**SAS Journal of Surgery**
Abbreviated Key Title: SAS J Surg
ISSN 2454-5104
Journal homepage: https://www.saspublishers.com

OPEN ACCESS

**Ophthalmology**

# Functional Results of Cataract Surgery at the Secondary Ophthalmology Center of Ouelessebougou: A Study of 170 Cases

Sékou Malle[1*], Momine Traore[3], Assitan Ballo[1], Abdourhamane Dicko[1], Assiatou Simaga[2], Noouhoum Guirou[2]

[1]Ophthalmology Department, Reference Health Center of Ouelessebougou, Ouelessebougou, Mali
[2]CHU-IOTA Bamako, Mali
[3]Ophthalmology Department, Reference Health Center of Fana, Fana, Mali

**DOI:** 10.36347/sasjs.2024.v10i01.016 | **Received:** 09.12.2023 | **Accepted:** 21.01.2024 | **Published:** 25.01.2024

***Corresponding author:** Sékou Malle
Ophthalmology Department, Reference Health Center of Ouelessebougou, Ouelessebougou, Mali

**Abstract** **Original Research Article**

Cataract remains a significant public health issue in developing countries, and its treatment is predominantly surgical. The aim of this study was to evaluate extracapsular extraction using manual phaco alternative without sutures in terms of functional outcomes. This prospective study took place from January 2023 to June 2023, involving 170 eyes followed up to day 30 at the secondary ophthalmology center in Ouelessebougou. Data were analyzed using IBM SPSS and Excel 2016. Almost all our patients, 95% in Phaco-A and 93.3% in ECCE+PCI, underwent biometry. At day 30 postoperatively with correction, the phaco alternative yielded 88.8% good results, and extracapsular extraction showed 72.2% good results. At day 30 with correction, Phaco-A resulted in 88.75% of patients achieving good visual acuity compared to 72.22% in ECCE+PCI. This result is comparable to those of Konaté M [17] and Windinmanegdé Djiguimdé *et al*., [18], who achieved 83.49% and 79.6% good visual acuities, respectively. Phaco alternative provides better postoperative results in cataract surgery at the secondary ophthalmology center of Ouelessebougou.

**Keywords:** Cataract surgery, adult; ECCE technique, Phaco-A, visual acuity.



## INTRODUCTION

Cataract is the total or partial opacification of the crystalline lens, typically bilateral, and responsible for varying degrees of visual impairment [1]. It is a widespread condition worldwide and stands as the leading cause of curable blindness globally [2]. According to the World Health Organization (WHO), at least 2.2 billion people have visual impairments, with at least 1 billion having preventable or untreated impairments, among which cataracts account for 65.2 million cases [3].

The average prevalence of blindness is 0.7% in Eastern European countries, ranging between 0.2% and 0.4% in the USA, 0.2% in France, and 1.4% in Sub-Saharan Africa [4]. In Togo, the prevalence of blindness was 1%, with over half attributed to cataracts [5]. In Mali, the prevalence of blindness exceeds 1.2%, with 180,000 blind individuals, 90,000 of whom have cataracts [6].

The treatment for cataracts is exclusively surgical, involving the removal of the opacified crystalline nucleus (phacoexeresis) and the correction of residual aphakia [6]. Various techniques are employed, including extracapsular extraction (ECCE), ultrasonic phacoemulsification (PKE), and manual sutureless phaco alternative (PKA). All these techniques involve lens implantation in either the anterior or posterior chamber [7, 8].

In Ouelessebougou, according to the annual report of the secondary ophthalmology center for the year 2021, out of 912 surgical cases, 840 cases were related to cataracts, constituting 92%. Manual sutureless phaco alternative and extracapsular extraction remain the two techniques used for cataract surgery in the region.

## PATIENTS AND METHODS

This was a prospective study conducted at a second-level ophthalmological center located in the Ouelessebougou Health District in the Republic of Mali, covering the period from January 1 to June 30, 2023.

