Causes of Suboptimal Cataract Surgical Outcomes at Nkhoma Hospital, Malawi: A Retrospective Analysis

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Article

Causes of Suboptimal Cataract Surgical Outcomes at Nkhoma Hospital, Malawi: A Retrospective Analysis

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Abstract

Background: Cataract remains the leading cause of blindness worldwide, particularly in low- and middle-income countries. Cataract surgery is an effective intervention, but poor or borderline outcomes reduce its impact in eliminating avoidable blindness. Assessing cataract surgical outcomes is essential for improving surgical quality. This study aimed to identify reasons for poor or borderline cataract surgical outcomes at NkhomaHospital, Malawi, focusing on ocular comorbidities, surgical complications, refractive errors, and demographic factors, including gender. Methods: This was a retrospective analysis of 828 patients with a post-operative visual acuity of 6/18 or worse in at least one eye following cataract surgery. Data were extracted from theatre records, including demographics, referral source, preoperative examination, intraoperative findings, and post-operative assessment. Reasons for poor or borderline outcomes were classified based on ocular comorbidities, refractive error, surgical complications, and screening errors. Results: Among patients with poor or borderline surgical outcomes, 52.2% had ocular comorbidities (e.g., glaucoma, diabetic retinopathy, corneal scarring), which adversely affected vision post-surgery. Uncorrected refractive error accounted for 25.8% of cases, indicating gaps in post-operative optical correction services. In 13.5% of cases, records lacked sufficient data to determine a cause. A significant gender disparity was observed ($p = 0.027$), with women more likely than men to present as blind at the time of surgery. These findings highlight potential barriers to timely cataract surgery for women, including financial constraints, caregiving responsibilities, and delayed health-seeking behavior. Conclusion: The causes of poor cataract surgery outcomes at Nkhoma Hospital are multifactorial, mainly driven by pre-existing ocular conditions, inadequate screening, and post-operative refractive care. Strengthening pre-operative screening, post-operative optical correction services, and gender-targeted outreach programs can improve surgical success. Targeted capacity building for cataract surgeons, outreach teams, and post-op follow-up staff is essential to ensuring equitable access to cataract surgery and reducing avoidable blindness in Malawi and other countries.

Keywords: blindness; cataract; visual impairment; surgery; malawi; refractive errors; equity; global eye health; gender

Background

Blindness and visual impairment pose significant global health challenges, disproportionately affecting low- and middle-income countries (LMICs)[1]. According to the World Health Organization (WHO)[2] and a recent review article in *The Lancet Global Health*[3], over 2.2 billion people worldwide have vision impairment, nearly half of which is preventable or untreated. This includes an estimated 43.0 million blind individuals, 295.0 million with moderate visual impairment (MVI), and 33.6 million with severe visual impairment (SVI). Among those aged 50 and above, approximately 501 million

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have near vision impairment due to uncorrected presbyopia[4]. Cataracts remain the leading cause of blindness worldwide[5].

To address the burden of vision loss, the WHO introduced the global eye health resolution (Resolution WHA74.12: Integrated People-Centered Eye Care), setting global eye care targets for 2030[6]. These targets emphasize Effective Refractive Error Coverage (eREC) and Effective Cataract Surgery Coverage (eCSC)[7]. eREC refers to the proportion of individuals with refractive errors who receive corrective lenses or treatment that restores functional vision, prioritizing quality over quantity[8]. Meanwhile, eCSC measures the proportion of individuals with cataract-related vision loss who undergo successful vision-restoring surgery, highlighting the importance of both access and optimal surgical outcomes.

Sub-Saharan Africa, including Malawi, bears a significant portion of the global vision loss burden, exacerbated by limited access to quality eye care, inadequate healthcare infrastructure, and persistent socio-economic barriers[9]. Globally, the leading causes of blindness include cataracts, refractive errors, glaucoma, diabetic retinopathy, and age-related macular degeneration (ARMD)[4]. Cataracts alone account for approximately 51% of global blindness, yet many regions, including Malawi, struggle to achieve elimination targets set by the 2030 Eye Health Agenda[7]. While these initiatives have significantly improved eye care globally, they remain underutilized in resource-limited areas like Malawi, where access to surgical services is still a challenge.

