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The Transactions of the Ophthalmological Society of Nigeria, an Official Journal of the Ophthalmological Society of Nigeria publishes proceedings from the annual congress of the Society. They comprise of peer-reviewed summaries abstracts of presentations during the congress. The scope of articles include clinical, laboratory and community medicine, basic medical sciences, medical technology, as well as the economics and management of health care delivery, especially in the African environment as they relate to the eyes. Articles are considered on the basis of subspecialty of Ophthalmology affected, including but not restricted to cornea and anterior segment, glaucoma, low vision, orbit and oculoplasty, vitreoretinal, neuro-ophthalmology, Paediatric ophthalmology, and public health ophthalmology.

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Editorial Comments

It is with great pleasure that we present the proceedings of the 49th Scientific Conference of the Ophthalmological Society of Nigeria in this 10th edition of the Transactions of the Ophthalmological Society of Nigeria. The conference took place between the 27th and 29th of August, 2025 at the The Afficient Event Centre, Nasarawa GRA, Kano, Kano State.

The meeting brought together specialists and subspecialists in ophthalmology from various parts of Nigeria and other countries, and provided a unique opportunity for ophthalmologists at different levels of training to interact and share ideas with colleagues. The theme of the Conference was "Ophthalmic Education and Training". The sub-theme was "Simulation Based Ophthalmic Surgical Training: The Role of International Collaboration in Ophthalmology".

In line with the major objective of the Journal, this edition features peer-reviewed abstracts of the presentations that were made during the 2025 conference of the OSN. These short articles are outputs of various research projects carried out by ophthalmologists of different sub-specialities from various public and private institutions in the country and abroad. They cut across various subspecialties including Glaucoma, Paediatric Ophthalmology and Strabismus, Retina & Vitreous, Community Ophthalmology, Cornea & Anterior Segment as well as Orbit and Oculoplasty.

Also included in this edition are four review articles, which are based on presentations made during some of the plenary sessions that took place during the conference. One of these review articles is the text of the President's lecture which was delivered by Dr. Babar M. Qureshi. In addition, there are two review articles based on the presentations delivered during special symposia at the conference, while the fourth review article is based on a presentation delivered during one of the breakfast sessions.

In addition, this edition features four original research articles. One of these articles is the text of the Council lecture delivered by Dr. Zainab Mazai. We solicit more full-length manuscripts from members of the Society for publication in subsequent issues of the Journal. Such submissions can be made at the Journal's website: "https://tosn.org.ng/". Members are also welcome to view previous volumes of the Journal and register as reviewers on the website.

Following the approval at the last annual general meeting of the Society, this and the subsequent issues of the Journal would be published only in electronic format (i.e. online publication only).

We hope that the contents of this edition will be a significant addition to the body of knowledge in Ophthalmology, which should translate to improved diagnosis and management of ophthalmic disorders in the country and beyond. A number of the articles featured in this issue are useful as templates for better patient management and further research, in addition to being evidence for advocacy to policymakers.

The contributions of the various individuals and groups that worked tirelessly in making this issue a reality are well appreciated. Notable amongst them are the OSN executive council, the Editorial board, our publishing consultant and the authors, who have also been charged a moderate publication fee to partly offset the cost of production of this edition.

Thank you.

The Editorial Team

TRANSACTIONS OF THE OPHTHAMOLOGICAL SOCIETY OF NIGERIA: PROCEEDINGS OF THE 2025 ANNUAL OSN CONFERENCE AT THE AFFICIENT EVENT CENTRE, KANO, KANO STATE.

NAMED LECTURES

President's Lecture

International collaboration in training human resources for eye care: Early lessons from CBM programmes in Sub-Saharan Africa

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Being the text of the President's Lecture delivered by Dr B.M. Qureshi during the 49th Annual Scientific Conference of the Ophthalmological Society of Nigeria on 27th August, 2025

ABSTRACT

The global burden of vision impairment is rising, affecting at least 2.2 billion people, with over 1 billion cases preventable or untreated. Sub-Saharan Africa (SSA) faces a "double deficit": high levels of avoidable blindness and a severe shortage of trained eye-health personnel. While global initiatives advocate integrated, people-centred eye care (IPEC), they offer limited practical guidance on developing and maintaining the necessary workforce. This article outlines CBM's approach to strengthening human resources for eye health (HReH) in SSA through international collaboration. It highlights simulation-based surgical education, postgraduate ophthalmology scholarships, and subspecialty training partnerships. Collaborating with ministries of health, universities, and eye-care institutions, CBM aims to increase the number, skills, and distribution of eye-health workers. Key initiatives include a Lavelle-funded, multi-country simulation programme for cataract and glaucoma surgery at the University of Cape Town and partner centres; a proposed national simulation training initiative in Nigeria with HelpMeSee; postgraduate scholarships for African ophthalmologists; and partnerships with LV Prasad Eye Institute, Children's Vision Fund, and the International Ophthalmological Fellowship Foundation (IOFF). By early 2025, the simulation project had trained 118 ophthalmic surgeons and twenty-four trainers. Follow-up surveys with 200 trainees found that 93% reported increased surgical confidence, 78% experienced fewer complications, and 74% saw improved postoperative visual outcomes. The scholarship programme has supported 140 doctors, with 102 completing residency, 34 in training, and four discontinuing. CBM's experience suggests that coordinated investments in simulation training, regional postgraduate education, and fellowships can expand the eye-health workforce and enhance the quality of care. Integrating these initiatives within national health systems and aligning with IPEC and 2030 In Sight provides a practical pathway to translate eye-health strategies into workforce-focused implementation.

Keywords: *Human resources for eye health, cataract surgery, simulation-based training, ophthalmology education, sub-Saharan Africa, CBM, universal health coverage.*

INTRODUCTION

Globally, avoidable vision loss has become a significant public health issue. According to the World Health Organisation (WHO), more than 2.2 billion people experience near or distance vision problems, with more than 1 billion cases that could have been prevented or remain unaddressed.[1] The main causes of blindness and visual impairment worldwide are uncorrected refractive errors and cataracts.[1-4] These issues predominantly impact older adults and individuals in low- and middle-income countries, leading to significant consequences for education, economic productivity, safety, and overall quality of life.[2,5-8]

The demand for eye care services is increasing significantly due to factors such as an ageing population, lifestyle changes, and improved survival rates from chronic illnesses.[2,9] The World Report on Vision emphasises that maintaining the current approach is inadequate to address these issues and advocates for adopting Integrated People-Centred Eye Care (IPEC) as the ideal model, integrated within robust primary health care and universal health coverage systems.[9] Likewise, the Lancet Global Health Commission on Global Eye Health underscores that enhancing eye care is vital to achieving the Sustainable Development Goals and urges a redefinition of eye health as both a health issue and a development priority on the international stage.[2]

In sub-Saharan Africa (SSA), a significant obstacle is the lack of human resources for eye health (HReH).[10] Recent research shows that most SSA countries have only about 2.5–2.7 ophthalmologists per million people, well below the VISION 2020 goal of at least 4 per million and far fewer than the roughly 76 per million in high-income nations.[11-13] These shortages result in longer wait times for eye care services, persistent cataract surgical backlogs, and noticeable access disparities between urban and rural areas.[14,15]

Despite clear workforce shortages, recent global plans have largely remained vague about how to develop, sustain, and distribute the eye health workforce necessary for large-scale IPEC delivery.[16] The International Agency for the Prevention of Blindness (IAPB)'s 2030 In Sight strategy and a related *Eye* journal commentary emphasise the importance of viewing vision as a vital socio-economic development issue, integrating eye health into broader health systems, and increasing consumer demand for eye care.[17] They explicitly acknowledge the need to train and build a diverse, resilient workforce to achieve these objectives.[18] Yet these broad frameworks allow considerable flexibility for countries and organisations to develop practical, context-specific solutions tailored to their particular needs and health system contexts.[19]

Christian Blind Mission, an international development organisation, has worked for many years with governments, training institutions, and local groups across Africa, Asia, and Latin America to address the HReH gap.[20,21] Its current Inclusive Health Initiative focuses on prioritising HReH within efforts to deliver integrated, inclusive eye care from the community level to tertiary care, ensuring that persons with disabilities are not left out.[22]

This article draws on internal programme data and experiences from CBM-supported initiatives to outline a multifaceted approach to training human resources for eye care in SSA. It focuses particularly on:

1. Simulation-based surgical training at the University of Cape Town (UCT);
2. A proposed national simulation-based training programme in Nigeria;
3. A regional postgraduate ophthalmology scholarship scheme; and
4. Subspecialty and mid-level training partnerships with institutions such as LV Prasad Eye Institute (LVPEI), alongside the Jones Foundation–funded Children's Vision Fund project and a collaboration with the International Ophthalmological Fellowship Foundation (IOFF) to facilitate training.

These experiences are discussed in the context of the emerging evidence base for simulation-based training in ophthalmology and of current global policy frameworks for eye health and Universal Health Coverage (UHC).

CBM'S APPROACH TO HUMAN RESOURCES FOR EYE HEALTH

CBM's work on HReH is grounded in principles that closely align with WHO's integrated people-centred eye care framework and the *Eye care in health systems: Guide for action*[1, 9]:

(a) **Partner-led and system-oriented** programmes are designed and owned by national ministries of health, universities and hospitals, with CBM providing catalytic technical and financial support rather than creating parallel systems.[20,23]

(b) **Integrated and district-focused** training emphasises team-based care across cadres (ophthalmologists, clinical officers, nurses, optometrists, rehabilitation workers) and across levels of care, from community outreach and primary care to tertiary services, in line with CBM's inclusive eye-health model and its broader Inclusive Health Initiative.[20,22]

(c) **Quality and patient safety**: CBM-supported programmes prioritise competency-based curricula, simulation-based surgical education and structured supervision, consistent with evidence that intense simulation-based training improves cataract surgical competence and reduces complications, and with WHO competency frameworks.[11,19]

(d) **Equity and inclusion** are pursued by coordinating trainee selection and deployment with governments to address geographic misdistribution and to expand access for underserved rural populations and people with disabilities, reflecting both CBM's commitment to disability-inclusive eye health and WHO's emphasis on equitable, people-centred services.[9]

Within this framework, CBM supports a portfolio of mutually reinforcing initiatives including intense simulation-based training, long-term ophthalmology residency scholarships, subspecialty fellowships and targeted capacity building in paediatric eye care and mid-level cadres to expand HReH in Africa and other low- and middle-income settings.[21,23] These investments aim to enhance both the quantity and quality of eye health personnel, strengthen regional training institutions, and contribute to more resilient eye health systems in the Global South.[11,23]

SIMULATION-BASED SURGICAL TRAINING AT THE UNIVERSITY OF CAPE TOWN

Project overview

In 2022, CBM, the University of Cape Town (UCT), and the London School of Hygiene & Tropical Medicine launched a project titled 'High-impact simulated ophthalmic surgical training in sub-Saharan Africa'. The three-year initiative (April 2022–March 2025) was funded by the Lavelle Fund for the Blind and aims to mainstream simulation-based surgical education across a network of regional training centres. *(Programme details in this section are drawn from CBM internal Programme data.)*

Key objectives included:

- Establishing a digital classroom at UCT, equipped with an Eyesi surgical simulator and multiple wet-lab stations using synthetic eyes.
- Training at least 90 ophthalmic surgeons through intense simulation courses in manual small-incision cataract surgery (MSICS), phacoemulsification and glaucoma surgery.
- Training 15 faculty members as simulation trainers to sustain and scale up the model.
- Embedding simulation into national and regional curricula through partnerships with universities and professional colleges.
- Evaluating the impact of simulation training on surgical competence, complication rates and patient visual outcomes.

Lavelle Fund for the Blind has granted follow-up funding for three years (2026–2028) to expand training at UCT and to pilot follow-up coaching of 15 trainees at their hospitals.

Outputs and early outcomes

By early 2025, internal programme monitoring showed that the project had:

1. Trained more than 118 ophthalmic surgeons, surpassing the original target of 90. Figure 1 presents details of the training

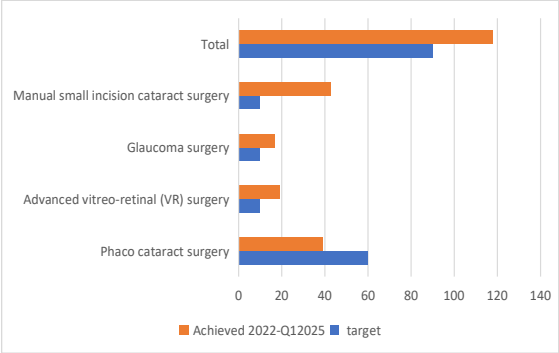


Figure 1: Cumulative number of ophthalmic surgeons trained through the simulation programme compared with original targets, 2022–2025

targets and their achievement by target area.

