implanted, under the supervision of the surgeon to avoid any potential measurement errors. Cataract surgeries were carried out under surgical operating microscopes (Topcon operating microscope OMS-800 and ZEISS operating microscope OPMI LUMERA 700, from Carl Zeiss Meditec Company). Phacoemulsification surgery was performed using the Gueder phaco machine (Geuder MEGATRON S4 HPS, Gueder Germany), later replaced by the White Star Signature Pro (Johnson and Johnson Company, USA). After surgery, patients were examined under a slit-lamp biomicroscope on days 1, 7, and 28 postoperatively for any complications, and the presenting best corrected visual acuity was recorded by a well-trained optometrist. Patients were prescribed topical steroids for four weeks in tapering doses and topical antibiotics for one week.

Study Design

After obtaining ethical endorsement from the hospital administration and the Department of Scientific Research and Development in the General Health Directorate of Basrah, we conducted a prospective cross-sectional study design. We assessed outpatient records, collected information directly from patients and/or their relatives, and obtained informed consent (paper records were collected and subsequently incorporated into electronic form) for elective cataract surgeries of all ages from October 2014 to November 2022. The mean age at the time of surgery was 62.74 ± 13.8 years, with 1,293 females and 1,065 males. Collected data were analyzed using Statistical Package for Social Sciences (SPSS 22), assessing age, sex distribution, preoperative characteristics of the study group, types of cataracts, types of surgical techniques performed, and best corrected postoperative visual acuity at day 1, 7, and 28 follow-ups. A total of 3,317 patients underwent surgery during this period but only 2,3583,3172,358 patients were enrolled in this study as they completed the final follow-up date, resulting in 959

exclusions due to non-attendance at the final visit. This study relied on the final best-corrected visual acuity after 28 days of surgery as the goal of comparison, as this is the minimum timeframe for complete recovery when surgery-related changes in ocular tissues (edema) resolve. However, in a few complicated cases, a longer period may be needed for corneal edema to resolve and vision to stabilize after suture removal, and we utilized this date to ensure most patients attended the visit. We used percentages for comparison. The levels of best-corrected visual acuity after cataract surgery were categorized using WHO-recommended guidelines. Any intraoperative and/or postoperative complications were documented.

RESULTS

Between October 2014 and November 2022, 2,710 cataract surgeries were performed at Al-Zubair General Hospital. Seventy-four percent were unilateral cataract surgeries, while 26% were bilateral. About 64.4% of the cases were performed using the modern phacoemulsification technique, while the remaining 31.6% were conducted using the ECCE method. A total of 2,558 eyes (92.98%) underwent PCIOL implantation, while 193 (7.01%) eyes were either left aphakic or had an ACIOL. Major intraoperative complications included rupture of the posterior capsule and vitreous loss (4.8%). Other complications, such as dropped nuclear fragments (0.2%), Descemet's membrane (0.3%), and iridodialysis (0.3%), were also noted.

Table 1 presents the preoperative criteria of the study group. It demonstrates the demographics, systemic diseases, and ocular morbidity distribution of the 3,317 patients who underwent cataract surgery. Not every patient with the mentioned risk factors necessarily developed poor visual outcomes; however, some of these factors are evident as risk factors for visual impairment, such as DR.

Table 2 presents the demographics and distribution of systemic and ocular morbidity among the 2,358 patients. The mean age of the patients included in the study was 62.74 ± 13.8 years (ranging from 20 to 99 years); 53.36% were females and 46.64% were males.

Visual Outcomes After Cataract Surgery

Visual outcomes were generally lower than those recommended by WHO during the major years of the study but noticeably improved in the last years, becoming comparable to WHO standards.

Table 3 lists the visual outcomes during the years of the study. For each year, good visual outcomes were achieved in 80.8% of cases, while poor visual outcomes were noted in 3.34%. The highest good visual outcome was recorded in 2022, while the highest poor visual outcome occurred in 2014.

Figure 1 shows visual acuity distribution during the study period.