Included in our study were cases of age-related cataracts (≥40 years), without associated apparent

ocular pathologies, operated using ECCE and PKA (manual sutureless phaco alternative) techniques, with intraocular lens (IOL) implantation in the posterior or anterior chamber (in the sulcus or the bag). The surgeries were performed by an ophthalmologist proficient in both surgical techniques, and the patients underwent a postoperative follow-up of at least 30 days.

Patients were recruited during consultations, and a pre-anesthetic consultation and preoperative assessment (PT, PTT, Glucose) were systematically conducted. Patients also underwent a preoperative consultation. Biometry was then performed on most selected patients using an A-mode ultrasound device (Sonomed Escalon).

Data collection utilized various sources, including the consultation register, patient records, operating room register, and the study information sheet. Data processing and analysis were performed using IBM SPSS and Excel 2016, while the document was compiled using Word 2016.

# RESULTS

## SOCIO-DEMOGRAPHIC ASPECTS

A total of one hundred and seventy (170) eyes distributed between the two operative techniques were included and followed up to day 30. The age group of 61-70 was the most represented, accounting for 40.6%. The male-to-female (M/F) ratio was 0.66. Homemakers dominated the sample at 27.1%. The majority of patients came from rural areas, comprising 57.1%.

## ANATOMO-CLINICAL ASPECTS

ECCE was used in 52.9% of patients, and Phaco A in 47.1% (Table 3). Preoperative visual acuity in ECCE+PCI was < 1/10 in 86.4% of patients. While in PhacoA+PCI, it was < 1/10 in 92.1% of patients. During the intervention, 7.5% of patients experienced incidents in the Phaco A group, and 4.4% in the EEC group (Table 4). Four (04) patients experienced incidents during ECCE, including Three (03) cases of capsular ruptures with vitreous loss (3.3%) and one (01) case of posterior capsular rupture without vitreous loss (1.1%). Among the four affected patients, 2 underwent PCI, and the other 2 underwent PCA (Table 5). Six (06) patients encountered incidents during Phaco-A, all involving capsular ruptures with vitreous loss. Despite these incidents, all six patients were successfully implanted, with (04) receiving PCA and (02) receiving PCI (Table 5). In Phaco-A, the IOL was planned or calculated by biometry in 95% of patients, and in ECCE+PCI, this was the case for 93.3% of patients (Table 6). PCI was placed in 97.8% of patients in the ECCE group and 95% in the Phaco-A group (Table 7). At day 1 postoperatively, 16.7% of patients in the ECCE group and 11.2% in the Phaco-A group experienced complications. On day 1, postoperative complications in both groups were marked by corneal edema and hyphema. At day 15 postoperatively, 10% of patients in the ECCE group and 3.8% in the Phaco-A group experienced complications. On day 15 postoperatively, complications in favor of the ECCE group included corneal edema, hyphema, and endophthalmitis. At day 30, 7.8% of patients in the ECCE group and 2.5% in the Phaco-A group presented complications. At day 30, the dominant complications were posterior capsule opacification, accounting for 5.6% in the ECCE group and 1.25% in the Phaco-A group. At day 30 postoperatively without correction, 25.6% had visual acuity <1/10 in the ECCE group and 11.2% in the Phaco-A group (Table 8). At day 30 postoperatively with a pinhole, visual acuity with pinhole was ≥ 3/10 in 77.5% of patients in the Phaco-A group and 55.5% in the ECCE group (Table 9). At day 30 postoperatively, visual acuity with the best correction worn was ≥ 3/10 in 88.8% in the Phaco-A group and 72.2% in the ECCE group (Table 10).

**Table 1: Distribution of the sample according to age**

| Age group | Frequency | Percentage |
|---|---|---|
| 40-50 | 16 | 9,4 |
| 51-60 | 50 | 29,4 |
| **61-70** | **69** | **40,6** |
| 71-80 | 26 | 15,3 |
| 81 and more | 9 | 5,3 |
| Total | 170 | 100,0 |

The mean age of our patients was 62.97 years, with a median age of 65.5 years. The 61-70 age group was the most represented at 40.6%.