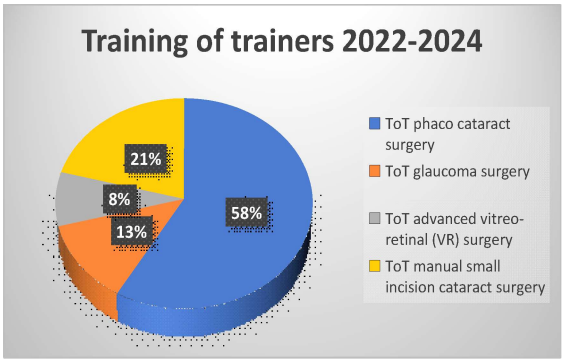


Figure 2: Percentage of faculty trained as simulation trainers by speciality

2. Trained 24 faculty members as simulation trainers, exceeding the target of 15 (Figure 2).
3. Attracted participants from a wide range of roles (approximately two-thirds consultant ophthalmologists, one-sixth residents/ registrars, and smaller proportions of medical officers and ophthalmic clinical officers) and from multiple countries across East, Central, Southern and West Africa, as shown on the map of Africa in Figure 3.
4. Established a network of training centres to embed simulation training, with functional digital classrooms and simulation training rooms in each partner centre, as shown in Figure 4. UCT helped establish the other training centres in the network with

Figure 3: Geographic distribution of simulation-course participants across East, Central, Southern and West Africa

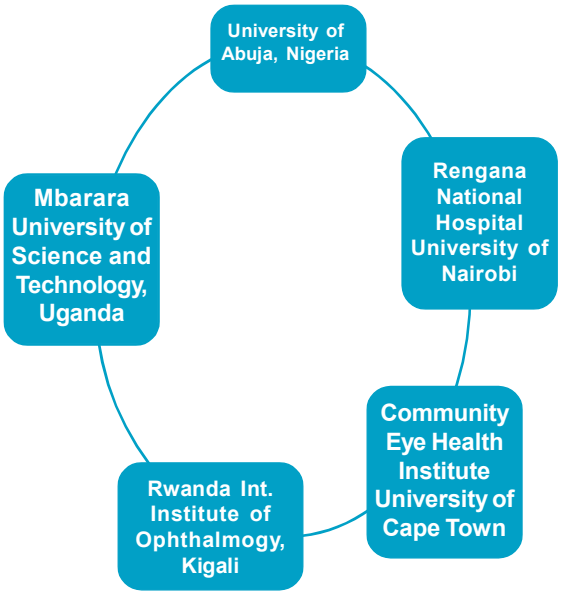


Figure 4: Network of simulation training centres

consumables, materials, and equipment, through mentorship and by facilitating exchange visits.

To understand the medium-term impact on practice, a survey of 200 trainees was conducted three to forty-eight months after course completion, with data collection completed in late 2024. Preliminary analyses indicate that:

- **93%** of respondents felt their surgical confidence had increased.
- **78%** reported a decrease in complication rates in their cataract surgery.
- **74%** observed improved postoperative visual outcomes among their patients.

Trainees also reported substantial positive effects on career progression, including increased readiness to take on complex cases, assume leadership roles in theatre, and serve as trainers for junior colleagues.

However, the survey also highlighted several persistent barriers to fully realising the benefits of simulation:

- Limited access to simulation facilities in home institutions;
- Inconsistent supervision and mentorship in live surgery;
- Competing clinical service pressures that restrict time for practice and reflection.

These findings align with broader research emphasising the need for systemic changes—such as protected training time, dedicated simulation facilities, and faculty development to integrate simulation effectively into standard ophthalmology education.[11,24]

PROPOSED NATIONAL SIMULATION-BASED TRAINING PROGRAMME IN NIGERIA

Building on lessons from the UCT initiative, CBM and the non-profit organisation HelpMeSee have developed a national simulation-based training programme for Nigeria, where cataract remains a leading cause of avoidable blindness and surgical coverage is uneven across regions. The project is scheduled to begin in 2026.

The proposed model includes:

- Establishment of three simulation training centres in Nigerian universities and teaching hospitals, each equipped with high-fidelity cataract surgery simulators provided by HelpMeSee and fully equipped dry labs.
- A training-of-trainers (ToT) component for at least eight Nigerian faculty members, delivered by master trainers from HelpMeSee and CBM partners.
- A target to train around 220 ophthalmology trainees and early-career surgeons over three years, covering MSICS tunnel construction and complete cataract procedures.
- Integration with existing residency curricula, with simulation serving as a prerequisite before independent live surgery.

The programme will combine e-learning, virtual-reality simulation, synthetic-eye exercises, and closely supervised live surgery. Evidence from India indicates that Virtual reality (VR) simulation curricula for Manual Small Incision Cataract Surgery (MSICS) reduce initial errors in scleral tunnel creation and may enhance patient safety during the initial surgical procedures performed by trainees.

By locating simulation centres in Nigeria and training local faculty, the project aims to create sustainable national capacity and reduce reliance on ad hoc, donor-funded overseas courses.

CBM POSTGRADUATE OPHTHALMOLOGY SCHOLARSHIP PROGRAMME

Rationale

Since 2000, CBM has been implementing a Postgraduate Ophthalmology Training Scholarship Programme for African doctors. The rationale is straightforward: without adequately trained ophthalmologists in national health systems, achieving the required cataract surgical volumes and ensuring clinical governance – essential for Universal Health Coverage (UHC) in eye care becomes unfeasible.

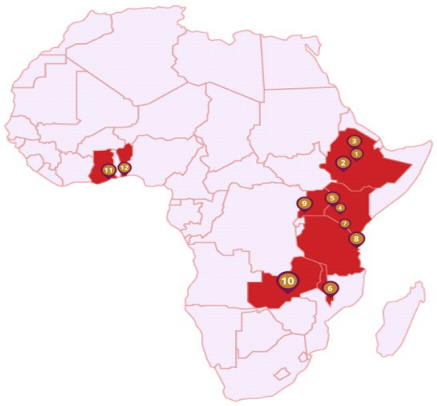
Evidence from SSA indicates that ophthalmology training places are limited, concentrated at a few urban universities, and often under-resourced. Governments frequently struggle to fund postgraduate training, leading to reliance on external sponsorship. CBM's scholarship scheme aims to close this gap by co-financing training places aligned with national workforce plans and with clear expectations that graduates serve in institutions serving rural and underserved communities. Scholarships are offered to doctors who have secured training places to

increase the number of ophthalmologists in underserved communities.

Programme design and scale

According to CBM internal data (2025), the scholarship programme:

- Has supported 140 doctors from multiple African countries (Benin, Cameroon, DR Congo, Ethiopia, Kenya, Malawi, Rwanda, Sierra Leone, South Sudan, Tanzania, Uganda and Zambia) to train as ophthalmologists since 2000.
- Of these, 102 have completed training, 34 are currently in residency, and only four have discontinued.
- Works with a network of training institutions in at least ten countries, including universities and teaching hospitals in Ethiopia (Addis Ababa, Jimma, St Paul's), Kenya (University of Nairobi, Moi Teaching and Referral Hospital), Malawi, Tanzania (Kilimanjaro Christian Medical University College; Muhimbili University of Health and Allied Sciences), Uganda (Mbarara University of Science and Technology), Zambia, Ghana and Benin, among others (Figure 5).



KEY:
1.Ethiopia, Addis Ababa University
2.Ethiopia, Jimma University
3.Ethiopia, St Paul Hospital Millenium Medical College
4.Kenya, University of Nairobi, UoN
5.Kenya, Moi Teaching and Referral Hospital,
6.Malawi, Kamuzu University of Health Sciences
7.Tanzania, Kilimanjaro Christian Medical University College
8.Tanzania, Muhimbili University of Health and Allied Sciences, KCMC
9.Uganda, Mbarara University of Science and Technology 10.Zambia, University of Zambia
11. Ghana, Korle Bu Teaching Hospital
12. Benin, University of Abomey-Calavi

Figure 5: Map of Africa showing geographic distribution of the partner training institutions for the CBM Postgraduate Ophthalmology Scholarship Programme

Scholarships typically cover tuition fees, stipends, learning resources, and, where necessary, supplementary clinical placements for hands-on training (provided by universities). Selection is undertaken jointly by CBM, training centres, and, where possible, ministries of health, with attention to:

- Geographic distribution and rural origin;
- Commitment to public service and to working with underserved communities.

BEYOND NUMBERS: ALUMNI NETWORK AND LEADERSHIP

Recognising that quality and leadership are as important as headcount, CBM has invested in an alumni network that includes:

- A mentor–mentee programme linking newer graduates with more experienced ophthalmologists;
- Regular continuing medical education (CME) opportunities;
- Annual alumni meetings aligned with the College of Ophthalmology of Eastern, Central and Southern Africa (COECSA) Congress;
- Alumni representation on scholarship award committees to strengthen peer accountability and local ownership.

Many alumni now hold key positions as training faculty, national eye-care coordinators or leaders of district-level eye programmes, multiplying the impact of the original investment.

PARTNERSHIPS FOR SUBSPECIALIST AND MID-LEVEL TRAINING

LV Prasad Eye Institute (LVPEI) collaboration

CBM collaborates with LV Prasad Eye Institute (LVPEI) in India to provide context-sensitive training for different cadres of African eye-care workers. This partnership is premised on "one

partner building the capacity of another" and includes:

- Tailored training packages for CBM partners' ophthalmologists, optometrists, nurses and low-vision specialists, with emphasis on paediatric eye care, complex cataract and community-oriented service models.
- Customisation of curricula to reflect the epidemiology, resources and referral pathways of trainees' home countries.
- Ongoing mentorship, both on-site and virtual, after trainees return, to support the adaptation of new skills to local settings.
- Facilitation of additional scholarship slots at LVPEI for CBM partner staff.

By leveraging LVPEI's experience as a high-volume, high-quality eye-care institution in a middle-income country, this collaboration exemplifies effective South–South learning and complements the Africa-based residency programmes.

Children's Vision Fund

Through the Children's Vision Fund, which started in 2023 and was funded by The Jones Foundation, USA, CBM, and partners, have strengthened paediatric eye-care services by training:

- Ophthalmologists in paediatric cataract and paediatric comprehensive eye care (for example, trainees from Ethiopia and Malawi);
- Mid-level cadres such as orthoptists, paediatric ophthalmic nurses and optical dispensers (for example, teams from Cameroon and other countries);
- Additional paediatric eye-care trainees are currently enrolled at institutions in East Africa and India.

Although precise numbers vary by year, early programme reports indicate a growing cadre of paediatric-focused teams who can deliver child-friendly services, school-screening programmes and integrated low-vision care.

IOFF Subspecialty Fellowship Programme

CBM also collaborates with the International Ophthalmological Fellowship Foundation (IOFF) to sponsor three-month subspecialty fellowships for African ophthalmologists in recognised centres, primarily in Europe and other high-resource settings.

Key features include:

- Training opportunities in up to 16 ophthalmic subspecialties, including cornea, glaucoma, retina, paediatric ophthalmology and oculoplastic surgery.
- Support for two ophthalmologists per year from CBM-supported programmes to pursue IOFF fellowships.
- Post-fellowship follow-up, which encourages graduates to develop new services, mentor residents, and implement updated diagnostic and treatment methods at their home institutions.

Survey data from IOFF fellows (not limited to CBM scholars) indicate that 98% considered the fellowship helpful to their daily practice, 92% reported learning new diagnostic and treatment methods, and around 85% introduced regular teaching activities in their departments on return. These findings provide reassurance that short, well-structured international fellowships can be highly cost-effective when linked to clear expectations for local capacity building.

Table 1 provides a summary of the CBM-Supported Human Resource Initiatives for Eye Care in SSA up till the 1st quarter of 2025.

DISCUSSION

Aligning practice with global eye-health strategies

Scaling skills where they are needed most: By training ophthalmologists and trainers within African institutions, the programmes tackle the gap between the global burden and workforce capacity, as documented by Palmer et al.[10] and Resnikoff et al.[12] This approach also helps reduce the urban–rural imbalance by prioritising trainees from rural institutions and implementing a bonding agreement to ensure they return and continue providing service after their training.