Table 1: Preoperative characteristics of the study group

Variable	No.	percent
Age		
<20	83	8.2%
20-39	528	15.9%
40-59	918	27.67%
60-79	1131	34%
80-99	657	19.8%
Total	3317	100%
Sex		
Male	1507	45.43%
Female	1810	54.56%
Total	3317	100%
Systemic diseases		
HT	568	17.12%
DM	413	12.45%
COAD	105	3.16%
IHD	272	8.2%
Parkinson disease	4	0.12%
Alzheimer disease	3	0.09%
Total	1365	41.15%
Ocular morbidity		
DR	173	5.2%
Glaucoma	43	1.29%
ARMD	9	0.27%
Corneal diseases	46	1.38
Total	271	8.17%

HT: Hypertension, DM: Diabetes mellitus, COAD :Chronic obstructive airway diseases ,IHD: Ischaemic heart diseases ,DR: Diabetic retinopathy ,ARMD: Age related macular degeneration

Table 2: Postoperative characteristics of the study group

Variable	No.	Percent
Age		
<20	54	2.29%
20-39	429	18.19%
40-59	628	26.63%
60-79	842	35.7%
80-99	405	17.17%
Total	2358	100%
Sex		
Male	1065	46.64%
female	1293	53.36%
Total	2358	100%
Systemic diseases		
HT	497	18.38%
DM	363	13.39%
COAD	94	3.46%
IHD	238	8.77%
Parkinson disease	3	0.11%
Alzheimer disease	3	0.11%
Total	1198	44.2%
Ocular morbidity		
DR	163	6.01%
Glaucoma	37	1.36%
ARMD	7	0.25%
Corneal diseases	37	1.36%
Total	244	9%

HT: Hypertension, DM: Diabetes mellitus, COAD :Chronic obstructive airway diseases ,IHD: Ischaemic heart diseases ,DR: Diabetic retinopathy ,ARMD: Age related macular degeneration

Table 3: Visual outcomes after cataract surgery during each year.

Years	Post-operative visual outcome						Total
	Good BCVA 6/6-6/18		Borderline BCVA 6/24-6/60		Poor BCVA <6/60		
	No	%	No	%	No	%	
2014	93	62%	39	26%	18	12%	150
2015	102	68%	37	25%	10	6.6%	150
2016	106	71.33%	37	24.66%	6	4%	318
2017	219	73.33%	64	21.95%	12	4%	296
2018	260	76.58%	70	20.63%	12	3.34%	349
2019	295	78.03%	74	19.12%	11	2.84%	387
2020	101	82.11%	21	17.07%	1	0.81%	123
2021	362	86.85%	45	10.7%	10	2.34%	370
2022	485	89.85%	43	8.4%	12	2.17%	552
Total	2,198	80.8%	430	15.84%	81	3.34%	2,710

BCVA: Best Corrected Visual Acuity.