**Table 2: Distribution of the sample according to occupation**

| Occupation | Frequency | Percentage |
|---|---|---|
| Farmer | 40 | 23,5 |
| Civil servant | 12 | 7,1 |
| Trader | 19 | 11,2 |
| **Homemaker** | **46** | **27,1** |
| Retired | 10 | 5,8 |
| Self-employed | 43 | 25,3 |
| Total | 170 | 100,0 |

Homemakers dominated our sample at 27.1%.

**Table 3: Distribution of the sample according to surgical techniques**

| Surgical techniques | Frequency | Percentage |
|---|---|---|
| **EEC** | **90** | **52,9** |
| Phaco A | 80 | 47,1 |
| Total | 170 | 100,0 |

EEC was used in 52.9% of patients, while Phaco A was used in 47.1%.

**Table 4: Distribution of patients according to the course of the intervention**

| Incident | EEC | | Phaco-A | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| With incident | 4 | 4,4 | 6 | 7,5 |
| Without incident | 86 | 95,6 | 74 | 92,5 |
| Total | 90 | 100 | 80 | 100 |

During the intervention, 7.5% of patients experienced incidents in the Phaco A group, while 4.4% experienced incidents in the EEC group.

**Table 5: Distribution of the sample according to the type of incident**

| Type of incident | EEC | | Phaco-A | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Posterior Capsular Rupture with Vitreous Loss | 3 | 3,3 | 6 | 7,5 |
| Posterior Capsular Rupture without Vitreous Loss | 1 | 1,1 | - | - |
| Total | **4** | **4,4** | **6** | **7,5** |

Four (4) patients experienced incidents in the EEC group during the intervention, while six (6) patients experienced incidents in the Phaco A group.

**Table 6: Distribution of patients according to the planned or calculated IOL**

| IOL | EEC | | Phaco-A | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Planned or calculated | 84 | 93,3 | 76 | 95,0 |
| Not planned | 6 | 6,7 | 4 | 5,0 |
| Total | **90** | **100,0** | **80** | **100,0** |

The IOL was planned or calculated by biometry in 95% of Phaco A patients and 93.3% of EEC+ICP patients.

**Table 7: Distribution of patients according to the type of IOL placed**

| Type of IOL | EEC | | Phaco-A | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| ICP | 88 | 97,8 | 76 | 95 |
| ICA | 2 | 2,2 | 4 | 5 |
| Total | **90** | **100,0** | **80** | **100,0** |

ICP was placed in 97.8% of patients in the EEC group and 95% in the Phaco-A group.

**Table 8: Distribution of patients according to uncorrected visual acuity at day 30**

| AVSC at day 30 | EEC | | Phaco-A | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| < 1/10 | 23 | 25,6 | 9 | 11,2 |
| 1/10 et 2/10 | 27 | 30,0 | 19 | 23,8 |
| ≥ 3/10 | 40 | 44,4 | 52 | 65,0 |
| Total | **90** | **100,0** | **80** | **100,0** |

At day 30 postoperatively, 25.6% had visual acuity <1/10 in the EEC group, and 11.2% in the Phaco-A group.

**Table 9: Distribution of patients according to visual acuity with glasses at day 30**

| AVaTS at day 30 | EEC | | Phaco-A | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| < 1/10 | 15 | 16,7 | 6 | 7,5 |
| 1/10 et 2/10 | 25 | 27,8 | 12 | 15,0 |
| ≥ 3/10 | 50 | 55,5 | 62 | 77,5 |
| Total | **90** | **100,0** | **80** | **100,0** |

At day 30 postoperatively, visual acuity with glasses was ≥ 3/10 in 77.5% of Phaco-A patients and 55.5% in the EEC group.