Cataract surgery is the most effective intervention for cataract blindness. However, suboptimal outcomes—poor or borderline visual results—can negatively impact vision and discourage individuals from seeking surgery[10]. Good surgical outcomes are critical, as cataracts are the leading cause of blindness globally. Visual outcomes from cataract surgery vary across regions[11]. In developed countries, surgical interventions typically result in positive patient outcomes, while in LMICs, poor visual outcomes often exceed WHO thresholds. Assessing cataract surgical outcomes is essential for improving surgical quality in LMICs, including Malawi[12].

Research on surgical outcomes in LMICs remains limited. Several studies indicate that patients seek surgical assistance primarily when they have confidence in positive outcomes[13] and that many are willing to pay for high-quality services[10,14]. This underscores the importance of identifying factors contributing to poor or borderline cataract surgery outcomes in these regions.

Over the years, Rapid Assessment of Avoidable Blindness (RAAB) surveys[15] have identified several reasons for suboptimal cataract surgery outcomes, including ocular co-morbidities (selection issues), surgical complications, uncorrected refractive errors, and long-term complications (sequelae). For instance, a 2010 RAAB survey in Southern Malawi[16] reported that 35.9% of cataract surgeries resulted in poor outcomes, with contributing factors including co-morbidities (40%), surgical complications (46.7%), and long-term sequelae (13.3%). Careful selection of patients for cataract surgery is vital, particularly in identifying those with pre-existing co-morbidities, such as chronic glaucoma, age-related macular degeneration, and diabetic retinopathy. A longitudinal study conducted in Ethiopia demonstrated that optimizing patient selection could enhance surgery outcomes for patients with pre-existing conditions by up to 80%[17]. Proper pre-operative screening and selection by experienced cataract surgeons can significantly improve visual outcomes. Intraoperative complications also play a critical role in cataract surgeries resulting in poor outcomes[11]. Some of these complications can involve discomfort or pain, bruising and swelling of the eyelid, increased intraocular pressure, and allergic reactions to medications[18]. Such complications can arise either during the operation or later in the follow-up period, further affecting surgical success and patient satisfaction.

Malawi, with an approximate population of 21 million, has five major eye hospitals, including Nkhoma Hospital, a key provider of cataract surgery in the central region, supported by the Christian Blind Mission(CBM). Established in 1955[13], Nkhoma Hospital operates in partnership with the Malawi Ministry of Health (MOH) and non-governmental organizations to provide eye care services in central-western and central-eastern Malawi.

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Despite being recognized for performing a high volume of cataract surgeries, the actual quality of surgical outcomes at Nkhoma Hospital has not been regularly independently assessed. A program may perform many surgeries but still fail to restore sight effectively if surgical quality is inadequate, leading to continued blindness and visual impairment[19]. Therefore, assessing surgical outcomes is crucial to ensuring that high-volume services translate into effective blindness prevention.

Cataract surgeries at Nkhoma Hospital are performed by one ophthalmologist and ophthalmic clinical officers, who, through task-shifting[20], have been trained as trichiasis and cataract surgeons. All cataract operations at Nkhoma Hospital use a sutureless technique[13], and routine outcome monitoring is integrated into the program[21].The program screens up to 30,000 people per year for cataracts, utilizing four methods: daily outreach clinics conducted by community members (cataract case finders), mobile eye clinics, Self-referrals and Community-Based Rehabilitation (CBR) workers under the Malawi Council for Disability Affairs (a non-governmental organization).

Understanding the causes of poor or borderline cataract surgery outcomes at high-volume facilities like Nkhoma hospital is vital. These challenges are deeply influenced by social determinants of health, including socioeconomic status, geographic barriers, and disparities in healthcare access. The primary goal of this study was to determine the causes of poor or borderline surgical outcomes at Nkhoma Hospital, while also exploring associations between age, gender, surgeon type, referral pathways, and common surgical complications.

The findings aim to provide valuable insights for developing effective strategies that promote equity in cataract surgical care, ensuring that all patients—regardless of background—receive timely, high-quality treatment. Addressing these issues through improved case finding, effective screening and referral practices, refractive error correction, and staff training can significantly enhance service effectiveness and strengthen global eye health efforts. By prioritizing equitable access to care and improving surgical outcomes, we can work toward reducing avoidable blindness worldwide.

Methods

Study Setting and Population

This study was conducted at Nkhoma Hospital, one of Malawi's leading eye care centers, situated 80 km south of Lilongwe, the capital city. Nkhoma Hospital serves as a referral center for cataract surgeries across central-western and central-eastern Malawi and has an annual surgical output of approximately 4,000 cases[13]. The study focused on patients who had undergone cataract surgery at Nkhoma Hospital over one year (January–December 2019) and who had poor or borderline post-operative visual acuity (VA) outcomes.

