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Study of Functional Outcomes of Cataract Surgery at the Secondary Ophthalmology Center of Nara

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Abstract **Original Research Article**

The treatment of cataract-related blindness is surgical, allowing for vision restoration. The objective of this study was to evaluate the functional outcomes of adult cataract surgery at a secondary ophthalmology center. This was a prospective and descriptive study of adults undergoing cataract surgery through extracapsular extraction over a 6-month period. Results were analyzed using the Monitoring Cataract Surgical Outcome (MCSO) software and compared to WHO standards. Out of 163 eyes from 141 patients, 160 eyes (98.2%) received posterior chamber implants, with a mean age of 65.1 years. Visual acuity was ≥3/10 with correction in 54% of cases, while 8.6% had poor visual acuity (<1/10). The proportion of patients with good outcomes increased to 76.6% with better correction, while 6.3% had poor outcomes. Posterior capsule rupture was the most common intraoperative complication (62.5%). These results are below WHO standards and highlight causes of poor outcomes, primarily refractive errors (36.4%) and sequelae (27.2%). Identifying these causes emphasizes the need to improve surgical skills, equipment, and postoperative refraction.

Keywords: Cataract; Extracapsular Extraction; Visual Acuity; Outcomes; Refraction.

INTRODUCTION

In 2014, the WHO estimated that nearly 285 million people worldwide suffer from visual impairment, including 39 million who are blind and 246 million with reduced visual acuity. Approximately 90% of visually impaired individuals live in low-income countries, and 80% of visual impairments are preventable or treatable [1].

Uncorrected refractive errors are the leading cause of visual impairment, but cataracts remain the primary cause of blindness in low- and middle-income countries [1]. Globally, the main causes of visual impairment include uncorrected refractive errors (43%), untreated cataracts (33%), and glaucoma (2%) [1].

Cataracts are the leading cause of curable blindness globally, accounting for 50% of all blindness cases [2]. In sub-Saharan Africa, the prevalence of blindness is estimated at 1.4% [3]. In Mali, the prevalence of blindness is 1.2% [4].

Blindness poses significant public health and socioeconomic challenges in developing countries. It is associated with high economic costs in terms of lost productivity, rehabilitation, and education. Moreover, blind individuals often rely on caregivers, increasing the burden on families and communities.

The need for cataract surgery is substantial across Mali. Surgical intervention is the only effective treatment for cataracts. However, surgical outcomes depend on several factors, including qualified personnel, adequate infrastructure, appropriate surgical techniques, cost and accessibility of care, stage of diagnosis, and underlying conditions (e.g., glaucoma, retinal detachment, optic neuropathies).

This study aimed to assess the functional outcomes of adult cataract surgery at a referral health center in Mali and identify factors associated with poor outcomes.

PATIENTS AND METHODS

The study was conducted at the Ophthalmology Department of Nara Referral Health Center. This was a prospective and descriptive study over six months, from February 1 to July 31, 2023. It included adult patients who underwent cataract surgery and had a minimum postoperative follow-up of 30 days. Patients with post-traumatic cataracts or those lost to follow-up were excluded.

Surgical procedures were performed in the operating theater by an ophthalmologist using extracapsular extraction (EEC). Postoperative consultations were conducted by the surgeon and medical assistants.

Outcomes were analyzed using the WHO methodology for evaluating functional outcomes of cataract surgery from postoperative day 1 to day 45. Results were classified into three categories: "good," "borderline," and "poor."

Table 1: Criteria for Classifying Functional Outcomes of Cataract Surgery

Outcome	Distance visual acuity	Uncorrected visual acuity	Corrected visual acuity
« Good »	10/10 – 3/10	> 80%	> 90%
« Borderline »	2/10 – 1/10	>15%	< 5%
« Poor »	<1/10	<5%	<5%

In the case of poor outcomes in more than 5% of cases, it is essential to investigate the underlying causes, which can be classified into four categories:

- Patient selection: risk factors or comorbidities affecting vision.
- Surgical complications: intraoperative or early postoperative.
- Implantation of an inappropriate lens.
- Late postoperative complications.