**Table 10: Distribution of patients according to visual acuity with correction at day 30**

| AVAC at day 30 | EEC | | Phaco-A | |
|---|---|---|---|---|
| | **Frequency** | **%** | **Frequency** | **%** |
| < 1/10 | 12 | 13,3 | 5 | 6,2 |
| 1/10 et 2/10 | 13 | 14,5 | 4 | 5,0 |
| ≥ 3/10 | 65 | 72,2 | 71 | 88,8 |
| Total | **90** | **100,0** | **80** | **100,0** |

At day 30 postoperatively, visual acuity with the best correction worn was ≥ 3/10 in 88.8% in the Phaco-A group and 72.2% in the EEC group.

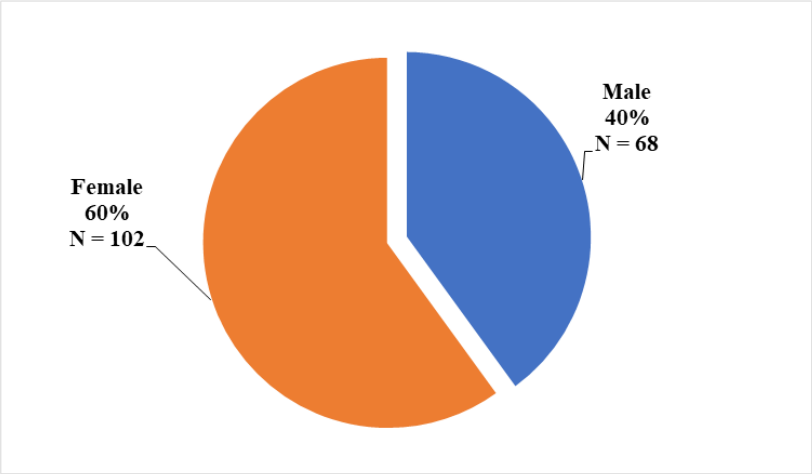


**Figure 1: Distribution of the sample according to gender**

The male-to-female sex ratio was 0.66.

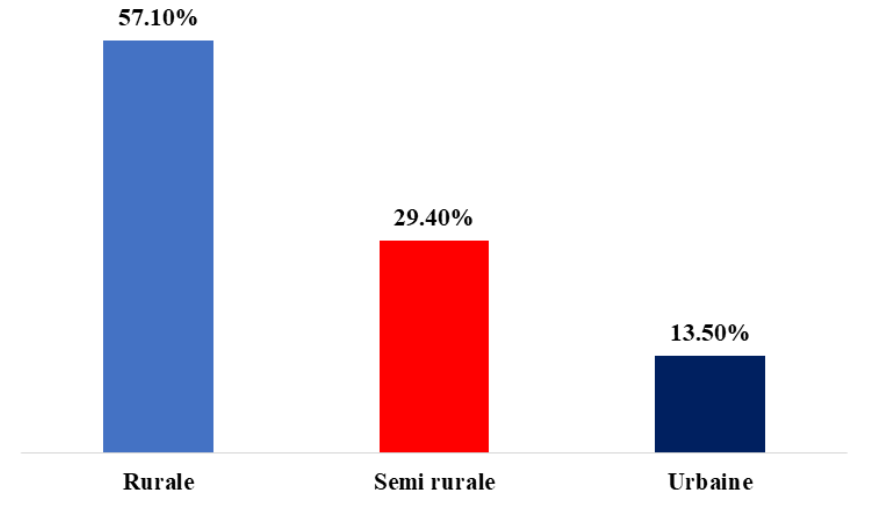


**Figure 2: Distribution of the sample according to residence**

The majority of our patients came from rural areas, accounting for 57.1%.

## DISCUSSION

**Sociodemographic Characteristics of Patients:**

**Age:** The mean age of our patients was 62.97 years, with the 61-70 age group being the most represented at 40.6%. The median age was 65.5 years, ranging from 40 to 90 years. This finding is consistent with studies by Konaté M, P. Widenmanegdé *et al.*, Nadio T *et al.*, and N. Maneh *et al.*, reporting mean ages of 63.77 years, 62.47 years, 64.2 years, and 61.63 years, respectively [17, 18, 6, 19]. This alignment may be explained by cataract being a physiological age-related change in the lens in the majority of cases.