The study employed a retrospective, quantitative design, analyzing theatre records of patients whose post-operative visual acuity was worse than 6/18 in at least one eye.

Ethical Approvals and Permissions

Following ethical approval from both Malawi (National Health Research and Services Committee and Nkhoma Hospital Research Ethics Committee) and South Africa (University of Cape Town HREC REF: 667/2022), meetings were held between the research team and hospital management to ensure compliance with ethical and institutional requirements. Permission was then granted to access admission logs, surgical records, and post-operative follow-up files to extract the relevant data, which was anonymized.

Data Collection and Data Entry

Records of patients with poor or borderline outcomes (VA <6/18) in at least one eye were identified from the master database and extracted for analysis. A total of 828 patients met the inclusion criteria and were included in the dataset. To ensure data accuracy and consistency, a

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structured data capture form was designed (supplement file 1) to systematically extract information from hospital record books and electronic patient files.

The collected data included demographic characteristics (age, gender), date of operation, referral route, and details of pre-operative, intraoperative, and post-operative assessments.

- Pre-operative assessment: Information on visual acuity before surgery, intraocular pressure measurements, biometry results, and presence of ocular comorbidities such as glaucoma, corneal scarring, diabetic retinopathy, and age-related macular degeneration was extracted.
- Intraoperative details: Data included surgical date, technique used (manual small-incision cataract surgery or phacoemulsification), intraocular lens (IOL) positioning, capsulotomy method, use of sutures, and any intraoperative complications (e.g., capsular rupture, posterior dislocation).
- Post-operative assessment: This covered post-operative VA, presence of surgical complications, refractive status, and recorded patient complaints.

Visual acuity was categorized according to the WHO classification, and presenting visual acuity was taken in both BE

- Blind: Visual acuity less than 3/60
- Severely Visual impairment: Visual acuity less than =>3/60-<6/60
- Moderate Visual impairment: Visual acuity less than =>6/60 - <6/18
- Early Visual impairment or not Blind: Visual acuity: >6/18

A categorical variable called "Reasons" was created to classify the primary causes of poor surgical outcomes. These categories were determined based on pre- and post-op VA, best corrected visual acuity (BCVA), biometry accuracy, intraoperative complications, and ocular comorbidities, according to Table 1.

Table 1. Reasons for poor or borderline outcomes after cataract surgery.

Reasons	Primary Determinant
Spectacles	Post-operative BCVA corrected to 6/18 or better
Surgery	Intra-operative complications or post-op VA / BCVA worse than pre-op
Selection	Ocular comorbidity known to cause vision loss, and other comorbidity likely to affect vision adversely
Screening	Pre-op VA corrected to 6/18 or better

A commonly encountered cause of long-term poor surgical outcomes, known as "sequelae", a standard for post-operative visual outcome assessment, i.e., 6-8 weeks, could not be fully assessed, as this study only included records from the immediate post-operative period. The captured reasons for poor outcomes were independently determined by a senior government ophthalmologist and verified by the lead ophthalmologist at Nkhoma Hospital to ensure validity.

Data Cleaning and Analysis

After data extraction, the information was entered into a Microsoft Excel spreadsheet using a double-entry system to minimize transcription errors.

For analysis, STATA 17 (Stata Corp, 2021: Release 17, College Station, TX: Stata Corp LLC) was used. The data were explored using descriptive statistics, which were summarized in tables and graphs to visualize key trends.

- Categorical variables (e.g., gender, referral pathways, surgical techniques) were summarized using frequencies and percentages.
- Continuous variables (e.g., age, pre- and post-op VA) were summarized using means and standard deviations.

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Inferential statistical tests, particularly chi-square analysis, were conducted to assess associations between surgical outcomes and key variables such as age, gender, referral route, and surgeon type.

Data Protection and Ethical Considerations

To protect patient privacy and confidentiality, all data were anonymized before analysis. No personal identifiers such as names, hospital numbers, or contact details were included in the dataset.

Results

Sample Characteristics

A total of 828 patients with poor or borderline post-operative visual acuity (VA) outcomes (6/18 or worse in at least one eye) were included in the study.

In terms of age distribution, 95.2% of patients were aged 50 years or older.