Data collection utilized preoperative consultation forms, survey sheets, and operating room records. Data entry and tables were created using Word 2007 and Excel 2007, while analysis was conducted using MCSO and Epi-Info 7.

RESULTS

Socio-Demographic Aspects

Out of 1,273 consultations, 362 cataract cases were identified, and 196 patients underwent surgery (54.1%). A total of 163 eyes from 141 patients were included, representing 45.02% of detected cases.

The majority of patients were female (51.5%, n = 84), with a sex ratio of 1.06. The 60 - 69 age group was the most represented (60.1%, n = 98), with a mean age of 65.1 years (range: 40 – 90). Most patients were from the Nara district (58.3%, n=95), while 41.7% (n=68) came from neighboring Mauritania.

Surgical Aspects

Intraoperative complications occurred in 8 cases (4.9%), with vitreous loss being the most common (37.5%). Postoperative complications included pain (36.8%) and corneal edema (26.4%) on day 1, and secretion (8%) on day 15.

Postoperative Outcomes

At postoperative day 30 (J30), posterior capsule opacification was the most common complication, observed in 3 cases (2.3%) (Table 9).

Out of the 163 cases operated on (Table 10) :

- 35 cases (21.5%) were lost to follow-up at J30 postoperative,
- 69 patients (54%) had good visual acuity without correction,
- 48 patients (37.4%) had moderate visual acuity, and
- 11 patients (8.6%) had poor visual acuity.

After best correction (Table 11) :

- 76.6% of cases achieved good visual acuity (≥3/10),
- 17.1% of cases had borderline visual acuity (2/10 – 1/10), and
- 6.3% of cases still had poor visual acuity (<1/10).

Refractive error accounted for 36.4% of the causes of poor visual acuity despite correction (Table 12).

Table 2: Number of ophthalmological consultations during the study

Total consultations	Detected cases	Operated cases	% of operated cases /detected cases
1273	362	196	54,1%

Out of 1273 consultations, 362 cases of cataracts were detected, among which 196 were operated on, representing 54.1%.

A total of 163 eyes were included in our study, fulfilling the criteria, which corresponds to 45.02% of the detected cataracts.

In total, 163 eyes from 141 patients were analyzed in this work.

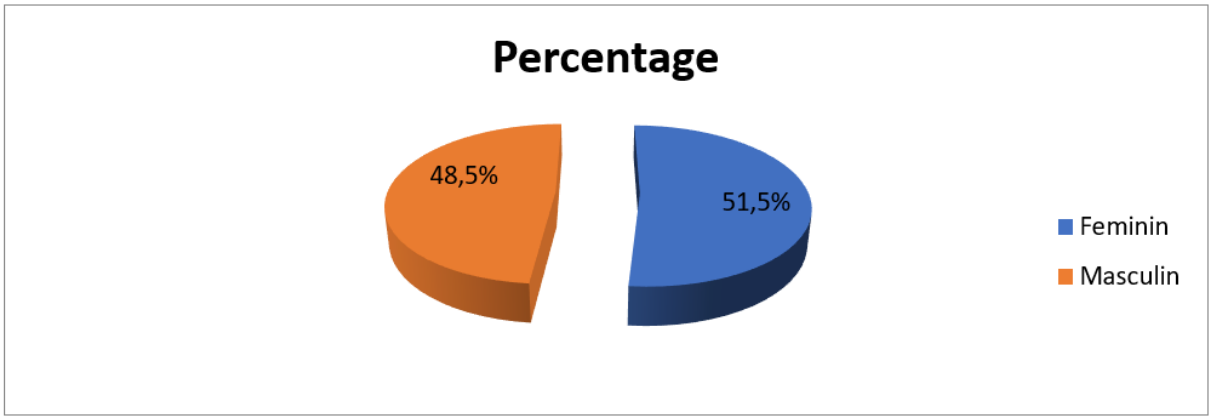

Figure 1: Distribution of patients by gender

The female gender was predominant in our study, with 84 cases (51.5%). The sex ratio was 1.06 in favor of females.