**Gender:** Females accounted for 60%, with a male-to-female ratio of 0.66. This result is similar to the study by Harba T *et al.*, in Chad, reporting 55.7% females and 44.3% males [20]. Ammous I *et al.*, found 63.33%

females [21]. The higher prevalence of females aligns with the demographic data of Mali, where women constitute 51.30% of the general population [22].

**Residence:** The majority of patients (57.1%) originated from rural areas. This could be attributed to the location of the hospital in the Ouelessebougou district, encompassing multiple rural zones.

**Occupation:** Housewives and farmers represented 27.1% and 23.5%, respectively. Given that agriculture is the primary source of income in this Mali region and the traditional division of household responsibilities in Africa, these results can be explained. Konaté M [17] also found a strong predominance of these two professions in his study, with 52.96% housewives and 19.63% farmers.

**Clinical Characteristics of Patients:**

**Preoperative Visual Acuity**

In our study, preoperative visual acuity was < 1/10 in 92.1% of Phaco-A+PCI patients and 86.4% in ECCE+PCI patients. Nadio T's study [9] reported preoperative visual acuity <1/10 in 97.8% of ECCE+PCI patients and 86.5% in Phaco-A. This preoperative visual acuity aligns with the characteristics seen in developing countries, where surgical intervention for cataracts is often delayed due to various reasons such as poverty, geographical inaccessibility, fear of surgery, lack of surgeons, absence of technical facilities, and ignorance [23].

**Surgery**

**Technique Used**

In our study, ECCE was used in 52.9% of patients, and Phaco-A in 47.1%. This result is similar to Nadio T's study [9], where ECCE was the most used technique at 55.9%. According to the WHO, in the early 1990s, ECCE was the most common extraction method in several countries because it allows for the placement of a biocompatible implant immediately after removing the lens, providing immediate visual rehabilitation [24].

**Biometry**

IOL was planned or calculated in 95% of Phaco-A patients and 93.3% of ECCE patients, similar to Nadio T's study [9], where IOL was planned or calculated by biometry in 89.8% of ECCE patients and 87.1% in Phaco-A. This is higher than results observed by Kanza [25], Baaré [26], and Ganone-T [27], who found rates of 34.9%, 54%, and 76%, respectively. The small percentage of patients not receiving the planned implant underscores the importance of accurate IOL calculations to improve functional outcomes.

IOL was mostly placed in the posterior chamber in similar proportions in both series (97.8% in ECCE and 95% in Phaco-A). This aligns with results from studies by Kanza [25] (98.8%), Baaré [26] (97.6%), and Ganone T [27] (98.7%).

**Intraoperative incidents**

In our study, four (04) patients experienced incidents during ECCE, including: three (03) cases of capsular ruptures with vitreous loss (3.3%); one (01) case of posterior capsular rupture without vitreous loss (1.1%). Among the four affected patients, 2 underwent PCI, and the other 2 underwent PCA.

In Phaco-A, six (06) patients encountered incidents, all involving capsular ruptures with vitreous loss. Despite these incidents, all six patients were successfully implanted, with (04) receiving PCA and (02) receiving PCI.

Capsular rupture, especially posterior capsular rupture, has been found as a leading cause of intraoperative complications in various studies: Guirou N *et al*., [28] (2.93%), Diallo JW *et al*., [29] (2.33%), Konaré CO [23] (6.47%), and Baaré [26] (3.2%).

These results could be explained by the fragility of the zonule of Zinn and the capsule, as well as surgical manipulations during the procedure.

**Early postoperative complications**

Corneal edema and hyphema dominated the early postoperative complications on the first day in both groups, gradually decreasing by day 15. On day 1 postoperatively, corneal edema and hyphema represented 6.7% and 4.5%, respectively, in the ECCE group and 3.8% each in the Phaco-A group.