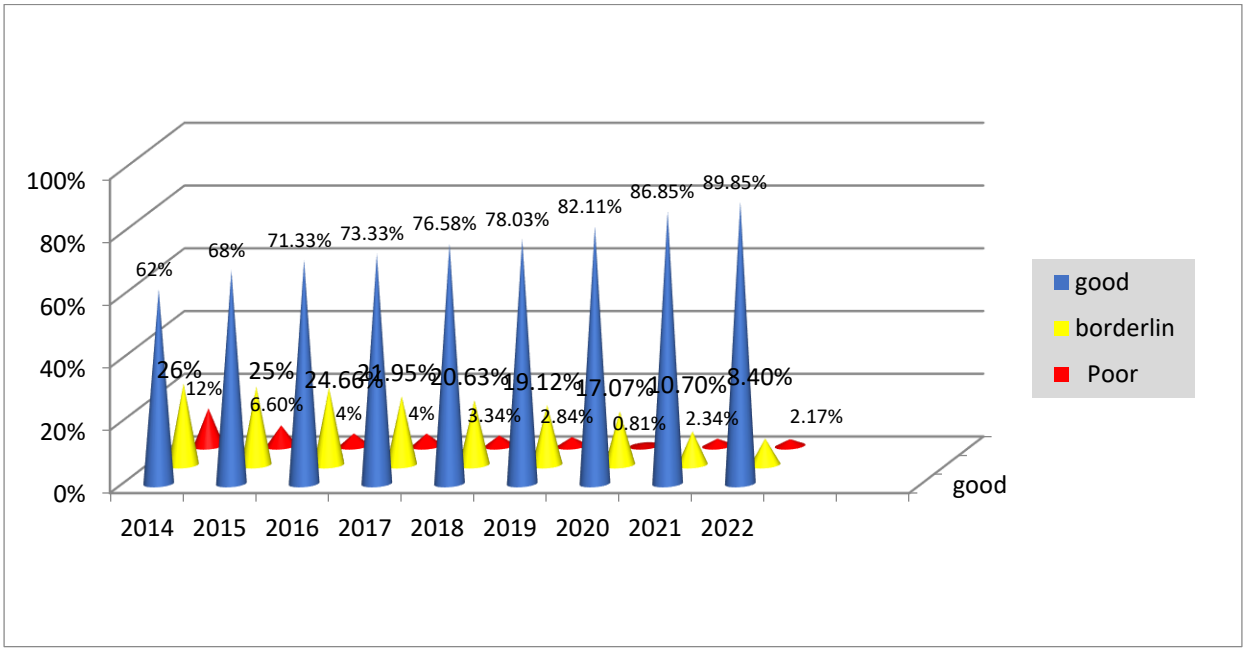

Figure 1: Visual acuity distribution during the period of the study

Table 4 compares the WHO standard of post-operative visual outcomes with the observed study.

The results of this study are comparable with WHO's standards for post-operative visual outcomes, although the percentage of good visual outcomes is slightly below the WHO recommendation. However, the percentage of poor visual outcomes is below the WHO standard, as specified in Table 4

Table 4: Comparison of the WHO standard of post-operative visual outcomes with the observed study

Visual Outcomes After Cataract Surgery (BCVA)	WHO Standard	Observed Study
Good Visual Outcome 6/6-6/18	>85%	80.8%
Borderline Outcome 6/24-6/60	10%	15.84%
Poor Vision <6/60	<5%	3.34%

Pre- and Post-Operative V/A

Visual acuity (BCVA) before surgery in participants' eyes to be operated was notably poor, with 85.02% (2,339 eyes) having a BCVA worse than 6/60, and 14.98% (412 eyes) having a BCVA of 6/60 or better. Out of those 2,339, 1,926 eyes (70.01%) improved to a visual acuity of 6/18 or better, while 29.99% (413 eyes) improved to a visual acuity of 6/60-6/18. This is indicated in Table 5, which reveals the pre- and post-operative changes in BCVA and the extent of improvement in vision.

Table 5: Pre- and post-operative changes in BCVA and the extent of improvement in vision

	Frequency	Percent
6/18-6/60 (Moderate)(Moderate)	410	14.98%
<6/60 (Poor)(Poor)	2,300	85.02%
Total	2,710	100%
Post-operative BCVA		
6/6-6/18 (Good)	Frequency	Percent
6/18-6/60 (moderate)	2,198	80.8%
<6/60 (poor)	430	15.84%
Total	81	3.34%
	2,710	100%

Visual improvement is also observed in cataract patients with systemic and/or ocular morbidity. Table 6 describes the extent of improvement in vision despite the presence of risk factors, keeping in mind that cataract surgery is not performed in patients with a visual acuity of >6/12 whether they are at risk or not. Specifically, it reveals the pre- and post-operative BCVA in patients with risk factors for cataracts.