The median age group for cataract surgery patients was 60–70 years.

In terms of gender distribution: 52.7% were female and 47.5% were male.

About two-thirds of cataract surgery patients had a pre-operative visual acuity of 6/60 or worse, in other words, blind or severely visually impaired.

Table 2 shows visual distribution from both eyes (BE), by gender, and Figure 1 further illustrates the imbalance, between genders.

Table 2. Vision (BE) Distribution by Gender.

Vision BE Category	Female (N)	Male (N)	Total (N)
Blind	148	122	270
%	37.8	28	32.6
Severely Visual Impaired (SVI)	117	144	261
%	29.9	33	31.5
Moderate Visual Impaired (MVI)	69	87	156
%	17.6	20	18.9
Early Visual Impaired (EVI)	24	28	52
%	6.1	6.4	6.3
Not Blind	34	55	89
%	8.7	12.6	10.8
Total	392	436	828
%	100	100	100

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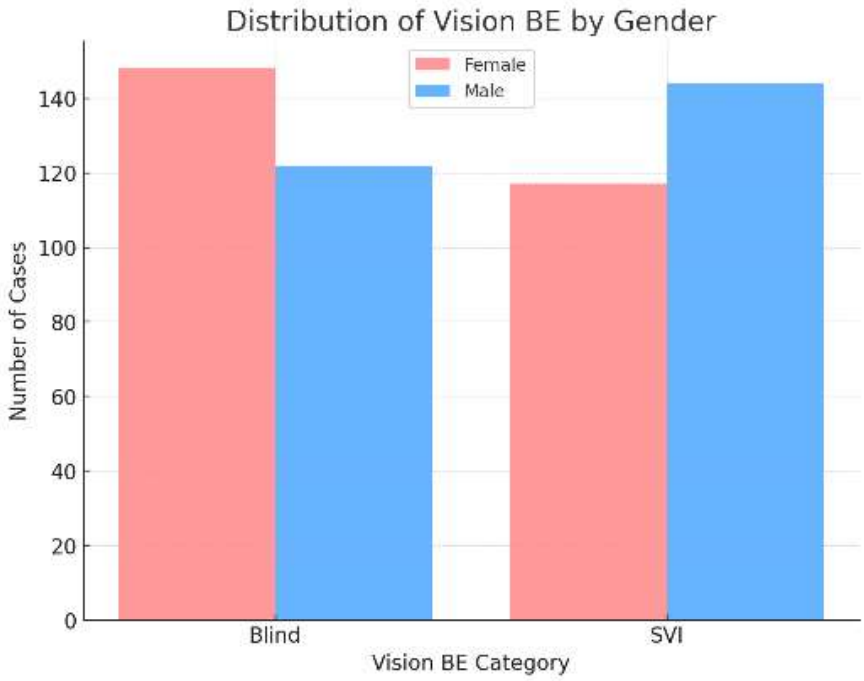

Figure 1. Distribution of vision, by gender.

Only 17.1% of all the clients were considered to have normal vision (either not blind or EVI). Approximately 1/3 were blind in both eyes after surgery.More females 37.8% (148 cases) were classified as blind compared to males 32.6% (122 cases). Females were significantly more likely to be blind (BE) than males (p = 0.027), even though severe visual impairment (SVI) was more common in males.Table 3 shows the referral source pathways.

Table 3. Referral source and the number of cases.

Referral Source	Number of Cases (N)	Percentage of Poor/Borderline Cases (%)
MACODA	337	40.7
Outreach Clinics	217	26.2
Cataract Case Finders	190	23
Self-Referred	84	10.1

In terms of where the patients came from, 40.7% were referred, by MACODA, 26.2% by outreach clinics, 22.9% by cataract case finders, and 10.1% by self-referral.

The key reasons identified for suboptimal post-operative vision are shown in Figure 2:

Ocular comorbidity (Selection) accounted for the majority (52.3%) of all cases contributing to suboptimal outcomes, while surgical complications were the least common reason for poor outcomes (3.7%).

There was no significant association between gender and poor cataract surgery outcomes (p-value = 0.073), and between age group and poor cataract surgery outcomes (p-value = 0.54).

Association of the type of referral route

Table 4 provides an in-depth breakdown of how different referral sources (Cataract Case Finder, MACODA, Outreach Clinic, and Self-Referral) contributed to various causes of poor or borderline cataract surgical outcomes.

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Table 4. Reasons for Poor Cataract Surgical Outcomes by Referral Route.