In Konaré CO's study [23], the main early postoperative complications were conjunctival hyperemia, corneal edema, and hyphema, accounting for 77.94%, 15.59%, and 1.92%, respectively. Diallo JW *et al.*, [29] in Burkina Faso reported 26.33% cases of corneal edema and 4.33% cases of hyphema.

By day 15 of hospitalization, corneal edema and hyphema had progressively regressed to 3.4% and 2.22% in the ECCE group, and 1.25% each in the Phaco-A group. Two cases of endophthalmitis were noted at day 15 (1 case in the ECCE group and 1 case in the Phaco-A group). This result is similar to Konaré CO's study [23], which found 1 case (0.10%) of endophthalmitis.

These complications can be explained mainly by the non-use of cautery for hyphema, surgical manipulations in the anterior chamber, pre-existing corneal disease for corneal edema, and poor hygiene for endophthalmitis.

**Late postoperative complications**

Late postoperative complications were predominantly dominated in both cases by posterior capsule opacification, accounting for 5.6% in the ECCE group and 1.25% in the Phaco-A group. These results are similar to Ganone's study [27], where posterior

capsule opacification represented 7.9% in the ECCE group and 9.2% in the Phaco-A group.

**Postoperative visual acuity**

In our study, 65% of patients had good uncorrected visual acuity at day 30 in the Phaco-A group, compared to 44.4% in the ECCE group. This result is comparable to Diallo JW *et al.*, who achieved 67.83% [29].

The majority of patients had good visual acuity with correction at day 30 in the Phaco-A group, accounting for 88.8%, compared to 72.2% in the ECCE group. This result is comparable to those of Konaté M [17] and Windinmanegdé Djiguimdé *et al*., [18], who respectively obtained 83.49% and 79.6%.

These results can be explained by the experience of the surgeons and the techniques used.

**ANNEXES**

**SURVEY FORM** Registration No: _____

**I- SOCIO-DEMOGRAPHIC DATA**

1. Age: / ___/ (40-50=1, 51-60=2, 61-70=3, 71-80=4, 81 and above=5)
2. Gender: /___ / (Male=1, Female=2)
3. Occupation: /____ / (Farmer=1, Civil Servant=2, Trader=3, Homemaker=4, Retired=5, Self-employed=6, Child=7)
4. Residence: /___ / (Rural=1, Semi-rural=2, Urban=3)

**II- CLINICAL DATA** 5. Preoperative visual acuity: /___ / (<1/10=1, 1/10 and <3/10=2, ≥3/10=3)

6. Comorbidity: /___ / (Strabismus=1, Diabetes=2, Hypertension=3, Ocular Trauma=4, None=5)
7. Corneal appearance: /___ / (Clear=1, Opacity=2, Leukoma=3, Dystrophy=4)
8. Cataract etiology: /___ / (Congenital=1, Traumatic=2, Senile=3, Pathological=4)

**III- THERAPEUTIC DATA** 9. Surgical technique: /___ / (ECCE+ICP=1, Phaco A+ICP=2)

10. Operated eye: / ___/ (Right=1, Left=2)
11. Peroperative complications: /___ / (Iridodialysis=1, Posterior capsule rupture without vitreous loss=2, Capsular rupture with vitreous loss=3, None=4)
12. IOL placement: /___ / (Planned=1, Not planned=2)
13. Type of IOL: /___ / (ICP=1, ICA=2)

**IV- ANATOMO-FUNCTIONAL RESULTS** 14. Postoperative complications on day 1: /___ / (Corneal edema=1, Iris hernia=2, Hyphema=3, Decentered implant=4, Residual crystalline mass=5, Iridocapsular adhesion=6, Posterior capsule opacification=7, Iridic pigment=8, Hypopyon=9, Endophthalmitis=10, None=11)