Emphasising quality and patient safety: Intensive simulation-based surgical education is now supported by robust RCT evidence,

Table 1: Summary of CBM-Supported Human Resource Initiatives for Eye Care in SSA (to Q1 2025)

Component	Geographic focus	Main partners	Cadres targeted	Selected achievements*
UCT simulation-based surgical training	South Africa	UCT, LSHTM, Lavelle Fund, CBM	Ophthalmology residents, early-career consultants, trainers	>118 surgeons trained (target 90); 24 trainers trained (target 15); network of 5 simulation centres; the majority of surveyed trainees report greater confidence, lower complication rates and better outcomes.
Proposed Nigeria simulation-based training project	Nigeria (national)	Nigerian universities/ teaching hospitals, HelpMeSee, CBM	Residents and ophthalmologists	3 simulation centres planned, 3 MSICS simulators, ToT for 8 trainers; planned 220 trainees over 3 years.
Postgraduate ophthalmology scholarships	>10 African countries	African universities & teaching hospitals, ministries of health, CBM	Doctors training as ophthalmologists	140 scholarships awarded since 2000; 102 graduates, 34 in training, 4 discontinued; strong alumni network and leadership roles.
LVPEI collaboration	Africa–India partnership	LV Prasad Eye Institute, CBM	Ophthalmologists, optometrists, nurses, and low-vision workers	Sub-specialties, Tailored short courses and observerships in comprehensive eye care; ongoing mentorship and south-south knowledge exchange.
Children's Vision Fund	Selected African countries	CBM, LVPEI and regional centres	Paediatric ophthalmologists, orthoptists, paediatric nurses, optical dispensers	Early cohorts trained in paediatric ophthalmology (e.g. Ethiopia, Malawi) and mid-level paediatric cadres (e.g. Cameroon); trainees on course in East Africa and India.
IOFF subspecialty fellowships	African ophthalmologists placed internationally	IOFF, host centres, CBM	Ophthalmologists seeking subspecialisation	2 CBM-linked fellows per year; high reported impact on clinical practice, new services and teaching activities.

**Programme achievements are based on CBM internal monitoring data and IOFF survey data as of early 2025.*

including the OLIMPICS trial and VR-based MSICS curricula, which demonstrate improvements in surgical competence and reductions in early complications.[11] CBM's internal data, indicating improvements in complication rates and visual outcomes, align with these findings.

Building multi-cadre teams for IPEC: By supporting paediatric ophthalmologists, orthoptists, low-vision and rehabilitation workers, the programmes extend beyond a narrow focus on surgeons, reflecting IPEC's emphasis on a continuum of promotive, preventive, treatment, and rehabilitative services.

Strengthening institutions rather than isolated individuals: Investments in simulation labs, digital classrooms, faculty development, and alumni networks contribute to sustainable capacity building within African universities and teaching hospitals.

Challenges and risks

Despite encouraging progress, several challenges remain:

1. Financing and sustainability: Simulation equipment, wet-lab consumables, faculty time, and scholarship stipends require sustained investment. Without long-term financing plans, ideally co-funded by governments, training institutions, and domestic philanthropy, there is a risk that gains will plateau once external grants end.
2. Retention and distribution: Training more ophthalmologists does not automatically guarantee equitable access. Many graduates are drawn to urban or private-sector posts. Scholarship bonding agreements, supportive working conditions in public and faith-based hospitals, and clear career pathways in rural and peri-urban areas are critical to avoid internal brain drain.
3. Embedding simulation in curricula: As qualitative studies from SSA highlight, simulation centres can become underused trophy projects if not fully integrated into assessment systems, examination requirements and competency frameworks.[24] Close collaboration with regional colleges (such as COECSA) and national specialty boards is therefore essential.
4. Measuring long-term impact: Initial self-reported improvements in confidence and perceived outcomes are encouraging, but they need to be supplemented by prospective data on surgical volumes, complication rates, and patient-level visual outcomes, ideally compared with national indicators of effective cataract surgery coverage.

Lessons and recommendations

Several practical lessons emerge from CBM's experience:

- Consider conceptualising initiatives as integrated' packages" instead of isolated projects. The aggregation of residency scholarships, simulation training, subspecialty fellowships, and team-oriented paediatric training constructs a continuum from fundamental proficiency to advanced mastery and regional leadership.
- Co-design with ministries of health. Aligning trainee selection, deployment, and facility upgrades with national HRH plans increases the likelihood that newly trained specialists will be absorbed into public services and that equipment will be maintained.
- Prioritise trainers, not just trainees. By training and supporting local faculty through ToT, peer networks, and recognition, we amplify the impact of each investment and reduce reliance on visiting international experts.
- Use international fellowships thoughtfully. Short overseas fellowships are most effective when they target clearly identified service gaps, are linked to specific post-fellowship responsibilities (e.g., establishing a glaucoma service), and are part of broader institutional capacity-building.

CONCLUSION

Sub-Saharan Africa's eye-health workforce gap is a major obstacle to achieving universal access to quality eye care. CBM's multi-country experience demonstrates that strategic, collaborative investments in simulation-based surgical training, postgraduate education, and

subspecialty fellowships can expand the number of trained ophthalmologists, improve the quality and safety of surgery, and strengthen regional training institutions.

While these efforts are not a replacement for comprehensive health system reforms, they are essential for establishing scalable, people-focused eye care services. As nations implement the World Report on Vision, the IPEC resolution, and the 2030 In Sight strategy, governments and development partners should regard HReH investment as a sound, high-value health investment that generates jobs, boosts productivity, and helps millions more see, learn, and work.

The next phase of work should focus on:

- Embedding simulation and competency-based training into regional examination systems;
- Securing sustainable domestic financing for training and equipment;
- Strengthening data systems to track workforce distribution and surgical outcomes; and
- Ensuring that the voices of trainees, patients and persons with disabilities shape future workforce planning.

If these steps are taken, the kinds of programmes described here can help move eye health from a series of pilot projects to a core, sustainable component of African health systems.

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Council Lecture

Comparison of ocular perfusion pressure in primary open angle glaucoma patients and non-glaucoma controls attending ophthalmology clinic in Aminu Kano Teaching Hospital, Kano

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ABSTRACT

Purpose: To compare ocular perfusion pressures (OPP) in primary open angle glaucoma (POAG) patients with age and sex-matched non-glaucoma controls and explore the relationship between the level of OPP and glaucoma.

Methods: In this cross-sectional comparative study, consecutive patients newly diagnosed with POAG at a tertiary hospital in northern Nigeria, along with age and sex-matched controls were selected and had detailed ocular examinations including intraocular pressure (IOP) and blood pressure measurements (systolic blood pressure, [SBP] and diastolic blood pressure, [DBP]) taken. The following were calculated: Mean ocular perfusion pressure (MOPP), Systolic ocular perfusion pressure (SOPP) and Diastolic ocular perfusion pressure (DOPP). The data was managed using IBM SPSS statistics version 20. T-test was used to determine the association between OPP and glaucoma. Level of significance was set at $p<0.05$.

Results: The mean IOP was significantly higher in POAG subjects (26.15mmHg ± 12.47 in POAG versus 13.10mmHg ± 3.10 in controls, p=<0.001). The MOPP (37.42 ± 12.37mmHg in the POAG group versus 48.05 ± 5.24mmHg in the control group, p<0.001), SOPP (97.03 ± 14.80mmHg in POAG group versus 105.09 ± 9.96mmHg in control group, p< 0.001) and DOPP (54.79 ± 12.93mmHg in POAG group versus 64.91 ± 7.46mmHg in control group, p< 0.001) were all significantly lower in the POAG group.

Conclusion: This study shows that MOPP, SOPP, and DOPP were all significantly lower in POAG patients compared to the control group. There is a need for further research to determine optimal ocular perfusion pressures that reduce the risk of glaucomatous damage.

Keywords: Glaucoma, ocular perfusion pressure, comparison

INTRODUCTION

Glaucoma represents a group of diseases defined by a characteristic optic neuropathy that is consistent with the remodeling of the connective tissue elements of the optic nerve head and with loss of neural tissue associated with the eventual development of distinctive patterns of visual dysfunction. [1] It is a disease of public health importance and the commonest cause of irreversible blindness accounting for 8% of all blindness (approximately 3.15 million blind people) in 2010[2], 2.9 million blind people in 2015 and 3.2 million blind people in 2020.[3] Primary open angle glaucoma (POAG) is defined by an open, normal-appearing anterior chamber angle, typically with elevated intraocular pressure (IOP), with no other underlying disease.[1] A 2021 estimate of

68.56 million (95% CI 59.99 ~ 79.98) people worldwide are affected by POAG with a global prevalence of 2.4% (95% CI 2.0 ~ 2.8%) in the last 20 years.[4]

Theories on the pathogenesis of glaucomatous optic neuropathy include mechanical and vascular theories. The vascular theory considers glaucomatous optic neuropathy to be a consequence of insufficient blood supply or other risk factors that diminish the ocular blood flow (OBF) which constitute problems in vascular auto-regulation.

The high prevalence and high rate of blindness make glaucoma a public health concern and a priority among healthcare planners and policymakers with an emphasis on the need for glaucoma care pathways for early detection and treatment to prevent blindness.[5]

Several studies[6-11] have implicated various vascular risk factors in the pathogenesis of glaucoma, of which blood pressure (BP) and ocular perfusion pressure (OPP) were the most studied. This vascular hypothesis is based on the theory that abnormal perfusion and the subsequent ischemia of the optic nerve head play a major role in the glaucomatous damage.[12]

Amongst many risk factors associated with POAG, raised intraocular pressure is the one measured and targeted for treatment. However, many patients with apparently "adequate" intraocular pressure control still show ongoing vision loss. Other than IOP, blood pressure and ocular perfusion pressure have been the most studied risk factors for POAG. [13] Ocular perfusion pressure and ocular blood flow (OBF) in POAG have been found to be reduced in some studies[14-16] carried out worldwide. Similarly, lower mean ocular perfusion pressure (MOPP) was found in POAG patients in studies[17-19] in South-west and South-eastern Nigeria. However, Omoti[20] found higher systolic ocular perfusion pressures (SOPP) in POAG patients. There exists paucity of such studies in North-west Nigeria.

Monitoring of OPP when coupled with the evaluation of macula and optic nerve head (ONH), retinal nerve fibre layer (RNFL) and ganglion cell complex (GCC) thickness, may alert physicians to possible glaucomatous damage.[21]

Findings from this study can therefore be used to suggest modification of vascular risk factors that influence ocular perfusion. The aim of the study was to assess ocular perfusion pressure levels as a risk factor for glaucoma by comparing the ocular perfusion pressures in non-glaucoma and newly diagnosed primary open angle glaucoma patients attending Aminu Kano Teaching Hospital, Kano, Nigeria and to explore the association between the levels of ocular perfusion pressure and primary open angle glaucoma.

METHODS

This was a hospital-based cross sectional (comparative) study carried out at the Ophthalmology clinics of the Aminu Kano Teaching Hospital (AKTH), Kano, Nigeria. Data was collected over a six-month period (December 2022 to June 2023).

Newly diagnosed POAG patients and age- and sex-matched (non-glaucoma patients and hospital staff) controls attending ophthalmology clinic in Aminu Kano Teaching Hospital were recruited into the study. The inclusion criteria were: age $\geq$18 years; newly diagnosed patients with primary open angle glaucoma, based on vertical cup–disc-ratio (VCDR $\geq$ 0.7), intraocular pressure, glaucomatous visual field defects and open anterior chamber angles on gonioscopy; and absence of identifiable secondary causes of open angle glaucoma.

Patients with ocular comorbidities such as features of diabetic retinopathy, hypertensive retinopathy, optic neuropathy, etc. were excluded from participation. In addition, patients with angle closure glaucoma, or a history of systemic diseases like hypertension, diabetes, sickle-cell disease etc. were excluded. Also excluded were patients on antihypertensive medications and patients who had undergone previous ocular surgery.

Consecutive newly diagnosed POAG patients and controls who fulfilled the inclusion criteria were recruited, briefed and a written informed consent obtained. Bio-data, clinical history and relevant systemic and ocular examination were carried out including: visual acuity (VA) assessment in each eye; anterior segment examination to examine the conjunctiva, cornea, anterior chamber, iris, pupil and lens; dilated fundus examination with the use of a 78D lens to assess the optic disc color and outline, vertical cup to disc ratio, optic disc vessels and neuro-retinal rim, retina blood vessels and macula; intraocular pressure measurement and gonioscopy.

Blood pressure measurement was performed using the mercury sphygmomanometer with the patient sitting comfortably upright, back supported and legs uncrossed, sphygmo-manometer cuff of appropriate size on the supported left arm and mercury column at the level of the heart. A participant was considered hypertensive if systolic blood pressure readings on two separate days were $\geq$140 mmHg and/ or the diastolic blood pressure readings on two separate days were $\geq$90 mmHg.

Intraocular pressure was measured using Goldmann applanation tonometer (GAT) following instillation of topical 1% amethocaine and staining of tear film with fluorescein dye. Patient's head was placed properly on the chin and head rest of the slit lamp with patient looking straight ahead and breathing normally. Goldmann applanation tonometer head placed on the apex of the cornea and semicircular mires visualized under cobalt blue light was adjusted to give centralized mires with appropriate thickness, and applanation pressure gradually applied by rotation of the dial till the inner margins of the mires align. Pressure at this point was read off the dial and multiplied by 10 to get the intraocular pressure in mmHg.