Table 6: Pre-operative BCVA in patients with systemic diseases and /or ocular morbidity

BCVA	No. of Patients	Percentage
<6/60 (Poor Vision)	960	66.63%
6/18-6/60 (Moderate)6/18-6/60 (Moderate)	481	33.37%
Total	1,441	100%
Post-operative BCVA in patients with Systemic Diseases and/or Ocular Morbidity		
VA	No. of Patients	percentage
6/6-6/18 (Good)	576	39.97%
6/18-6/60(moderate)	533	36.98%
<6/60 (Poor)	333	21.1%
Total	1,441	100%

Table 7 illustrates that the most frequent type of cataract treated with phacoemulsification was PSC and post-polar, while hard nuclear sclerosis, hypermature, intumescent, and Morgagnian cataracts were primarily treated with ECCE.

Table 7: Types of cataract and the surgical procedure performed

Type of Cataract	Type of Surgical Procedure				
	Phacoemulsification		ECCE		Total
	No	%	No	%	
PSC and Post-Polar	1,350	74.95%	0	0%	1,350
Nuclear Sclerosis	237	12.99%	413	43.47%	650
Hypermature Cataract	78	4.33%	217	23.58%	295
Intumescent	0	0%	180	21.78%	180
Morgagnian	0	0%	167	18.94%	167
Traumatic	219	12.15%	17	1.87%	236
Total	1,801	65.46%	909	34.53%	2,710

PSC: Posterior Subcapsular Cataract, Post-Polar: Posterior Polar.

This study confirms that visual outcomes after cataract surgery are better in patients who underwent phaco surgery than those who had ECCE. Additionally, patient satisfaction was higher in phaco surgery, as shown in Table 8, which enumerates the visual outcomes in Phaco surgery and ECCE.

Table 8: Visual outcome in phaco .surgery as compared to the ECCE surgery.							
	Good VA 6/6-6/18		Borderline 6/24-6/60		Poor <6/60		
Type of Surgery	No.	%	No.	%	No.	%	Total
Phaco Surgery	1,425	64.37%	300	69.1%	61	75%	1786
ECCE	760	35.62%	115	30.9%	9	25%	884
Total	2,198	100%	430	100%	81	100%	2710

The primary cause of visual impairment after cataract surgery was an uncorrected refractive error (URE), as noted in other studies, where patients rejected the wearing of glasses since the aim of modern cataract surgery (particularly phacoemulsification) is to achieve spectacle independence or the patient has got anisometropia from high astigmatism or aphakia. Other causes include diabetic retinopathy, glaucoma, corneal scarring, and persistent corneal edema (after the 28th postoperative day), as well as age-related macular degeneration (ARMD).

Refractive errors account for more than 50% of cases with impaired vision of 6/24-6/6, while DR is the major cause of poor visual outcomes (BCVA 6/60-6/30), as demonstrated in Table 9, shows the main causes of visual impairment and the degree of visual impairment.

Table 9: Causes of visual impairment(VI)and the degree of visual impairment.					
Causes of Visual Impairment (VI)	VA 6/24-6/60		VA 6/60-3/60		Total
	No.	%	No.	%	
Refractive Error (URF)	225	51.6%	7	7.6%	232
DR	145	33.25%	45	48.9%	190
Glaucoma	27	6.19%	12	13.04%	39
Corneal Scarring and Corneal Edema	20	4.58%	12	13.04%	32
ARMD	7	1.6%	3	3.26%	10
Other	12	2.75%	6	6.52%	18
Total	436	100%	92	100%	528
URF: Uncorrected Refractive Errors.					

The highest intraoperative complications were found to be 5.6% of the operated eyes, which is comparable to the WHO standard (less than 5%). However, these complications are not necessarily associated with poor visual outcomes if adequately managed. The main complications were due to posterior capsular rent and/or dropped nuclear fragments. Severe complications, such as endophthalmitis and malignant glaucoma, were reported in five eyes with poor visual outcomes, as shown in Table 10, which illustrates the frequency of ocular complications.