15. Postoperative complications on day 4: /___ / (Corneal edema=1, Iris hernia=2, Hyphema=3, Decentered implant=4, Residual crystalline mass=5, Uveitis=6, Iridocapsular adhesion=7, Posterior capsule opacification=8, Iridic pigment=9, Hypopyon=10, Endophthalmitis=11, Keratitis=12, None=13)
16. Uncorrected visual acuity at day 15: /___ / (<1/10=1, 1/10 and <3/10=2, ≥3/10=3)
17. Postoperative complications at day 15: /___ / (Corneal edema=1, Iris hernia=2, Hyphema=3, Decentered implant=4, Residual crystalline mass=5, Uveitis=6, Iridocapsular adhesion=7, Posterior capsule opacification=8, Iridic pigment=9, Hypopyon=10, Endophthalmitis=11, Keratitis=12, None=13)
18. Postoperative complications at day 30: /___ / (Corneal edema=1, Iris hernia=2, Hyphema=3, Decentered implant=4, Residual crystalline mass=5, Uveitis=6, Iridocapsular adhesion=7, Posterior capsule opacification=8, Iridic pigment=9, Hypopyon=10, Endophthalmitis=11, Keratitis=12, None=13)
19. Uncorrected visual acuity at day 30: /___ / (<1/10=1, 1/10 and <3/10=2, ≥3/10=3)
20. Visual acuity with pinhole at day 30: / ___/ (<1/10=1, 1/10 and <3/10=2, ≥3/10=3)
21. Corrected visual acuity at day 30 with the best correction worn: /___ / (<1/10=1, 1/10 and <3/10=2, ≥3/10=3)

## CONCLUSION

Cataract, the leading cause of blindness worldwide, remains a significant public health challenge, particularly in developing countries where its prevalence increases with age.

At the end of our prospective study conducted over a period of 6 months, we can conclude that cataracts predominantly affect the elderly, with a higher representation in females. This surgically curable condition was most commonly addressed through the ECCE surgical technique in our study. Capsular ruptures with vitreous loss were the most frequent intraoperative incidents. Corneal edema and hyphema were prevalent in early postoperative complications, while late complications were dominated by posterior capsule opacification, favoring the ECCE group.

At day 30 postoperatively, the majority of patients achieved better outcomes in the Phaco-A group, with 88.8%, compared to 72.2% in the ECCE group. These results are notably close to the recommendations of the World Health Organization (WHO).

To further enhance cataract surgery quality, improvements in surgical techniques, regular patient follow-up, and the use of high-quality equipment are deemed necessary.