Mean ocular perfusion pressure (MOPP), Diastolic ocular perfusion pressure (DOPP), Systolic ocular perfusion pressure (SOPP) were calculated as follows[9, 13]:

MOPP =2/3Mean arterial pressure (MAP) – Intraocular pressure (IOP)

where MAP=Diastolic blood pressure (DBP)+1/ 3 pulse pressure (PP),

PP being Systolic blood pressure (SBP)-DBP

DOPP =DBP-IOP

SOPP =SBP-IOP

Standard automated perimetry was performed by a nurse assistant using the Humphrey visual field analyzer to confirm diagnosis and parameters noted in the questionnaire.

All findings were recorded in the data collection form and patients received appropriate further clinical management.

Data analysis: All data collected was entered and analyzed using the IBM SPSS Statistics for windows version 20. Socio-demographic variables of respondents were summarized using frequencies, percentages, mean and standard deviation.

Ocular Perfusion Pressure (OPP) was summarized using mean and standard deviation in both glaucoma and non-glaucoma patients. The student's t-test was used to determine significant differences between mean levels of ocular perfusion pressure, intraocular pressure and blood pressure among glaucoma and non-glaucoma patients. Chi-square tests and the Fisher's exact test were used as appropriate to analyze factors associated with OPP. In all tests of significance, $p<0.05$ was considered statistically significant.

Ethical considerations: Ethical approval for the study was obtained from Aminu Kano Teaching Hospital Health Research-Ethics Committee. An information sheet about glaucoma and its evaluation was given to the patients. The participants were given information on the examinations to be carried out, the parameters to be calculated from data gotten and its importance to patients' management. The informed written consent form was given to literate respondents to sign before the questionnaire was administered. For those who could not read and write, details of the consent form were explained to them by the researcher and they subsequently appended their thumbprint to the form to

indicate consent. Confidentiality of patients' details was maintained. Patients' names were not included in the questionnaires, rather codes were used (identification numbers) and personal data kept strictly confidential. The Helsinki declaration was upheld throughout the research.

RESULTS

Sociodemographic characteristics

A total of 160 participants were studied (Table 1), consisting of 80 POAG patients and 80 age and sex-matched controls. The mean age of the participants was 46.25±17.22 years in the POAG group and 46.74±16.82 years in the control group. There were 94 male and 66 female participants, giving a male:female ratio of 1.42:1. Majority of the participants in the control group had tertiary level of education, 47 (58.8%); while in the glaucoma group, 50 (62.5%) participants had less than tertiary level of education. Among the glaucoma participants, 37 (46.2%) participants were self-employed, while 28 (35.0%) of the controls were civil servants. The differences in the distribution of the educational level and occupation between the two groups were statistically significant (Table 1).

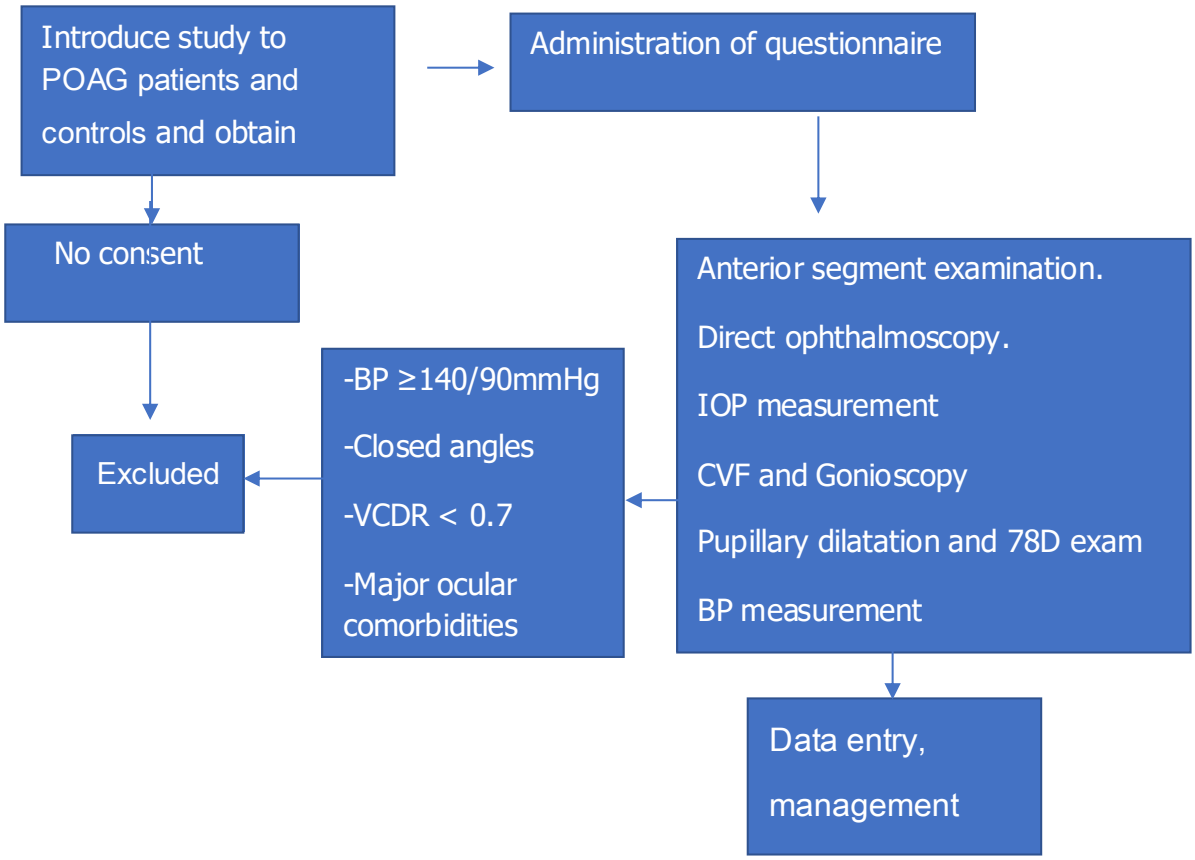

Figure 1: Study flow chart

Table 1. Comparison of socio-demographic characteristics of POAG patients and non-POAG controls.

Variable	Glaucoma n=80 (%)	Non-glaucoma n=80 (%)	Total N=160 (%)	χ^2	*p*-value
Age (years)					
< 20	4 (5.0)	4 (5.0)	8 (5.0)	0.313[F]	1.000
20 – 39	23 (28.8)	24 (30.0)	47 (29.4)		
40 – 59	36 (45.00)	36 (45.0)	72 (45.0)		
60 – 79	13 (16.2)	13 (16.2)	26 (16.2)		
≥ 80	4 (5.0)	3 (3.8)	7 (4.4)		
Mean ± SD	46.25±17.22	46.74±16.82		-0.181	0.856
Range	18 – 92	18 – 90			
Sex					
Male	46 (57.5)	48 (60.0)	94 (58.8)	0.103	0.748
Female	34 (42.5)	32 (40.0)	66 (41.2)		
Occupation					
Civil servant	12 (15.0)	28 (35.0)	40 (25.0)	9.016	**0.029***
Self employed	37 (46.2)	25 (31.2)	62 (38.8)		
Unemployed	19 (23.8)	17 (21.2)	36 (22.5)		
Others	12 (15.0)	10 (12.5)	22 (13.8)		
Religion					
Islam	73 (91.2)	78 (97.5)	151 (94.4)	2.943[F]	0.167
Christianity	7 (8.8)	2 (2.5)	9 (5.6)		
Marital status					
Single	15 (18.8)	14 (17.5)	29 (18.1)	0.239[F]	0.919
Married	60 (75.0)	62 (77.5)	122 (76.2)		
Widowed	5 (6.2)	4 (5.0)	9 (5.6)		
Education					
No formal education	13 (16.2)	6 (7.5)	19 (11.9)	13.979	**0.007***
Primary school	14 (17.5)	4 (5.0)	18 (11.2)		
Secondary school	21 (26.2)	23 (28.7)	44 (27.5)		
Tertiary	30 (37.5)	47 (58.8)	77 (48.1)		
Others	2 (2.5)	0 (0.0)	2 (1.2)		
Ethnicity					
Hausa	72 (90.0)	69 (86.2)	141 (88.1)	3.125[F]	0.389
Igbo	3 (3.8)	2 (2.5)	5 (3.1)		
Yoruba	1 (1.2)	0 (0.0)	1 (0.6)		
Others	4 (5.0)	9 (11.2)	13 (8.1)		

χ^2: Chi Square test; F: Fisher's exact test

**: p value <0.05 (i.e., statistically significant)*

Mean ocular perfusion pressure among POAG and control groups

The mean ocular perfusion pressure (± standard deviation) was 37.42 ± 12.37 right eye (RE) and 39.08 ±10.03 left eye (LE) in the POAG group; and 48.05 ±5.24 RE and 47.93± 5.20 LE in the control group (Table 2).

perfusion pressure groups and diastolic ocular perfusion pressure between POAG and control groups in the right eyes, and similar differences in the left eyes. IOP was significantly higher in POAG group while MOPP, SOPP and DOPP were significantly lower in the POAG group compared to controls.

Table 2: Mean ocular perfusion pressure of POAG and control groups

Parameter	POAG group	Non-POAG group
Right eye MOPP (mmHg)		
Mean ± SD	37.42 ± 12.37	48.05 ± 5.24
Median (IQR)	39.29 (29.06 – 45.81)	48.10 (43.58 – 52.18)
Range	6.04 – 70.02	36.04 – 59.13
Left eye MOPP (mmHg)		
Mean ± SD	39.08 ± 10.93	47.93 ± 5.20
Median (IQR)	40.73 (31.47 – 46.46)	47.60 (44.44 – 51.76)
Range	14.89 – 57.35	34.04 – 59.13

SD: Standard deviation IQR: Interquartile range

Comparison of the IOP and ocular perfusion pressures between POAG patients and controls

This study revealed statistically significant differences (Table 3) in the mean IOP, mean ocular perfusion pressure, systolic ocular

Comparison of other continuous variables between POAG patients and controls

Mean deviation was significantly more negative in the POAG group compared to controls (Table

Table 3: Comparison of IOP and perfusion pressures between POAG patients and controls

Variable	POAG Mean± SD (mmHg)	Controls Mean± SD (mmHg)	t	*p* value
Right eye				
Intraocular pressure	26.15 ± 12.47	13.10 ± 3.10	9.085	**<0.001***
Mean Ocular Perfusion Pressure	37.42 ± 12.37	48.05 ± 5.24	-7.079	**<0.001***
Systolic Ocular Perfusion Pressure	97.03 ± 14.80	105.09 ± 9.96	-4.042	**<0.001***
Diastolic Ocular Perfusion Pressure	54.79 ± 12.93	64.91 ± 7.46	-6.067	**<0.001***
Left eye				
Intraocular pressure	24.49 ± 10.99	13.23 ± 3.09	8.825	**<0.001***
Mean Ocular Perfusion Pressure	39.08 ± 10.93	47.93 ± 5.20	-6.538	**<0.001***
Systolic Ocular Perfusion Pressure	98.69 ± 13.56	104.96 ± 9.89	-3.344	**0.001***
Diastolic Ocular Perfusion Pressure	56.45 ± 11.61	64.79 ± 7.45	-5.404	**<0.001***

t: Independent Samples T test;

**p value <0.05 (i.e., statistically significant)*

4). Pattern standard deviation, Systolic BP and diastolic BP were all significantly higher in the POAG group.

Table 4: Comparison of other continuous variables between POAG patients and controls

Variable	POAG	Non-glaucoma	t	*p* value
Mean deviation RE (dB)	-4.69 ± 9.01	-0.05 ± 0.43	-4.605	**<0.001***
Mean deviation LE (dB)	-4.81 ± 9.54	-0.04 ± 0.37	-4.468	**<0.001***
PSD RE (dB)	2.16 ± 3.63	0.02 ± 0.21	5.260	**<0.001***
PSD LE (dB)	2.28 ± 5.50	0.02 ± 0.19	3.673	**<0.001***
Systolic BP (mmHg)	123.18 ± 9.93	118.19 ± 10.18	3.137	**0.002***
Diastolic BP (mmHg)	80.94 ± 6.44	78.01 ± 6.85	2.783	**0.006***
PP (mmHg)	42.24 ± 9.16	40.18 ± 9.05	1.433	0.154

t: Independent Samples T test
**p value <0.05 (i.e., statistically significant)*
RE: Right eye
LE: Left eye
IOP: intraocular pressure
PSD: pattern standard deviation
PP: pulse pressure

Relationship between ocular perfusion pressure, IOP and BP in the POAG and control groups

In both the POAG and control groups, there was a negative correlation of MOPP with IOP and mean deviation. Also, there was a positive correlation of MOPP with systolic ocular perfusion pressure (SOPP), diastolic ocular perfusion pressure (DOPP), systolic blood pressure (SBP) diastolic blood pressure (DBP), pulse pressure (PP) and pattern standard deviation (PSD). (Tables 5 and 6).