Table 10: Frequency of ocular complications	
Variable	Frequency
Corneal Edema	23%
Hyphema	0.1%
High IOP	3.5%
Descemet's Membrane detachment	0.6%
Iridodialysis	0.3%
Posterior Capsular Rent	4.8%
Dropped nuclear fragments	0.2%
Dislocated iol	0.3%
Toxic Anterior Segment Syndrome (TASS)	0.05%
Malignant glaucoma	0.1%
Acute Post-operative Endophthalmitis	0.07%

DISCUSSION

Cataract surgery is frequently mentioned as a high-volume operation due to the high prevalence of cataracts and the limited available alternatives for interventions. This study demonstrates that cataracts are a significant visual health problem and a leading cause of reversible blindness. The results of cataract surgery are encouraging, and the visual outcomes are important for facilitating surgeons and ophthalmic centers in tracking their results over time. It is also crucial that patients with associated ocular comorbidities do not reject the idea of cataract surgery due to fear of poor visual outcomes. One of the indices of the success of cataract surgery is the visual outcome after the procedure. There are no guidelines from international organizations regarding the visual acuity threshold for cataract surgery. Ideally, patients with visually significant cataracts should be offered surgery. Priority should be given to those who are legally blind due to untreated cataracts, as this group benefits most from surgery. However, this tendency has changed in recent times, as patients' needs and expectations from surgery have evolved. Consequently, many patients in the early stages of cataract development, with visual acuity of 6/6 to 6/12, plan to undergo cataract surgery to correct associated refractive errors rather than to

reverse visual impairment caused by cataracts. The prevalence of blindness due to cataracts exceeds that of other causes of blindness. Studies have shown that cataract surgery is associated with improved visual function, self-reported surveys, and real-life visual ability. Cataract patients exhibit considerable improvements in vision-targeted quality of life after surgery. This study found that good visual outcomes were achieved in 74.7% of operated eyes, which is better than similar studies conducted in Liberia,[1] and India,[3] yet still below the recommended by WHO (85%). Poor visual outcomes were evident in 3.34%, compared to the WHO standard of 5%.

One notable contribution of the study is that it is the first study performed in Al-Zubair Province and Basra Governorate to report on the outcomes of cataract surgeries performed by a nationally certified surgeon. Since no similar studies have been conducted in the aforementioned hospital or nearby hospitals for comparison, the results of this study are compared with other international studies mentioned previously. In our study, the outcomes of modern phacoemulsification were reported to be better than those of ECCE. We believe that this improvement over time is due to the surgeon's increasing skill and experience, which is a crucial factor affecting visual outcomes. As illustrated in Figure 1, the percentage of eyes with good vision increased over the years, while the percentage with poor visual outcomes declined.

We observed that systemic and ocular comorbidities were associated with poor postoperative visual outcomes in some patients, while others experienced visual improvement, albeit to a lesser extent than those without systemic and/or ocular morbidity. Diabetes mellitus, hypertension, renal diseases, neurological issues, and cerebrovascular accidents are the primary systemic factors associated with poor vision. Retinal microangiopathy changes in diabetic, hypertensive, and uremic patients are the underlying pathogenesis of poor outcomes. Additionally, elderly patients face a higher risk of intra- and postoperative complications, such as posterior capsule rupture, elevated intraocular pressure, and corneal edema due to reduced endothelial cell counts. Older patients are more likely to have hard cataracts, and their inability to maintain a comfortable position during surgery due to cervical osteoarthritis can further complicate the procedure. Another significant factor impacting outcomes is refractive surprise related to incorrect IOL calculations. However, correcting this ametropia can improve the post-operative visual outcomes after cataract surgery. Accurate biometry was found to be vital for precise IOL calculations, and applanation ultrasound biometry is a significant risk factor for postoperative ametropia, as it may cause insensible compression of the eye by the ultrasound transducer, leading to incorrect axial length readings. Contrarily, optical biometry utilizes partial coherence interferometry, which has less variability in axial length measurements due to its non-contact method. We utilized only ultrasound biometry due to the unavailability of optical biometry in the hospital. Another significant risk factor for unsatisfiable post-operative outcomes is coexisting ocular diseases. Ocular comorbidities such as diabetic retinopathy, glaucoma, and macular diseases are major risk factors associated with postoperative BCVA of 6/18 or worse. We also found that patients with dense cataracts had a higher risk of poor outcomes as dense cataract surgeries are associated with an increased risk of operative complications and obscure fundus visualization, which may lead to undetected preexisting sight-threatening diseases, such as diabetic retinopathy or macular pathology.