## REFERENCES


1. Lawani, R., Pommier, S., & Roux, L. (2007). Magnitude and management strategies of cataract worldwide. *Revue Generale Med Trop*, 67, 644-650.
2. Resnikoff, S., Pascolini, D., Etya'Ale, D., Kocur, I., Pararajasegaram, R., Pokharel, G. P., & Mariotti, S. P. (2004). Global data on visual impairment in the year 2002. *Bulletin of the world health organization*, *82*(11), 844-851.
3. WHO. (2019). World Report on Vision. Geneva. Available at: https://www.who.int/fr/news/item/08-10-2019-who-launches-first-world-report-on vision
4. Diallo, J. W., Meda, N., & Boni, S. (2015). Complications of small incision cataract surgery with posterior chamber implantation: a study of 300 cases. Revue SOAO. N° 01, pp.2127.
5. Mensah, A., Balo, K. P., & Kondi, G. (2003). Cataract surgery in Togo. *Med Sante Tropicale*, 13(1), 5-8.
6. Nadio, T., Napo, A., & Baldé, R. (2017) Extracapsular extraction versus manual sutureless phaco in adult cataract treatment at CHU-IOTA. Mali Medical. 2017; N°3. P: 16-19.
7. Diakite, M. (2006). Prevalence of cataract and trachomatous trichiasis in Bamako and Narena. Med Thesis, Bamako, USTTB, 2006, N°06M369.
8. Pouliquen, Y. (1983). Precis d'ophtalmologie. Ed Masson, Paris, 1983. 637p.
9. Nadio, T. (2009). Evaluation of Two Cataract Surgical Techniques at IOTA: EECC+ICP and Phaco-A. Med Thesis (USTTB) 2009; N°09M410; 87p.
10. Roche, O., Beby, F., & Orssaud, C. (2006). Congenital cataract. *J Fr Ophtalmol*, *29*(4), 443-455.
11. Chanfi, M. (1994). Surgical treatment of cataract in African settings. Memoir, CES Ophthalmology, IOTA, 1994.
12. Marc Ancel, J. (2008). E-memoires de l'Academie Nationale de Chirurgie, 7(2), 43-44.
13. Cook, C. (2000). How to Improve the Outcome of Cataract Surgery. *J Comm Eye Health*, 13, 37-38.
14. Thomas, R., & Kuriakose, T. (2000). Surgical Techniques for a Good Outcome in Cataract Surgery: Personal Perspectives. *J Comm Eye Health*, 13, 37-38.
15. Villieus, M., Le, B., & Oliveau, A. C. (1959) Cataract in Black Africa. Influence of associated ocular endemics on surgical cure. *Oculist*, *192*(1), 52-70.
16. Nenefing Samake. (2012) Study of perinatal mortality in Ouéléssebougou Reference Health Center in 2010. Med Thesis (USTTB) 2012; N°12M198; 124p.
17. Konate M. (2019). Evaluation of cataract surgery results at the Sikasso Regional Hospital from November 2017 to June 2018. Med Thesis (USTTB) 2019; N°19M270; 55p.
18. Windinmanegde, P., Diomande-Abib, I., & Ahnoux-Zabsonre, A. (2015). Results of advanced cataract surgery by tunneling: a study of 262 cases. *Pan Afr Med J*, 22, 366.
19. Maneh, N., Banla, M., & Nonon Saa, K. B. (2015). Manual small incision cataract surgery: an alternative in Sub-Saharan Africa. *Research-An Academy Journal*, 2, 1307.
20. Harba, T., Djada, D., Didier, K. A., & Yena, A. (2013). Functional results of cataract surgery during the ophthalmological caravan at the Regional Hospital of Abéché in Chad. *Revue Scientifique du TCHAD*, *1*(13).
21. Ammous, I., Bouayed, E., & Mabrouk, S. (2017). Phacoemulsification versus manual small incision cataract surgery: anatomical and functional results. *Journal francais d'ophtalmologie*, 40, 460-466.
22. Cellule de Planification et de Statistiques (CPS/SSDSPF). (2014) Demographic and Health Survey (EDSM V). May 2014; 577p.
23. Konare, C. O. (2020). Functional results of cataract surgery at the ophthalmology department of Nianankoro Fomba Hospital in Segou. Med Thesis (USTTB) 2020; 20M240; 68p.
24. WHO. (1990). Prevention of Blindness Program. Report on the use of intraocular implants in cataract surgery in developing countries. Geneva, December 3-7, 1990; 31p.
25. Kanza, E. (2005). Functional evaluation of operated cataracts at IOTA: a study of 418 cases. CES Ophthalmology Memoir, IOTA, 2005.
26. Baare I. (2006). Functional results of cataract surgery by the manual sutureless phaco-alternative technique at IOTA: a study of 124 cases. CES Ophthalmology Memoir, IOTA, 2006.
27. Ganome T. (2007). Evaluation of two cataract surgical techniques at IOTA: Extracapsular Extraction and Sutureless Manual Phacoalternative, Memoir, CES Ophthalmology, IOTA, 2007.
28. Guirou, N., Napo A., & Dougnoun, A. (2013). Functional results of adult cataract surgery. *J Fr Ophtalmol*, 36, 19-22.
29. Diallo, J. W., Meda, N., Ahnoux-Zabsonre, A., Yameogo, C., Dolo, M., Sanou, J., & Daboue, A. (2015). Functional outcomes of cataract surgery by phacoemulsification with implantation in the posterior chamber: 300 cases in Bobo Dioulasso (Burkina Faso). *The Pan African Medical Journal*, *20*, 230-230.