Table 5: Correlation of mean ocular perfusion pressure with other study variables among POAG group

Variable	MOPP RE		MOPP LE	
	r	*p* value	r	*p* value
IOP	-0.939	**<0.001***	-0.922	**<0.001***
Mean deviation	-0.145	0.203	-0.111	0.337
PSD	0.159	0.163	0.154	0.179
SOPP	0.884	**<0.001****	0.860	**<0.001****
DOPP	0.968	**<0.001****	0.960	**<0.001****
Systolic BP	0.138	0.224	0.154	0.173
Diastolic BP	0.125	0.269	0.159	0.159
PP	0.061	0.589	0.055	0.627

r: Pearson Correlation coefficient
IOP: Intraocular pressure
MOPP: mean ocular perfusion pressure
DOPP: diastolic ocular perfusion pressure
SOPP: systolic ocular perfusion pressure
PSD: Pattern standard deviation
PP: Pulse pressure
** Statistically significant negative correlation of MOPP with IOP*
*** Statistically significant positive correlation of MOPP with SOPP and DOPP*

Table 6: Correlation of mean ocular perfusion pressure with other study variables among the non-POAG controls

Variable	MOPP RE		MOPP LE	
	r	*p* value	r	*p* value
IOP	-0.484	**<0.001***	-0.476	**<0.001***
Mean deviation	-0.118	0.296	-0.035	0.759
PSD	0.118	0.296	0.035	0.759
SOPP	0.751	**<0.001***	0.744	**<0.001***
DOPP	0.923	**<0.001***	0.924	**<0.001***
Systolic BP	0.588	**<0.001***	0.578	**<0.001***
Diastolic BP	0.786	**<0.001***	0.791	**<0.001***
PP	0.066	0.559	0.052	0.646

r: Pearson Correlation coefficient
****: p value <0.05 (i.e., statistically significant)***
IOP: Intraocular pressure
MOPP: mean ocular perfusion pressure
DOPP: diastolic ocular perfusion pressure
SOPP: systolic ocular perfusion pressure
PSD: Pattern standard deviation
PP: Pulse pressure

Relationship between IOP and BP in the POAG and control groups

IOP in POAG group: there was a weak positive relationship of intraocular pressure (IOP) with systolic blood pressure (SBP), which was not significant (Pearson's correlation coefficient, r=0.142, p=0.21 RE; r=0.163, p=0.149 LE) (Figure 2). Similarly, a weak positive relationship is shown between IOP and diastolic BP (r=0.021, p=0.855 RE; r=0.193, p=0.086 LE) (Figure 3).

IOP in Control group: a significant weak positive relationship was however demonstrated with SBP (r=0.221, p=0.049 RE; r=0.244, p=0.029 LE) (Figure 4) but no relationship demonstrated between IOP and DBP (r=0.021, p=0.855 RE; r=0.021, p=0.855 LE) (Figure 5).

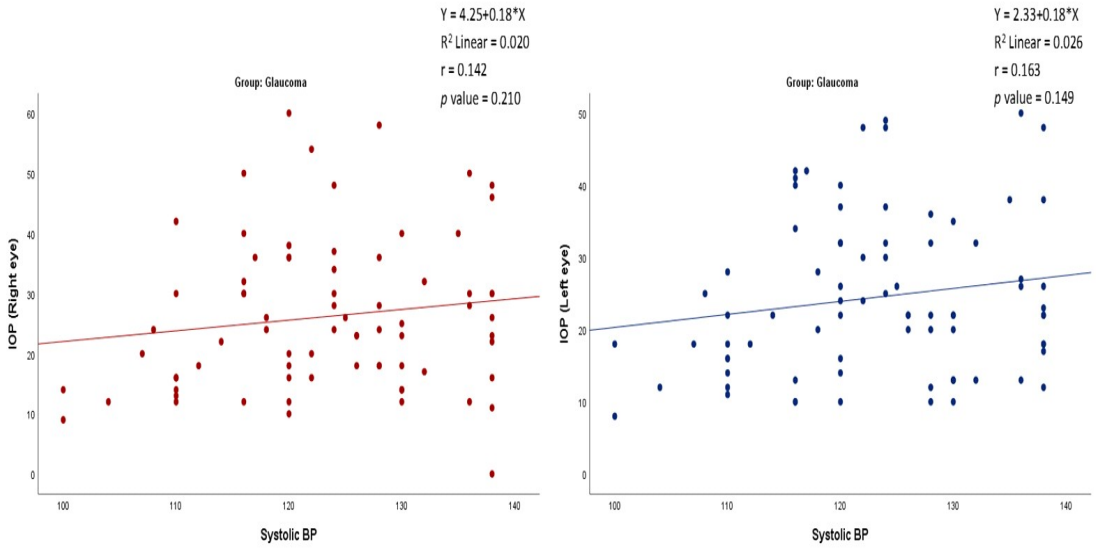

Figure 2: Relationship between IOP and systolic BP among POAG patients

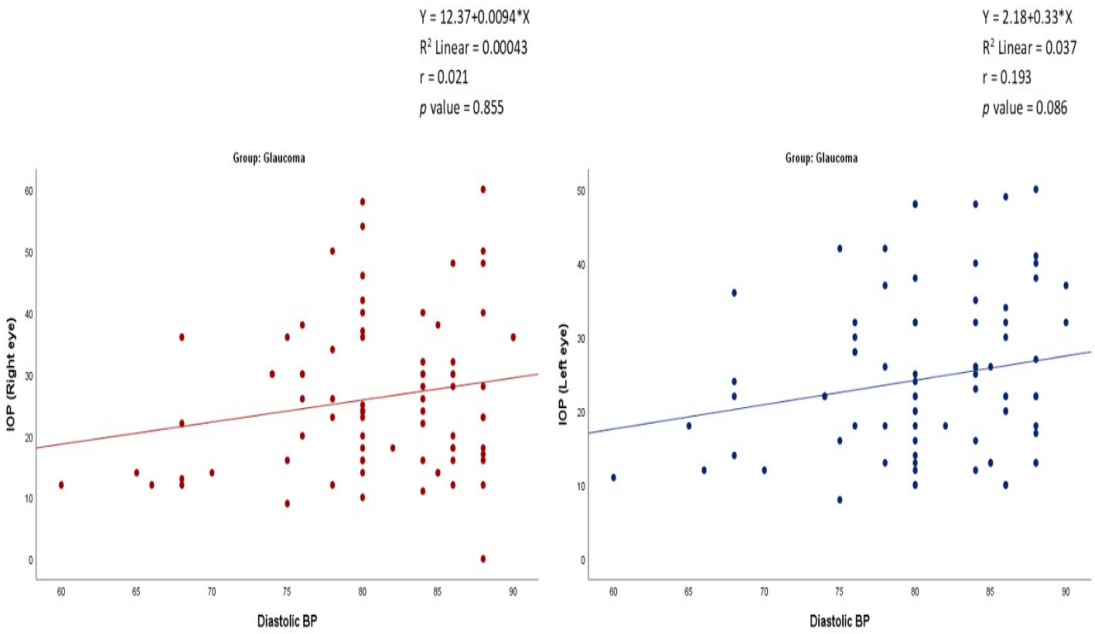

Figure 3. Relationship between IOP and diastolic BP among POAG patients

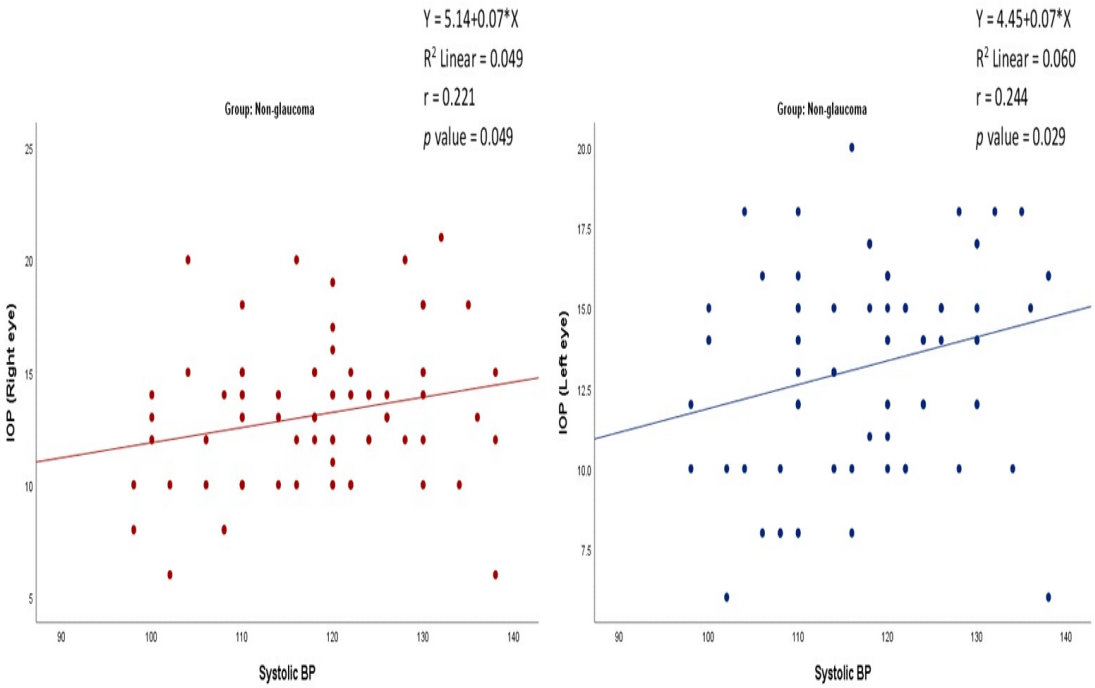

Figure 4. Relationship between IOP and systolic BP among controls

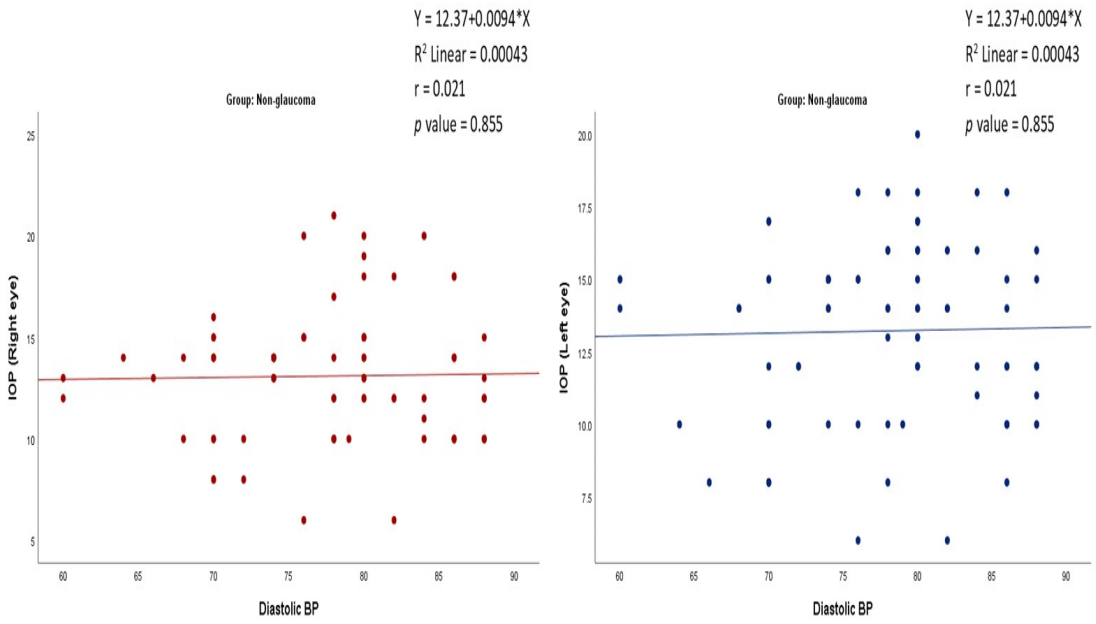

Figure 5. Relationship between IOP and diastolic BP among controls.

Level of ocular perfusion pressures optimal for normal functioning of the optic nerve

Receiver Operating Characteristic (ROC) curve analysis were used to determine the level of ocular perfusion pressure considered optimal for normal functioning of the optic nerve, potentially protective against POAG. The optimal threshold for each ocular perfusion pressure parameter was selected based on the maximum Youden Index (J = Sensitivity + Specificity - 1). Calculating the Youden index for the various MOPP, SOPP and DOPP values in POAG and control groups (summarized in Table 7), the optimal cut-off values in these participants were: MOPP > 40.62 - 42.57mmHg; SOPP > 94mmHg; DOPP > 58 - 59mmHg.