Reasons	Referral Route				
	Cataract Case Finder	MACODA	Outreach clinic	Self	Total
Selection	107	156	129	40	432
%	24.7	36.1	29.8	9.2	100
Screening	5	15	16	3	39
%	12.8	38.4	41.0	7.6	100
Spectacles	51	104	33	26	214
%	23.8	48.6	15.4	12.1	100
Surgery	6	12	10	3	31
%	19.3	38.7	32.2	9.6	100
Unknown	21	50	29	12	112
%	18.7	44.6	25.8	10.7	100
Total	190	337	217	84	828
	22.9	40.7	26.2	10.1	100

Pearson Chi2=26.4 prob=0.010.

Referral sources significantly influenced surgical outcomes (p-value = 0.0010)

Ocular comorbidities were the most common cause of poor outcomes (52.3%) across all referral routes, with MACODA contributing the highest proportion (36.1%), followed by Outreach Clinics (29.8%) and Cataract Case Finders (24.7%).

Self-referred patients had the lowest proportion (9.2%) of poor outcomes due to selection issues.

Outreach Clinics had the highest percentage of screening errors (41.0%), followed by MACODA (38.4%) and Cataract Case Finders (12.8%).MACODA referrals had the highest proportion of uncorrected refractive error cases (48.6%)., and the highest percentage of surgical complications (38.7%),

MACODA referrals accounted for the highest proportion (44.6%) of unknown cases, while self-referral cases had the lowest proportion (10.7%).

Overall, MACODA referrals had the highest proportion of poor outcomes across all categories (selection issues, refractive errors, surgical complications, and unknown causes).

Table 5 illustrates the distribution of reasons for poor or borderline outcomes, categorized by type of surgeon.

Table 5. Association between type of the surgeon and the reasons for poor or borderline outcomes.

	Surgeon		
Reasons	**Cataract surgeon**	**Ophthalmologist**	**Total**
Selection	409	23	432
%	52.2	52.3	52.2
Screening	39	0	39
%	5.0	0.00	4.7
Spectacles	203	11	214
%	25.9	25.0	25.9
Surgery	28	3	31

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%	3.6	6.8	3.7
Unknown	105	7	112
%	13.4	15.9	13.5
Total	784	44	828
%	100.0	100.0	100.0

Pearson Chi2 =3.6 Prob=0.467.

Cataract surgeons performed 95% of all surgeries, while the Ophthalmologist only did 5% of all cases, but outcome quality was not significantly associated with surgeon type (p-value = 0.46).

Among cases with complications, issues were categorized based on which layer of the eye was affected, and this is shown in Table 6. The most common complications were corneal opacities (59.2%).

Table 6. Surgical Complications and Layer of the Affected Eye.

Eye Layer Affected	% of Cases	Common Complications
Outer Layer (Cornea, Sclera, Anterior Segment)	59.2	Hazy cornea
Middle Layer (Lens, Uvea, Vitreous Body)	36.7	Vitreous loss, dislocated IOL
Inner Layer (Retina, Fundus)	4.1	Retinal issues

Discussion

This study investigated the reasons for poor or borderline cataract surgical outcomes at a high-volume cataract surgery facility in Malawi, and the common factors identified included: (i) the influence of referral sources on surgical outcomes, (ii) lack of post-operative refractive services to improve visual outcomes and (iii) the role of surgeons.

Referral Source and Its Influence on Surgical Outcomes

Although referral sources did not significantly predict poor outcomes (Table 4), it remains a critical factor in patient selection and surgical case volume. About 40.7% of patients with poor or borderline outcomes were referred by MACODA (Malawi Council for the Disability Affairs, an organization that serves individuals with disabilities and visual impairments. The high proportion of patients with pre-existing ocular conditions (52.2%) suggests referral systems may not adequately screen for serious comorbidities such as glaucoma, diabetic retinopathy, or corneal scarring, which can limit surgical success.

Patients referred through outreach and MACODA screening programs were more likely to have been misclassified as requiring surgery (Table 3 & 4), despite having borderline visual impairment. This highlights potential gaps in screening procedures, possibly due to insufficient diagnostic tools or pressure to maximize surgical numbers in outreach settings. Strengthening training for referral personnel, particularly outreach workers and MACODA staff, could help improve patient selection and reduce unnecessary surgeries.