Table 3: Distribution of patients by age group

Age Group (years)	Frequency	Percentage
< 50 year	7	4,3%
50 – 59 year	17	10,4%
60 - 69 year	98	60,1%
De 70 - 79 year	30	18,4%
80 year and plus	11	6,8%
Total	**163**	**100**

The 60–69 age group was the most represented, with 98 cases (60.1%). The average age was 65.1 years, with extremes ranging from 40 to 90 years.

Table 4: Distribution of patients by origin

Origin	Frequency	Percentage
Nara	95	58,3%
RIM*	68	41,7%
Total	***163***	***100%***

RIM = Islamic Republic of Mauritania

Patients came from diverse geographical locations, with the majority (95 cases, 58.3%) from Nara. Sixty-eight cases (41.7%) were from Mauritania, a neighboring country of Mali.

Table 5: Distribution of patients according to intraoperative incidents

Intraoperative Complications	Frequency	Percentage
YES	8	4,9%
NO	155	95,1%
Total	**163**	**100%**

Intraoperative complications occurred in 8 cases (4.9%).

Table 6: Breakdown of intraoperative complications

Complications	Frequency	Percentage
Capsular rupture without vitreous prolapse	2	25%
Vitreous prolapse	3	37.5%
Zonular dehiscence	2	25%
Iris trauma	1	12.5%
Total	**8**	**100%**

Among the 163 cases, 8 patients (4.9%) experienced intraoperative complications, with vitreous prolapse being the most frequent (3 cases, 37.5%)

Table 7: Distribution of patients by surgical revision

Surgical Revision	Frequency	Percentage
Iris hernia	3	42.8%
Suture loosening	2	28.6%
Mass lavage	2	28.6%
Total	**7**	**100%**

Surgical revision due to iris hernia was the most common, with 3 cases (42.8%).

Table 8: Distribution of patients by postoperative complications on Day 1 (J1)

Complications	Frequency	Percentage
Residual masses	9	5.5%
Secretion	2	1.2%
Iris hernia	3	1.8%
Keratitis	9	5.5%
Hyphema	2	1.2%
Decentered pupil	4	2.5%
Subconjunctival hemorrhage	14	8.6%
Suture loosening	2	1.2%
Palpebral edema	11	6.8%
Corneal edema	43	26.4%
Pain	60	36.8%
Loose thread	4	2.5%
Total	**163**	**100%**

Pain was the most common complication on J1, reported in 60 cases (36.8%), followed by corneal edema (43 cases, 26.4%).

Table 9: Distribution of patients by postoperative complications on Day 15 (J15)

Complications	Frequency	Percentage
Residual masses	5	3%
Secretion	13	8%
Keratitis	3	1.8%
Decentered pupil	2	1.2%
Subconjunctival hemorrhage	7	4.3%
Corneal edema	8	5%
Pain	11	6.7%
None	114	70%
Total	**163**	**100%**

At J15, secretion was the most common complication (13 cases, 8%), followed by pain (11 cases, 6.7%).

Table 10: Distribution of patients according to postoperative complications on Day 30 (D30)

Complications	Number	Percentage
Posterior capsule opacification	3	2.3%
Chronic corneal edema	2	1.6%
None	123	96.1%
Total	**128**	**100%**

At postoperative Day 30, posterior capsule opacification was the most frequent complication, accounting for 3 cases (2.3%).

Table 11: Distribution of patients by visual acuity with correction (AV CP) at postoperative Day 30

VA WC at Day 30	Number	Percentage
Good (≥ 3/10)	69	54%
Moderate (2/10–1/10)	48	37.4%
Poor (< 1/10)	11	8.6%
Total	**128**	**100%**

Out of 163 operated cases, 69 patients (54%) achieved good visual acuity without correction.

Table 12: Distribution of patients by best-corrected visual acuity (BCVA) at postoperative Day 30

Best-Corrected Visual Acuity	Frequency	Percentage
Good (≥ 3/10)	98	76.6%
Moderate (2/10–1/10)	22	17.1%
Poor (< 1/10)	8	6.3%
Total	**128**	**100%**

After best correction:

- 76.6% of patients achieved good visual acuity (≥ 3/10).
- 17.1% had moderate visual acuity (2/10–1/10).
- 6.3% retained poor visual acuity (< 1/10).