DISCUSSION

The mean ocular perfusion pressure (37.42mmHg in POAG group versus 48.05mmHg in the control group), systolic ocular perfusion pressure (97.03mmHg in POAG group versus 105.09mmHg in control group) and diastolic ocular perfusion pressures (54.79mmHg in POAG group versus 64.91mmHg in control group) were all found to be lower in the POAG group. This is similar to findings in a previous study done in South-east Nigeria[18] where lower mean ocular perfusion pressure in POAG subjects was found (RE = 43.6, LE = 41.9) mmHg compared with the control group (RE = 53.9, LE = 53.7) mmHg, ($p < 0.001$). Similarly, the study by Khandelwal et al.[10] showed lower mean ocular perfusion pressure in primary open angle glaucoma patients (46.23mmHg) than in non-POAG normotensive patients (55.35mmHg). However, Omoti et al.[20] and Orzalesi *et al*.[22] found significantly higher systolic ocular perfusion pressures in POAG patients compared with controls (113.51mmHg in POAG versus 107.30mmHg in controls in Omoti's study and 122.7mmHg in POAG versus 121.7mmHg in controls in Orzalesi's study). Diastolic ocular perfusion pressures were not significantly different between POAG and control groups in these two studies[20,22], although higher than in the current study. The higher levels of SOPP and DOPP in Orzalesi's study compared to the current study may be related to patient selection criteria (most POAG patients either had normal IOP or were on IOP lowering drugs in the study by Orzalesi et al).

Using receiver operating curves in a bid to determine an optimal level of ocular perfusion pressure above which the development of glaucoma is less likely, this study found MOPP below 40.62mmHg RE and 42.57mmHg LE,

Table 7 Ocular Perfusion Pressure Levels Associated with POAG Diagnosis Based on ROC Analysis

Parameter	Criterion (mmHg) RE	Criterion (mmHg) LE	Sensitivity (%) RE	Sensitivity (%) LE	Specificity (%) RE	Specificity (%) LE	Youden Index (J) RE	Youden Index (J) LE	AUC (p-value) RE	AUC (p-value) LE
Mean Ocular Perfusion Pressure (MOPP)	≤40.62	≤42.57	57.50	60.00	93.75	86.25	0.5125	0.4625	0.788 (<0.001)	0.755 (<0.001)
Systolic Ocular Perfusion Pressure (SOPP)	≤94.00	≤94.00	47.50	42.50	86.25	86.25	0.3375	0.2875	0.677 (<0.001)	0.643 (<0.001)
Diastolic Ocular Perfusion Pressure (DOPP)	≤59.00	≤58.00	63.75	55.00	82.50	85.00	0.4625	0.4000	0.746 (<0.001)	0.715 (<0.001)

RE = Right Eye;

LE = Left Eye;

AUC = Area Under the Curve

SOPP below 94mmHg and DOPP below 58mmHg RE and 59mmHg LE to be associated with glaucoma diagnosis.

These were similar to findings in the study by Leske *et al*[23] in the Barbados eye study where those with a MOPP under 42 mm Hg, SOPP lower than 101 mm Hg or a DOPP below 55 mm Hg at baseline had a 3.1-, 2.6- and 3.2-fold increased risk, respectively, of developing glaucoma at 4 years.[24]

The similarities are probably due to the similarity in the populations studied (populations of African descent). This brings to light the potential effect of genetics along with vascular mechanisms in POAG development.[25]

Other such similar findings occurred in the Baltimore eye study[26] where diastolic ocular perfusion pressure below 50mmHg was associated with POAG prevalence (odds ratio [OR] 1.72 in the subgroup with 40-49mmHg DOPP, OR 2.14 in 30-39mmHg DOPP subgroup, OR 6.22 in subgroup with DOPP less than 30mmHg); and the Egna-Neumarkt Glaucoma study where lower diastolic perfusion pressure (<68mmHg) was associated with a marked, progressive increase in the frequency of hypertensive glaucoma (odds ratio for POAG 1, $p < 0.001$).[27] Proyecto VER study in Hispanics (reported mean perfusion pressure lower than 50mmHg as having 4 times greater risk of open-angle glaucoma) and the Rotterdam Eye study reported diastolic perfusion pressure lower than 50mmHg as having 4 times greater risk of open-angle glaucoma than those with a perfusion pressure of 80mmHg.[28, 29, 30]

In Latino individuals, those with a mean ocular perfusion pressure of 50 mm Hg or less were nearly four times more likely to have open-angle glaucoma. However, those with a high systolic ocular perfusion pressure (>150 mm Hg) also had a higher prevalence of open-angle glaucoma. There was a trend toward an association of open-angle glaucoma with higher mean ocular perfusion pressure, although it did not reach statistical significance.[15] Racial and genetic differences are likely explanatory factors for these.

It is thus imperative for ocular perfusion pressures to be assessed and modified appropriately in the management of glaucoma patients.

Study limitations

1. Blood pressure and intraocular pressure were measured once during one visit. Consequently, the study did not account for circadian fluctuations in ocular perfusion pressure.
2. The study's cross-sectional design prevents establishing a temporal sequence between low ocular perfusion pressure (OPP) and glaucoma. Therefore, it remains unclear whether low OPP precedes glaucoma or vice versa.
3. The absence of multivariable analysis to control for potential confounders in the relationship between OPP and glaucoma is also a limitation.

CONCLUSION

The mean ocular perfusion pressures, systolic ocular perfusion pressures and diastolic ocular perfusion pressures were all found to be significantly lower in POAG patients compared to the control group.

The relationship between IOP with SBP and DBP in the POAG patients and controls were non-significant weak positive relationships similar to that between MOPP with SBP and DBP in glaucoma patients. However, significant moderately positive relationships were found between MOPP with SBP and DBP in the control group.

RECOMMENDATIONS

Ophthalmologists need to research along with physicians in the area of blood pressure modification in patients at risk of developing glaucoma. Focus should be on adequate and not overzealous blood pressure reduction. Routine blood pressure, IOP and ocular perfusion pressure should be measured for POAG patients, suspects as well as those presenting for glaucoma screening in the eye clinics. More studies to determine optimal ocular perfusion pressures that will protect the optic nerve head from glaucoma should be

carried out. Ophthalmologists should determine ocular perfusion pressure for glaucoma patients and attempt to titrate target IOP such that adequate perfusion of the optic nerve head is maintained.

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Oculoplasty Symposium: Current Perspectives in Globe Ablation Procedures

Evisceration: When is it a necessity?

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ABSTRACT

Introduction: Evisceration is the removal of intraocular contents while preserving the scleral shell and attachments, enabling a more natural coupling between the orbital implant and prosthesis. As the balance between necessity and preference shifts, it is essential to identify when evisceration is the appropriate procedure to prevent unnecessary tissue removal. This review examines evisceration in contemporary practice, with emphasis on when it becomes a necessity rather than a choice.

Methods: A structured narrative review of the literature on indications, contraindications, surgical techniques, orbital implants, complications, and postoperative rehabilitation regarding evisceration was conducted, searching PubMed, Scopus, and Google Scholar from database inception to 31 May 2025.

Findings: Evisceration is primarily indicated or necessary in eyes that are irreversibly blind and painful due to chronic disease or infection. The potential for residual infection within the scleral envelope, the theoretical risk of occult intraocular malignancy, severe scleral thinning, or rupture extending posteriorly may preclude evisceration in selected cases. Factors such as the underlying pathology, the patient's systemic condition, and the desired aesthetic outcome play an integral role in decision-making. The introduction of the scleral wall modifications has enhanced implant sizing, orbital volume restoration, and symmetry. Thus, establishing evisceration as a reconstructive operation capable of achieving good cosmetic and functional outcomes in severely traumatised, phthisical, or anterior staphylomatous eyes.

Conclusion: Evisceration is not only a less invasive alternative to enucleation, but also a reconstructive procedure with specific indications. Careful case selection, ethical counselling, optimal surgical technique, and postoperative rehabilitation remain central to successful patient outcomes.

INTRODUCTION

Evisceration is defined as the removal of intraocular contents while preserving the scleral shell and extraocular muscle attachments. It remains a time-tested surgical procedure in ophthalmic practice. First described in 1817 by Beer,[1] evisceration was initially performed to manage devastating intraocular infections and painful blind eyes when enucleation carried substantial surgical morbidity. A major advancement came in 1885, when Mules introduced the placement of a glass sphere within the eviscerated sclera, marking the beginning of modern orbital implantation.[2, 3] This modification not only improved cosmesis but also restored orbital volume, revolutionising the role of evisceration from a purely ablative procedure to reconstructive surgery. Over time, refinements in aseptic technique, anaesthetic safety, and ocular implant technology have transformed evisceration from a last-resort intervention to a reconstructive procedure

capable of achieving good cosmetic and functional outcomes.

The historical reluctance toward evisceration was primarily because of the fear of sympathetic ophthalmia, a bilateral granulomatous panuveitis that may follow ocular trauma or surgery.[3, 4, 5] Incomplete removal of uveal tissue was believed to predispose to this vision-threatening immune reaction. Consequently, enucleation, complete removal of the globe including the sclera, became the preferred approach in many settings.[6] However, studies published from the early 2000s onwards have substantially revised this perspective. Multiple series have demonstrated that the risk of sympathetic ophthalmia after evisceration is exceedingly rare, particularly when meticulous surgical technique is employed to ensure complete removal of uveal remnants.[7, 8, 9] Furthermore, with modern immunosuppressive therapy, even the occasional case of sympathetic ophthalmia can be effectively managed without permanent loss of vision in the fellow eye.[10]

Alongside the improved safety profile, advances in orbital implant design have improved prosthesis motility and achieved superior cosmetic rehabilitation.[11] Retaining the native scleral shell preserves the extraocular muscle cone and orbital architecture, enabling more natural coupling between the implant and prosthesis. This anatomic preservation translates to reduced operation time, smoother postoperative recovery, and a lower risk of socket contracture compared to enucleation.

Despite these advantages, evisceration is not without limitations.[12, 13] The potential for residual infection within the scleral envelope, the theoretical risk of occult intraocular malignancy, and the presence of severe scleral thinning or rupture extending posteriorly may preclude the procedure in selected cases. Therefore, proper patient selection remains critical.

In recent decades, the scope of evisceration has expanded beyond its traditional indications. It is now routinely employed in infectious endophthalmitis or panophthalmitis, provided the sclera remains sufficiently intact to contain an implant.[13, 14] The technique has also become a viable option for cosmetic rehabilitation of disfigured, phthisical, or anterior staphylomatous eyes, particularly for individuals seeking rapid recovery and minimal postoperative morbidity. In contrast, enucleation remains reserved for cases in which intraocular malignancy is suspected or confirmed, or when scleral integrity is severely compromised.[15] As the boundaries between necessity and preference evolve, it is important to critically evaluate when evisceration is the most appropriate procedure, ensuring that no more of the diseased eye is removed than is absolutely necessary. Factors such as the underlying pathology, the patient's systemic condition, and the desired aesthetic outcome play an integral role in decision-making. This review article revisits the indications, advantages, limitations, and technical considerations of evisceration in contemporary practice, highlighting the clinical scenarios in which the procedure represents the most appropriate and necessary intervention.

METHODS

This narrative review of the literature was conducted by searching PubMed, Scopus, and Google Scholar for articles published from database inception to 31 May 2025, using keywords including "evisceration," "eye evisceration," "enucleation," "orbital implant," "anophthalmic socket," "sympathetic ophthalmia," "blind painful eye," "endophthalmitis," "panophthalmitis," "ocular trauma," "phthisis bulbi", and "anterior staphyloma". Reference lists of relevant articles were also manually screened to identify additional historical and clinically important publications. Priority was given to peer-reviewed English-language original clinical studies, review articles, and surgical technique reports. Articles were excluded if they were not relevant to ophthalmic evisceration, lacked clinically applicable information, or addressed anophthalmic socket management without specific discussion of evisceration. The selected literature was reviewed narratively and grouped into major themes: indications for evisceration; contraindications and case selection;

comparison with enucleation; surgical technique; scleral wall modification techniques; orbital implant selection; complications; postoperative rehabilitation; and ethical considerations. Because this was a narrative review rather than a meta-analysis, formal risk-of-bias assessment and quantitative pooling of outcomes were not performed.

FINDINGS AND DISCUSSION

Indications for Evisceration

Evisceration is primarily indicated or necessary in eyes that are irreversibly blind and painful from chronic disease or infection, provided there is no suspicion of intraocular malignancy and the scleral shell remains structurally intact.[15] The decision to proceed with evisceration should be guided by the underlying pathology, the patient's systemic condition, and the anticipated cosmetic and psychological outcomes. In contemporary ophthalmic practice, the most common indications can be grouped into four major categories: blind painful eyes, severe ocular trauma, uncontrolled intraocular infection, and cosmetic rehabilitation.[11, 15]

1. **Blind Painful Eye**

   The blind painful eye represents an important indication for evisceration.[16] These eyes typically result from chronic end-stage diseases such as neovascular glaucoma, chronic uveitis, or end-stage retinal disorders. Pain in such cases may stem from ciliary body inflammation, corneal decompensation, or secondary angle-closure glaucoma, which can be refractory to medical therapy. When topical cycloplegics, corticosteroids, and intraocular pressure-lowering agents fail to relieve discomfort, evisceration offers definitive palliation and early cosmetic rehabilitation.[17]

   Prior to surgery, it is important to rule out occult intraocular malignancy, particularly in eyes with opaque media or long-standing phthisis. B-scan ultrasonography remains the investigation of choice for this purpose. In certain cases, a second specialist opinion may be advisable before definitive surgery, both for medicolegal prudence and patient reassurance.