Another challenge is the lack of access to post-operative spectacle correction for many referred patients, which significantly impacts long-term visual outcomes. Moreover, documentation gaps in outreach settings contribute to missing data, making it difficult to assess the true impact of referral pathways on surgical success.

Monitoring post-surgical outcomes is crucial for informing eye care managers, surgeons, and donors on strategies to improve service quality. Tracking outcomes enables data-driven

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improvements in screening, surgical performance, and follow-up care, ensuring that patients receive the most appropriate interventions.

The Need for Post-Operative Refractive Services

The World Health Organization (WHO) launched SPECS 2030[22,23], a global initiative aimed at expanding access to refractive error services, endorsed at the 2021 World Health Assembly. Despite these efforts, uncorrected refractive error remains a major contributor to poor post-operative outcomes, accounting for 25.8% of cases in this study. This highlights persistent gaps in Universal Eye Health (UEH)[23] and Universal Health Coverage (UHC)[24] and equity, as many patients—particularly in low-resource settings—lack access to affordable post-operative optical correction. These findings reinforce the urgent need to integrate post-operative refraction into cataract surgical programs to ensure equitable vision restoration for all patients, regardless of socio-economic status.

Beyond refractive errors, ocular comorbidities (52.2%) were the leading cause of poor outcomes, followed by uncorrected refractive error (25.8%), screening errors (4.7%), and surgical complications (3.7%). Though screening errors were less frequent, they imposed significant costs on patients and the healthcare system, particularly when surgery failed to improve vision. Investing in specialized training for screening personnel could help reduce misclassification and unnecessary surgeries.

Although surgical complications were rare (3.7%), they remain a significant cost and risk factor for eye care programs. The most common complications were corneal opacity (Table 6), which could have been prevented through improved surgical precision and better post-operative care. Modern simulation-based surgical training programs have proven to be effective in improving surgeon skills, reducing complications, and ensuring better visual outcomes.

The Role of Surgeons and Case Complexity

Interestingly, surgical outcomes were not significantly associated with surgeon type, suggesting that factors such as patient selection, surgical techniques, and follow-up care play a greater role in poor outcomes than surgeon experience alone. Cataract surgeons performed 95% of all surgeries (Table 5), demonstrating their central role in service delivery at Nkhoma Hospital. However, the higher complication rate among ophthalmologists is likely due to their involvement in more complex, high-risk cases, which require longer operating times and advanced surgical skills.

Additionally, the ophthalmologist at Nkhoma Hospital also holds an administrative leadership role, limiting their surgical caseload and making direct comparisons between surgeon types challenging. Since both surgeon types had similar proportions of poor outcomes due to refractive errors, this further supports the need for expanded access to post-operative spectacle correction services, regardless of who performed the surgery.

The imbalance in case distribution between ophthalmologists and cataract surgeons should be considered when evaluating surgical outcome patterns. While retraining surgeons may help improve surgical success rates, a greater emphasis should be placed on systemic improvements in screening, patient selection, and post-op refractive care to enhance cataract outcomes in LMICs.

Finally, it is important to discuss the gender disparities in blindness that were noted before the surgeries were conducted. Blindness was not evenly distributed between males and females (Table 3, Figure 1). Females were significantly more likely to be blind than males ($p = 0.027$). This suggests that women face barriers to accessing cataract surgery early, a challenge widely documented in low- and middle-income countries (LMICs)[5,25–27].

Several factors contribute to this disparity. Women may experience financial constraints, caregiving responsibilities, and social barriers that delay or prevent them from seeking timely eye care[5,26]. Additionally, they may present later in disease progression, leading to higher rates of blindness at the time of surgery. Hormonal factors and a longer life expectancy among women may also increase their risk of developing advanced cataracts.

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Globally, women are 1.3 times more likely to be blind than men, yet they receive cataract surgery at lower rates[5]. To address these disparities, gender-sensitive interventions should include targeted screening[28], and outreach for women to increase surgical access before blindness occurs[26].

Study Limitations

The study's findings should be interpreted with caution due to several limitations. Incomplete and inconsistent record-keeping led to missing data, affecting how reasons for poor or borderline cataract surgery outcomes were classified. Short-term visual acuity measurements (taken one day post-surgery) did not capture long-term complications, such as posterior capsular opacification, which typically develops weeks after surgery. The 13.5% "unknown" category could have been reclassified with better documentation, potentially altering the proportions of different causes of poor outcomes.