Table 13: Distribution of causes of poor visual acuity with correction (VA CC) at postoperative Day 30 (<1/10)

Causes of poor outcomes	Number	Percentage
Selection	2	18.2%
Surgery-related*	2	18.2%
Sequelae	3	27.2%
Glasses	4	36.4%
Total	**11**	**100%**

Selection: Preoperative comorbidities (posterior segment conditions, including glaucoma and uveitis sequelae).
Surgery: Chronic corneal edema.
Sequelae: Posterior capsule opacification.

Refractive error accounted for 36.4% of the causes of poor visual acuity with correction.

DISCUSSIONS

Socio-demographic aspects

Women represented more than half of the sample, accounting for 51.5%.

This result is similar to those reported by Traoré M [9]. with 51.6%, Guirou N. [10] with 51.9%, and Lindfield R. [11] with 56% in Kenya, 52% in Bangladesh, and 60% in the Philippines. This result differs from that of Diallo J.W. with a male predominance of 57.7% [12], and that of Dolo M. [13].

The mean age of our patients was 65.1 years, ranging from 45 to 90 years. This is in line with the findings of Guirou N. who reported an average age of 65 years [10], and Diallo J.W. who reported 66 years [12]; our results are also similar to those of Traoré M. [9] and Rupert B. [14] in Pakistan, with respective averages of 61 years and 59.6 years.

The age group 60-69 years was the most represented, accounting for 60.1%. This is similar to Guirou N.'s result [10] which found 39.1%, but different from Lindfield R.'s result [11] where the age group 70-79 was the majority in Bangladesh, Kenya, and the Philippines.

More than half of our patients came from Nara and its surrounding areas, 58.3%. This may be explained by the proximity to the ophthalmological care center and the desire to restore vision. A significant portion, 41.7%, came from the Islamic Republic of Mauritania, which could be explained by the proximity and the lack of ophthalmological care centers in this border region of Mali, or due to insufficient equipment or qualified personnel.

Surgical aspects

Surgical Technique:

Extracapsular extraction (EEC) was the technique used in 100% of our patients.

This result is similar to that of Fanny A. *et al.*, [16], who used EEC in 100% of their patients. It differs from the findings of Guirou N. [10] who reported 52.2% EEC and 47.4% phacoemulsification (Phaco A), and from Rupert B. [14] in Pakistan, who found 66% Phaco A and 34% EEC.

Posterior chamber intraocular lens (PCIOL) implantation dominated our study with 98.2%. This result is similar to those of Traoré M. [9] and Guirou N. [10], who reported 97.59% and 97.8%, respectively.

Peroperative Complications:

Of the 163 eyes operated, 8 cases (4.9%) presented peroperative complications. Posterior capsule ruptures accounted for 62.5% of these, with 37.5% involving vitreous loss. Our results are similar to those of Guirou N. [10] who reported 3.1%, and Daboué [17] who found 3%. These results differ from those of Traoré M. [9] and Fanny A. [16], who found 1.35%, 1.90%, and 0%, respectively. Gao Y. [18] using classic extracapsular extraction found a higher complication rate of 6.7%.

Postoperative Follow-up:

At day 1, all patients were examined for possible early postoperative complications and treated accordingly. The leading complications at day 1 were pain (36.8%), followed by corneal edema (26.4%),

subconjunctival hemorrhage (8.6%), and eyelid edema (6.8%). Other complications included crystallin masses (5.5%), iris hernia (1.8%), and suture breakage (1.2%), leading to 7 patients being taken back to the operating room. Keratitis accounted for 5.5% of complications, while displaced pupils, hyphema, and secretions accounted for 4%, 1.2%, and 1.2%, respectively.

Pain may be explained by the various maneuvers performed on the eyeball during surgery, as well as the inflammation induced by the surgical procedure. Corneal edema could be attributed to endothelial trauma during nucleus expulsion. Crystallin masses may result from poorly controlled mydriasis and insufficient lavage during surgery. Keratitis could be due to incomplete eyelid closure after anesthesia (trauma). Our results are similar to those of Diallo J.W. [12], who found 26.33% corneal edema, and Danté M.L. [15], who found 41.1% pain followed by 30.4% corneal edema.