2. **Severe Ocular Trauma**

   Evisceration is also indicated in severe ocular trauma when the scleral shell is intact, but the intraocular contents are irreparably damaged. Examples include open-globe injuries with extensive intraocular tissue loss, disorganisation of intraocular structures, or penetrating injuries with no visual potential.[18] In such cases, evisceration allows removal of necrotic intraocular tissue, reduces the inflammatory and infectious load, and enables immediate orbital implant placement without the extensive dissection required for enucleation.[19] Furthermore, in ocular trauma, the timing of surgery is critical. When performed early, evisceration minimises the risk of socket contracture and yields better cosmetic outcomes than delayed secondary procedures.

3. **Uncontrolled Intraocular Infection**

   Another well-established indication for evisceration is severe endophthalmitis or panophthalmitis unresponsive to medical therapy.[20] In the modern era, evisceration is largely preferred to enucleation for infectious cases, provided that the scleral wall remains viable.[19, 20] Evisceration offers faster infection control by allowing the debridement of infected tissues and direct irrigation of the scleral cavity with antibiotics. In addition, retaining the scleral shell facilitates early prosthetic rehabilitation once the infection resolves.[21]

   In cases of globe perforation due to panophthalmitis, evisceration can be performed after confirming that the scleral rupture does not extend posteriorly.[13,22] If extensive posterior involvement of scleral rupture or scleral necrosis is present, enucleation remains the safer alternative. The use of adjunctive systemic and topical antibiotics is critical to minimise postoperative recurrence of infection.

4. **Cosmetic Rehabilitation**

   Evisceration serves an important reconstructive role in patients seeking cosmetic rehabilitation of disfigured, non-

seeing eyes.[23] Conditions such as phthisis bulbi, anterior staphyloma, and post-inflammatory atrophic eyes can cause significant psychosocial distress despite being painless. In such cases, evisceration with orbital implant placement provides superior prosthesis motility, improved symmetry, and greater patient satisfaction compared with enucleation.[19, 24]

From a reconstructive perspective, preserving the scleral shell maintains orbital volume and muscle cone alignment, which directly translates to natural prosthetic movement. In particular, patients with anterior staphyloma benefit from evisceration because the intact posterior sclera provides a firm base for implant placement while eliminating the disfiguring anterior bulge.[24, 25]

Advantages and disadvantages of Evisceration

A comparison of the pros and cons of evisceration is presented in Table 1.

Advantages of Evisceration	Disadvantages / Risks of Evisceration
Shorter surgical time and faster postoperative recovery compared to enucleation.[7,24]	The residual scleral shell may harbour infection or necrotic tissue in infectious or traumatic cases.[13,20]
Better postoperative prosthesis motility and cosmesis due to preservation of extraocular muscles and scleral shell.[11,12]	Not suitable when intraocular malignancy is suspected or scleral rupture extends posteriorly.[14,24]
Allows placement of large orbital implants, improving orbital volume replacement and facial symmetry.[21,23]	Theoretical risk of sympathetic ophthalmia due to residual uveal tissue (extremely rare in modern series).[3,9]
Less intraoperative bleeding and simpler surgical technique. Can be performed under local anaesthesia.[7,8]	Limited access to the posterior orbit in case of unexpected hidden pathology or retained foreign body[18]
Lower rate of socket contraction and implant extrusion compared with enucleation.[8,21]	Residual scleral necrosis or incomplete debridement may predispose to reinfection.[20]
Preserves normal orbital anatomy and alignment of the muscle cone, improving prosthesis movement.[11,23]	Limited reconstructive potential in cases of severe phthisis or shrunken scleral shell.[14]
Reduced emotional trauma, as preservation of part of the natural eye improves patient acceptance.[24]	Patient anxiety regarding theoretical sympathetic ophthalmia risk or need for long-term prosthetic care.[3]

Surgical Technique and Perioperative Considerations

Pre-operative Care

Meticulous preoperative evaluation is important to achieve both functional and cosmetic success after evisceration. A thorough medical and ocular history should include details regarding systemic comorbidities, current medications, particularly antiplatelet or anticoagulant therapy, and any prior ocular surgery. Patients on antiplatelet or anticoagulant therapy should ideally discontinue such drugs 5-7 days before surgery, when permissible, to minimise intraoperative bleeding.[26] A complete ocular examination of both the affected and the fellow eye is mandatory.[27] This would help rule out potentially treatable causes of pain, assess for co-morbid conditions, and confirm the absence of intraocular malignancy.

When the media is opaque and direct visualisation of intraocular contents is not possible, B-scan ultrasonography must be performed to exclude intraocular mass lesions.[28] In longstanding phthisical eyes, where a tumour may be concealed, ultrasound biomicroscopy or magnetic resonance imaging can be considered. A second specialist opinion is advisable when diagnostic uncertainty persists.

Patients should receive detailed counselling about the procedure, its cosmetic expectations, potential complications, and the rare possibility of sympathetic ophthalmia. Preoperative photography helps document the appearance of the eye at presentation, including pre-existing deformity (Figures 1a and 2a).

Anaesthesia and Surgical Preparation

Evisceration can be performed under local or general anaesthesia,[16] depending on the patient's age, systemic status, and psychological tolerance. Local or peribulbar anaesthesia with intravenous sedation is sufficient for most adults, offering safety and rapid recovery. General anaesthesia is reserved for children, uncooperative adults, or extensive trauma cases requiring prolonged manipulation. Following anaesthesia, 5-10% povidone iodine is applied to the cornea, conjunctival sac, and periocular skin for a minimum of three minutes prior to surgery,[29] and a sterile drape is applied. A lid speculum is used to expose the surgical field.

Evisceration Techniques

Standard evisceration techniques involve gaining access to the anterior chamber and removing the intraocular contents.[30] A 360-degree conjunctival peritomy is performed just posterior to the limbus using scissors, and Tenon's capsule is dissected posteriorly to expose the sclera circumferentially. The extraocular muscle insertions are preserved to maintain postoperative motility. A corneal stab incision is made at the limbus using a scalpel blade. This incision is extended 360 degrees with scissors to excise the cornea button (Evisceration with keratectomy).[30] This provides direct access to the intraocular cavity while maintaining the strength of the peripheral scleral rim for closure. In selected cases, the surgeon may choose to preserve the cornea if there are no contraindications, such as keratitis, corneal thinning, corneal ulcers or corneal degeneration (Evisceration with retention of the cornea).[30] Instead of cornea removal, a 180-degree sclerotomy is performed at the 12 o'clock position, between the insertion of the superior rectus muscle and the limbus. All intraocular contents, including the uveal tissue, retina, and vitreous, are gently removed using an evisceration spoon or Freer's periosteal elevator with or without a cotton applicator. In infectious cases, the cavity should be irrigated with balanced salt solution containing antibiotics. The surgeon may wipe the inner scleral surface with absolute alcohol to ensure devitalization of residual uveal tissue.[32] Meticulous removal of all pigmented tissue minimises the already rare risk of sympathetic ophthalmia and reduces the chance of postoperative inflammation.[22, 24]

Scleral Wall Modifications

To accommodate an adequately sized orbital implant, posterior scleral expansion is achieved through splitting the scleral cavity and releasing the scleral flaps or petals from their optic nerve attachments.[32] These scleral modifications or

petal techniques differ in the number and orientation of relaxing incisions. The goal is to increase scleral compliance while preserving vascularity and providing uniform closure around the implant.

1. Posterior Sclerotomy Technique

Long et al.,[31] illustrated a scleral modification technique where the scleral cavity is opened posteriorly. A vertical posterior sclerotomy positioned temporal to the optic nerve allows access to the optic nerve. The implant is inserted behind the sclera, within the muscle cone, using an implant introducer. The scleral flaps are then sutured in two layers over the implant, preventing migration, erosion, and extrusion.

2. Two-Petal (Bisection) Technique

Massry et al.,[32] described this method for modifying the sclera to accommodate a larger implant post-evisceration while reducing the risk of postoperative enophthalmos and superior sulcus deformity. A full-thickness sclerotomy is made from the limbal incision to the optic nerve in the inferonasal and superotemporal quadrants between the rectus muscle insertions, creating two scleral flaps. The scleral flaps are detached from the optic nerve, mobilised and brought forward. The orbital implant is then placed within the scleral flaps or petals, which are folded over the implant and closed down to the equator.

3. Four-Petal (Quadrisection) Technique

In this technique, four oblique sclerotomies are created between the rectus muscle insertions, forming four posteriorly hinged petals. Each petal retains thickness and an independent vascular supply, decreasing the risk of scleral necrosis. The quadrisection technique offers good orbital volume restoration, even closure tension, minimal implant extrusion, and optimal prosthesis motility.[33, 34, 35, 36]

Orbital Implantation and Wound Closure

Implant material is selected based on indication and infection status. Non-porous acrylic or silicone implants are recommended for infectious or inflamed sockets due to their smooth surface and reduced bacterial adherence.[23, 25] Porous implants such as hydroxyapatite or porous polyethylene (Medpor) may be used in sterile cases to improve fibrovascular ingrowth and prosthesis motility.[25, 37, 38, 39]

The implant size is chosen to restore orbital volume while permitting tension-free closure.[40] The implant is inserted into the posterior scleral cavity using an implant introducer. In petal techniques, the petals are temporarily retracted to accommodate the implant centrally, ensuring even distribution of closure forces.

The scleral petals are re-approximated with interrupted 5-0 or 6-0 vicryl sutures.[41] Watertight but non-ischemic closure prevents postoperative implant exposure. Even closure of multiple petals is key to maintaining implant centration and symmetry, an inherent advantage of the two- and four-petal designs.[25, 34, 36]

Tenon's capsule is re-approximated with interrupted 5-0 or 6-0 absorbable sutures, and the conjunctiva is closed with 6-0 absorbable sutures in a continuous or interrupted pattern.[30, 32] Layered closure provides smooth coverage over the implant and maintains fornix depth for prosthesis fitting (Figure 1b). The risk of socket dehiscence is minimised when the sclera has been evenly expanded and closed under minimal tension. A fenestrated conformer coated with antibiotic ointment (tobramycin or chloramphenicol) is placed in the fornices to preserve the socket contour. A temporary tarsorrhaphy may be performed in paediatric or infected eyes to retain the conformer.[42] A firm pressure dressing is applied to control oedema and prevent hematoma formation.

Post-operative Care

Following evisceration, the goals of postoperative care are to ensure infection control, pain relief, and proper wound healing, while maintaining the shape of the newly formed socket. A pressure dressing applied at the end of surgery should remain undisturbed

for 48-72 hours unless there is excessive discomfort or soakage. The pressure dressing minimises the risk of hematoma and conjunctival oedema, both of which can jeopardise wound healing and implant stability. Typically, topical broad-spectrum antibiotic-steroid drops or ointments are continued four times daily for 2-3 weeks to reduce inflammation and promote epithelialization.[39] Analgesic and anti-inflammatory medications ensure patient comfort and reduce eyelid oedema. Mild chemosis can be managed conservatively with topical lubricants and steroid drops, while frank wound dehiscence or implant visibility requires prompt intervention. The conformer inserted intraoperatively maintains fornix depth and prevents socket contracture (Figure 2b). It should remain in situ for 4-6 weeks, being periodically lubricated with artificial tears or antibiotic ointment. If discharge or mucopurulent secretion develops, the conformer may be gently removed, cleaned with saline, and replaced under sterile precautions.

Fitting a custom-made ocular prosthesis is a crucial milestone in postoperative rehabilitation (Figure 1c and 1d). In uncomplicated cases, prosthesis fitting is typically done 4-6 weeks postoperatively, once conjunctival oedema subsides, and the socket is well epithelialised.[19, 23, 25, 33, 38] Early prosthetic fitting improves appearance and prevents socket contracture and fornix shortening, especially in paediatric patients (Figure 2c and 2d). Custom-made prostheses are preferred over stock shells due to their superior cosmetic match, improved motility, and better fit.[25, 43] The prosthesis should be periodically polished and replaced to maintain optimal sheen and prevent protein deposition.