The WHO recommends assessing post-operative outcomes at eight weeks, making these early results less definitive. Additionally, data inconsistencies, recall bias, and subjective classification methods may have influenced the reporting of surgical outcome causes.

Despite these limitations, the study provides valuable insights into global eye health, emphasizing the impact of social determinants of health on cataract surgery outcomes. The findings highlight gaps in equitable access to quality surgical care, particularly in low-resource settings, where healthcare infrastructure and gender disparities influence health-seeking behavior. Addressing these barriers can improve surgical success rates and post-operative care, ensuring that cataract treatment programs align with WHO standards and contribute to reducing avoidable blindness worldwide. Strengthening data systems and follow-up care can further enhance equity in eye health services across diverse populations.

Conclusion

This study underscores the need for improving cataract surgery outcomes through enhanced patient selection, post-operative care, and better screening protocols. While limitations in data quality and short-term follow-up should be acknowledged, the findings remain globally relevant, contributing to discussions on global eye health and the role of social determinants of health in surgical success.

Moving forward, long-term post-operative assessments and refined referral strategies are essential to improving patient outcomes. Additionally, strengthening post-operative refractive services—such as providing affordable corrective eyewear—will be critical to ensuring that patients achieve the best possible vision after surgery. By focusing on these areas, cataract treatment programs can be more effective, equitable, and sustainable, reducing preventable blindness worldwide.

Abbreviations

BCVA Best Corrected Visual Acuity
BICO Blantyre Insititute for Community Outreach
CBM Christian Blind Mission
eCSC Effective Cataract Surgical Coverage
eREC Effective Refractive Error Coverage
LMIC Low- and Middle-Income Countries
MACODA Malawi Council for the Disability Affairs
MOH Ministry of Health
RAAB Rapid Assessment of Avoidable Blindness
SPECS Services, Personnel, Education, Cost, Surveillance
SVI Severe visual impairment

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UEH Universal Eye Health

UHC Universal Health Coverage

VA Visual Acuity

VI Visual Impairment

WHO World Health Organization

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References

1. Bourne R, Adelson J, Flaxman S, et al. Trends in Prevalence of Blindness and Distance and Near Vision Impairment Over 30 Years and Contribution to the Global Burden of Disease in 2020. *SSRN Electronic Journal*. Published online 2020. doi:10.2139/ssrn.3582742
2. World Health Organization. *World Report on Vision.*; 2019. Accessed December 21, 2024. https://www.who.int/publications/i/item/world-report-on-vision
3. Burton MJ, Ramke J, Patricia Marques A, et al. The Lancet Global Health Commission The Lancet Global Health Commission on Global Eye Health: vision beyond 2020 See Comment pages e383, e385, and e387 International Centre for Eye. *Lancet Glob Health*. 2021;9.
4. Burton MJ, Faal HB, Ramke J, et al. Announcing The Lancet Global Health Commission on Global Eye Health. *Lancet Glob Health*. 2019;7(12). doi:10.1016/S2214-109X(19)30450-4
5. Bassett H, Faal H, Burton M. The Lancet Global Health Commission on Global Eye Health: key findings. *Community Eye Health Journal*. 2021;34(111).
6. World Health Assembly. Resolution WHA74(12). Integrated people-centred eye care, including preventable vision impairment and blindness. In: Seventy-fourth World Health Assembly, Geneva, 24–31 May 2021. Geneva: World Health Organization; 2021. Published online 2021.
7. World Health Organization. World Health Organization. (2022). Report of the 2030 targets on effective coverage of eye care. World Health Organization. Published online 2022.
8. McCormick I, Butcher R, Evans JR, et al. Effective cataract surgical coverage in adults aged 50 years and older: estimates from population-based surveys in 55 countries. *Lancet Glob Health*. 2022;10(12). doi:10.1016/S2214-109X(22)00419-3
9. Kalua K. Comparison of Effectiveness of Using Trained Key Informants versus Health Surveillance Assistants in Identifying Blind and Visually Impaired Children in Malawi. PhD. London School of Hygiene and Tropical Medicine; 2015.
10. Lewallen S, Schmidt E, Jolley E, et al. Factors affecting cataract surgical coverage and outcomes: A retrospective cross-sectional study of eye health systems in sub-Saharan Africa. *BMC Ophthalmol*. 2015;15(1). doi:10.1186/s12886-015-0063-6