At day 15, all patients were seen, with secretions dominating complications (8%), followed by pain (6.7%) and corneal edema (5%). Subconjunctival hemorrhage and keratitis represented 4.3% and 3%, respectively. Secretions were likely linked to poor hygiene, as many patients did not properly clean their eyes, either due to pain or ignorance. Antibiotics and hygiene advice were prescribed.

At day 30, 128 patients (78.5%) were reviewed. Posterior capsule opacification accounted for 2.3%, and these patients were referred to IOTA for management. These results vary in the literature, ranging from 0.7% to 8.2% [17,20]. Corneal edema accounted for 1.6%, which is similar to Diallo J.W.'s results [12], who found 0.7% persistence of edema at day 30. No cases of endophthalmitis were noted in our series.

Functional Results:

The majority of our cases (54%) had good visual acuity (≥3/10) with correction, 37.4% had borderline visual acuity (1/10–2/10), and 8.6% had poor visual acuity (<1/10). The proportion of patients with good results increased with best correction to 76.6%, with 17.1% showing borderline acuity and 6.3% having poor results.

These results are lower than WHO standards, which recommend a rate of at least 80% with correction and over 90% with the best correction for good outcomes, and less than 5% for poor outcomes. Our good results with correction are similar to those of Guirou N. [10] with 45.5%, but lower than those obtained by Lindfield R. [11] with 81% in Bangladesh, 75% in the Philippines, and 65% in Kenya, and by Gogate [21] in India, who found 98.4%. Our results are higher than those of Rupert B. [14] in Pakistan with 29.5%, Baldé R. [19] with 14.7%, and Traoré M. [9] in a similar surgical campaign with 3.79%.

Our poor results with correction (8.6%) are lower than those of Lindfield R. [11] with 19% in the Philippines and 20% in Kenya, and Guirou N. [10] with 21.6%. Several developing countries [9, 10, 11, 13, 14, 15, 16] have obtained results below WHO standards, while many developed countries [22] have met these standards. This can be attributed to the surgical techniques used. Phacoemulsification is the preferred technique for cataract surgery in developed countries, as several studies [8, 23] have shown that phacoemulsification yields better visual results, partly due to lower postoperative astigmatism owing to the absence of sutures and smaller incisions [24].

Causes of Poor Results:

The main causes of poor results were refractive errors (36.4%), sequelae (27.2%), poor selections (18.2%), and surgery (18.2%). The study showed no significant difference between age, sex, surgical technique, and poor results. Our results are similar to those of studies conducted in Kenya, the Philippines, and Pakistan, where 37%, 49%, and 53.4%, respectively, of poor results were attributed to refractive errors. In contrast, in Bangladesh, preoperative comorbidities and surgical complications were the main causes, accounting for 58% and 21%, respectively [17, 25]. In all these countries, the study did not reveal any significant relationship between age, sex, profession, type of surgery, and poor results.

Guirou N. [10] found that 42.1% of causes were due to surgical complications, but our conditions were not the same. Traoré M. [9] in a similar surgical campaign at IOTA found that 63.4% of poor results were attributable to postoperative sequelae.

CONCLUSION

Cataract remains the leading cause of treatable blindness and a significant public health issue, especially in developing countries. The need for eye care, particularly cataract surgery, is substantial across all regions of Mali, as demonstrated by various surveys. The most remote rural areas suffer greatly from cataracts, where the majority of the population does not receive proper diagnosis and treatment.

Surgical intervention, the only treatment for cataracts using advanced techniques and artificial implants, remains the ultimate solution to reduce the number of people blinded by this condition. It will be necessary to strengthen and expand surgical centers where cataracts are operated on and to select the most appropriate methods based on the sociocultural context.

Nearly half of all cases of blindness could be treated if all cataracts causing blindness were operated on. This is a significant task for which infrastructure and manpower are insufficient.

This study has confirmed the clinical effectiveness of cataract surgery. Our results could be improved with better technical platforms, qualified personnel (AMO, ISO), and the availability of suitable implants.

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