It is worth noting that appropriate pre- and intraoperative measures were taken for cataract patients with systemic diseases and/or ocular morbidity. For instance, patients with systemic hypertension should have well-controlled blood pressure (BP <150/90 mm Hg); if readings exceed this level, surgery is postponed until BP is adequately controlled. Diabetic patients with random blood sugar (RBS) >250 mg% or fasting blood sugar (FBS) >140 mg% should also have their surgery postponed until well controlled. Certain appropriate means are adapted for patients unable to lie flat, such as elevating the surgical bed to 45 degrees or doing the surgery in a sitting position for patients with kyphoscoliosis or congestive heart failure (CHF). The greatest challenge arises with cataract patients with diabetic retinopathy; preoperative retinal examinations aided by optical coherence tomography (OCT) are essential for detecting DR, and appropriate treatments are administered based on the stage of DR, which may include intravitreal anti-VEGF injections and/or retinal laser photocoagulation. In some cases, patients with dense cataracts and severe

DR may require intraoperative intravitreal anti-VEGF treatment.

Patients with glaucoma and uncontrolled IOP should be maintained on maximum topical anti-glaucoma therapy, with preoperative oral acetazolamide administered three days before surgery; in some instances, intraoperative intravenous mannitol may be necessary to better control IOP. It is imperative to mention that visual impairment after cataract surgery may result from either the complexity of the procedure and/or associated ocular pathology; determining which factor is more responsible requires further study.

Several factors, including the type of surgery, surgical wound type and placement, types of intraocular lenses, and types of anesthesia, can affect visual outcomes. Additionally, the availability of high-quality operating microscopes, phaco machines, and a full-time, well-trained ophthalmic surgeon, along with accurate biometry, is essential. Consequently, we recommend standardized training of surgical techniques, adapting residency training programs, and encouraging to utilization of phacoemulsification techniques due to the evidence supporting better cataract surgery outcomes compared to ECCE. There is also a need for the supply of higher-quality operating microscopes, phaco machines, IOL masters for biometry (optical biometry), and good quality IOLs, in addition to local socioeconomic comprehension and population education to raise awareness about cataracts.

Visual acuity alone is insufficient to assess improvements in visual outcomes after surgery. However, considering that not all operated patients possess the same level of education and knowledge in this area, where the study was conducted, the majority are not well aware of other visual function assessment tests, such as contrast sensitivity, color desaturation, and brightness. Hence, we depend only on visual acuity, which is also the standard assessment used by the WHO and other similar studies.

The limitations of this study include the fact that it does not reflect the actual number of operated patients, as not all operated patients attended their follow-up appointments, resulting in inadequate information for analysis. Additionally, not all operated patients had fully documented information, and those with poor visual acuity at 28 days postoperatively (as described previously it is the minimum period for corneal edema to resolve) may have experienced improvements in vision after that period. Some patients residing outside this county may not have returned for follow-up at the same hospital. BCVA was assessed using a Snellen chart instead of LogMAR, which is the commonly used standard due to its reliability.

CONCLUSIONS

We reported the surgical outcomes of cataract surgery for a nationally representative sample of minority inpatients in Al-Zubair County. Overall the visual outcomes after cataract surgery were successful based on the current study's findings, with complications rate comparable to WHO standards. Patients with visually significant cataracts should be encouraged to do cataract surgery. The cataract surgeries performed in Al-Zubair County, which is located away from the city center, yielded good outcomes as they were conducted by a highly skilled surgeon.

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