 doi:10.20944/preprints202603.0038.v1

11. Lindfield R, Vishwanath K, Ngounou F, Khanna RC. The challenges in improving outcome of cataract surgery in low and middle income countries. *Indian J Ophthalmol*. 2012;60(5). doi:10.4103/0301-4738.100552
12. Limburg H. Monitoring cataract surgical outcomes: Methods and tools. *Journal of Community Eye Health*. 2002;15(44).
13. Dean WH, Sherwin JC, Kambewa E, Metcalfe NH. Addressing cataract in rural Malawi: The Nkhoma eye programme. *Community Eye Health Journal*. 2014;27(85).
14. Dean WH, Sherwin JC, Kumwenda S, Angeletti M, Wiehler U. Willingness to pay for cataract surgery in post-operative cataract patients in rural Malawi. *Ophthalmic Epidemiol*. 2012;19(5). doi:10.3109/09286586.2012.708085
15. McCormick I, Butcher R, Ramke J, et al. The Rapid Assessment of Avoidable Blindness survey: Review of the methodology and protocol for the seventh version (RAAB7). *Wellcome Open Res*. 2024;9. doi:10.12688/wellcomeopenres.20907.1
16. Kalua K, Lindfield R, Mtupanyama M, Mtumodzi D, Msiska V. Findings from a rapid assessment of avoidable blindness (RAAB) in Southern Malawi. *PLoS One*. 2011;6(4). doi:10.1371/journal.pone.0019226
17. Markos CM, Tamrat LT, Asferaw MA. Outcomes and Associated Factors of Cataract Surgery Among Adults Attending a Tertiary Hospital in Addis Ababa, Ethiopia . *Patient Relat Outcome Meas*. 2020;Volume 11. doi:10.2147/prom.s280049
18. Miller K, Sherief R, Kaplowitz K, Chou TA, Abazari A. Surgical outcomes following complicated phacoemulsification cataract surgery performed by beginner resident surgeons. *Invest Ophthalmol Vis Sci*. 2016;57(12).
19. Dean WH, Patel D, Sherwin JC, Metcalfe NH. Follow-up survey of cataract surgical coverage and barriers to cataract surgery at Nkhoma, Malawi. *Ophthalmic Epidemiol*. 2011;18(4). doi:10.3109/09286586.2011.590918
20. Gichangi M, Kalua K, Barassa E, Eliah E, Lewallen S, Courtright P. Task Shifting for Eye Care in Eastern Africa: General Nurses as Trichiasis Surgeons in Kenya, Malawi, and Tanzania. *Ophthalmic Epidemiol*. 2015;22(3). doi:10.3109/09286586.2015.1040924
21. Sherwin JC, Dean WH, Schaefers I, Courtright P, Metcalfe N. Outcomes of manual small-incision cataract surgery using standard 22 dioptre intraocular lenses at Nkhoma Eye Hospital, Malawi. *Int Ophthalmol*. 2012;32(4). doi:10.1007/s10792-012-9565-x
22. Stuart Keel, Andreas Mueller. WHO SPECS 2030 – a global initiative to strengthen refractive error care. *Community Eye Health*. 2024;37(122):6-7.
23. Ramke J, Zwi AB, Palagyi A, Blignault I, Gilbert CE. Equity and Blindness: Closing Evidence Gaps to Support Universal Eye Health. *Ophthalmic Epidemiol*. 2015;22(5). doi:10.3109/09286586.2015.1077977
24. World Health Organization. Universal health coverage (UHC) Key Facts. *World Health Organization*. 2019;(January).
25. Ulldemolins AR, Benach J, Guisasola L, Artazcoz L. Why are there gender inequalities in visual impairment? *Eur J Public Health*. 2019;29(4). doi:10.1093/eurpub/cky245
26. Mganga H, Lewallen S, Courtright P. Overcoming gender inequity in prevention of blindness and visual impairment in Africa. *Middle East Afr J Ophthalmol*. 2011;18(2). doi:10.4103/0974-9233.80695
27. Abou-Gareeb I, Lewallen S, Bassett K, Courtright P. Gender and blindness: A meta-analysis of population-based prevalence surveys. *Ophthalmic Epidemiol*. 2001;8(1). doi:10.1076/opep.8.1.39.1540
28. Mercer GD, Lyons P, Bassett K. Interventions to improve gender equity in eye care in low-middle income countries: A systematic review. *Ophthalmic Epidemiol*. 2019;26(3). doi:10.1080/09286586.2019.1574839