Ethical Considerations

The psychological impact of eye loss can be profound, even when the preoperative eye was blind and disfigured.[24] Counselling, reassurance, and referral to ocularists or rehabilitation specialists are integral to postoperative recovery. Informed consent for eye removal is essential. Patients should be clearly counselled about the indication, possible alternatives such as enucleation or conservative management, and the expected cosmetic and functional outcomes. Although the risk of sympathetic ophthalmia after evisceration is exceedingly low, it must still be disclosed transparently. Proper documentation of the consent process, surgical indication, implant details, and follow-up safeguards both the patient and surgeon. In essence, ethical evisceration practice involves more than technical skill; it involves respect for patient dignity, informed participation, and continued support throughout recovery and rehabilitation.

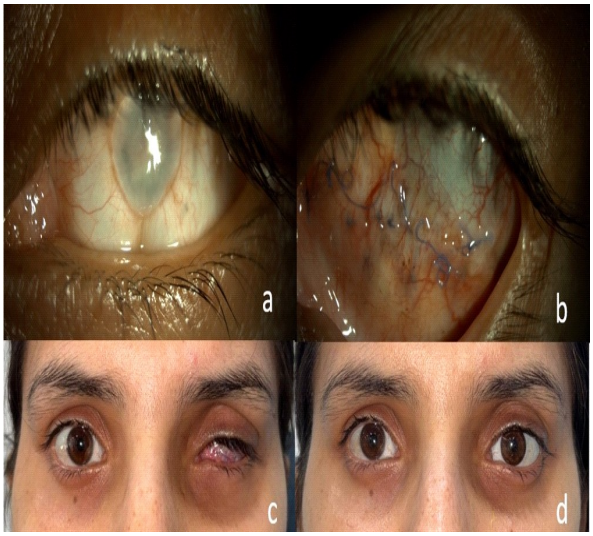

Figure 1 (a-d). Clinical photographs showing a 25-year-old female with left fungal endophthalmitis who had evisceration with orbital implantation and prosthetic rehabilitation.

(a) Preoperative slit-lamp photograph showing a phthisical eye post-fungal endophthalmitis. (b) Clinical photograph at three weeks post-evisceration plus orbital implant placement, showing healing conjunctiva with sutures in situ. (c) Postoperative appearance before prosthetic fitting, showing the anophthalmic socket and socket asymmetry. (d) Final postoperative appearance after customised ocular prosthesis fitting, showing improved palpebral aperture and satisfactory socket symmetry.

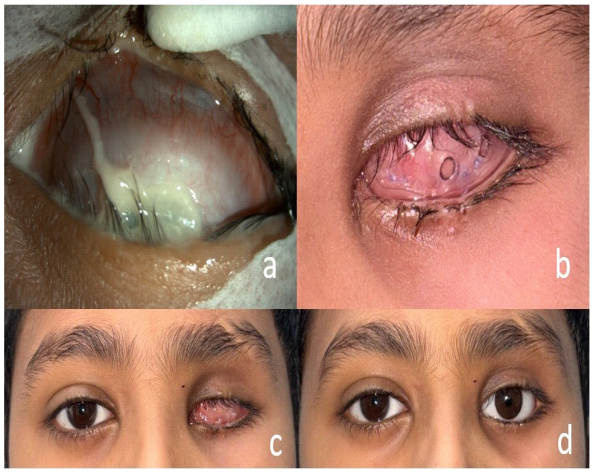

Figure 2 (a-d). Clinical photographs of a 12-year-old boy with a left perforated anterior staphyloma and secondary infection who had evisceration with orbital implantation and prosthetic rehabilitation.

(a) Preoperative clinical photograph of a disfigured eye with perforated anterior staphyloma and secondary infection. (b) Clinical photograph at five weeks post-evisceration plus orbital implant placement, showing a healed conjunctiva with conformer in situ. (c) Postoperative appearance before prosthetic fitting, showing the anophthalmic socket and socket asymmetry. (d) Final postoperative appearance after customised ocular prosthesis fitting, showing improved palpebral aperture and satisfactory socket symmetry.

CONCLUSION

Evisceration is primarily indicated or necessary in eyes that are irreversibly blind and painful from chronic disease or infection, provided there is no suspicion of intraocular malignancy and the scleral shell remains structurally intact. The introduction of the scleral-petal modification has enhanced implant sizing, orbital volume restoration, and symmetry, establishing evisceration as a refined reconstructive operation capable of achieving good cosmetic, functional, and psychological outcomes in patients with blind severely traumatised or disfigured eyes. Its safety has been reaffirmed by modern evidence showing an extremely low risk of sympathetic ophthalmia, provided meticulous uveal removal is done. Nevertheless, careful case selection, ethical counselling, and postoperative rehabilitation remain central to successful patient outcomes.

Informed consent: Written informed consent was obtained for the use of clinical photographs.

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Symposium on Organ and Tissue transplantation

Basic concepts of Keratoplasty

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INTRODUCTION

The history of corneal transplant surgery is a fascinating story of more than 200 years duration.

In, 1905 from the small town of Moravia in the Czech republic came the first report of a successful penetrating keratoplasty by Edward Zirm.[1] This event opened a wide gate for people suffering from corneal blindness. The rate of rejection of human corneas is generally below 5%, making corneal transplants the most efficacious form of transplant surgery.[2] This remarkable degree of success is achieved by the immune privileged status of the cornea, which is due to an combination of factors including absence of corneal vascularity and absence of corneal lymphatic vessels that prevents delivery of antigens to T-cells within lymph nodes.

The concept of corneal storage in artificial media was initially introduced by Mc Carey and Kaufman during the early 1970s.[3] Townley Paton and Jhon Mclean established the first eye bank in New York in 1944.[4]

The development of penetrating keratoplasty can be categorized into 3 eras:

1. The xenograft era which propose the replacement of diseased human cornea by clear animal cornea, (19th century).
2. The surgical keratoplasty era
3. The femtosecond laser era

The femtosecond laser was first developed by Dr Kurtz at the University of Michigan in the early 1990s.[5]

It was rapidly adopted in the surgical field of ophthalmology. Femtosecond laser emit light pulse of short duration at 1053 nm wave length that cause photo-disruption of the tissue with minimum collateral damage.[6]

Penetrating keratoplasty (PKP) has changed over the years, from the early 1900s , when the first procedure was performed without any modern surgical device[7] to the novel technique of femtosecond laser assisted keratoplasty and a well-matched donor recipient bed.[8]

METHODS

Literature search

A systematic review of published journal articles reporting on the basic concepts of keratoplasty was performed according to the Preferred Reporting Items for Systematic review and Meta Analysis (PRISMA) guidelines.[9]

DISCUSSION

Keratoplasty can be performed for various purposes and is classified as therapeutic, tectonic and optical. Therapeutic keratoplasty is done to remove the infective portion of the cornea mainly in the cases of recalcitrant or perforated infective keratitis. Tectonic keratoplasty provides support and maintains the integrity of the globe. Optical keratoplasty aims to restore vision and has seen various advancements with time.

There are many types of corneal transplants with different techniques, which are used for replacing selective anterior or posterior diseased part of cornea with a normal part of donor cornea.

Rock *et al.*[10] evaluated the indications for corneal transplantation and the changing trends for corneal transplantation from 2005

to 2016. The most common indications were found to be Fuchs endothelial corneal dystrophy (45.5%) and keratoconus (10.2 %). Other indications were bullous keratopathy (10.4%), trauma (4.3%) and corneal graft failure due to rejection (8.9 %), followed by infective keratitis and ulcers (16.8 %).

Postoperative outcome in DSAESK is associated with faster and early visual recovery.[11] Jordan et al.[12] conducted a study on 598 patients and found a rejection rate of 9%. In a study on deep anterior lamellar keratoplasty, Amayem and Anwar[13] found a visual acuity better than 6/9 in 95.8% cases in one-year post-operative follow up.

There have been various studies to evaluate the visual out comes and the complications post penetrating keratoplasty. Rahman et al.[14] reported a best corrected visual acuity (BCVA) of better than 6/12 in 48% of patients at 5 years of follow up.

Complications for PKP include graft rejection, graft failure, infection, expulsive hemorrhage and suture related complications. Pramanik *et al.*[15] reported a graft rejection rate of 21%.

Corneal donation in the modern era

Corneal donation is a complicated process, as it involves many social, ethical and legal issues.

To keep up with growing demand on corneal tissues, the first eye bank was started in New York by Paton in 1944.[16] To further promote eye banking and establish uniform standards and rules, ten such eye banks in America joined hands to form the Eye Bank Association of America.[16]

Role of eye banks

Eye banks play great role in corneal harvesting, processing and record keeping.

The eye bank keeps a vigil on controlling quality during harvesting, transportation, processing and storage until the donor cornea reaches the surgeon. It is important to ensure complete asepsis during retrieval of the cornea as any source of infection can lead to visually-threatening complications. Multiple cases of post keratoplasty graft infection have been reported because of the organism present in the storage media.[17]

Recent advancements in corneal transplantation

Femtosecond assisted- lamellar keratoplasty (FALK):

FALK has many advantages over manual keratoplasty. Lamellar as well as full thickness keratoplasty (PKP), can be performed using femtosecond laser.[18]

If the host and donor cut are in perfect alignment, this result in enhanced epithelial healing and reduction of post- operative astigmatism.[19]

Bioengineered cornea

The gap between availability of donor cornea and the requirement for visual rehabilitation has been managed by several methods. One of the methods is the development of bioengineered corneas. These are designed to replace the full thickness of the diseased cornea or part of the diseased cornea. These range from keratoprothesis, which replace the function of the cornea to the recent development of tissue-engineered hydrogels that help in the regeneration of the host tissue.[20] Furthermore, there are bioengineered lenticules that can be used to correct refractive errors by implantation into the cornea.[21]

CONCLUSION

More than one hundred years have passed since the first corneal transplant surgery was performed by Edward Zirm, and since then various advancements in techniques have evolved. Customized component to replace the diseased part of the cornea, improved instrumentation and engineering marvels have helped in reaching greater heights of sight restoration and visual recovery with better success rates. Improvements in eye banking techniques have greatly helped the surgical results. The future holds promise with further optimization of results and widening scope of services to reach remote areas.

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Addressing Pupillary Dilation Challenges in Phacoemulsification

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ABSTRACT
Adequate pupillary dilation is a cornerstone of safe and effective cataract surgery. Small pupils increase the risk of intraoperative complications such as iris trauma, capsular tears, and corneal endothelial damage, while reducing surgical efficiency. Despite advances in phacoemulsification techniques, poor dilation remains a common and sometimes unpredictable challenge. This review summarizes the pharmacological, mechanical, and surgical strategies available to manage small pupils, with special emphasis on intraoperative floppy iris syndrome (IFIS). Practical pearls for anticipating, preventing, and addressing pupillary challenges are also highlighted to optimize patient outcomes.

INTRODUCTION
Phacoemulsification has revolutionized cataract surgery, offering rapid recovery and excellent visual outcomes. However, small pupils remain a major obstacle to surgical success, increasing the complexity and risk profile of the procedure.[1,2] A well-dilated pupil ensures optimal visualization, instrument maneuverability, and safety margins during critical steps such as capsulorhexis, nucleus management, and cortical aspiration.[3,4] This review explores the causes of poor dilation and evaluates evidence-based management strategies, ranging from pharmacological agents to mechanical devices.

CAUSES OF POOR PUPILLARY DILATION
Poor pupillary dilation may result from pharmacological factors, underlying ocular pathology, or intraoperative events. Among pharmacological causes, chronic use of miotic agents such as pilocarpine produces a fibrotic and non-compliant iris that responds poorly to mydriatic medications.[3] Systemic medications may also contribute, particularly alpha-1 adrenergic antagonists such as tamsulosin, which are strongly associated with intraoperative floppy iris syndrome (IFIS).[4] Certain antipsychotic medications have likewise been reported to impair pupillary dilation. Inadequate preoperative mydriatic regimens can also result in inadequate pupil dilation at the time of surgery.

Several ocular pathologies are also associated with poor mydriasis. Pseudoexfoliation syndrome (PXF) is a common cause and is frequently accompanied by weak zonular support and reduced pupillary dilation.[1,3] In patients with diabetes mellitus, chronic ischemic changes result in stiffening of the iris stroma, limiting the pupillary response.[2] Chronic uveitis or iritis may produce posterior synechiae that mechanically restrict dilation, while previous intraocular surgery or ocular trauma can similarly impair iris mobility. Pigment dispersion syndrome has also been implicated as a contributing factor.

Intraoperative factors may exacerbate progressive miosis despite adequate preoperative preparation. Excessive manipulation of the iris, prolonged surgical duration, and inadequate anesthesia leading to sphincter muscle spasm have all been associated with deterioration of pupillary dilation during cataract surgery.[1]

PREOPERATIVE PHARMACOLOGICAL STRATEGIES
Effective preoperative pharmacological preparation remains the first step in managing patients at risk of inadequate pupillary dilation. Aggressive mydriasis is commonly achieved by

using a combination of topical phenylephrine 10% and tropicamide 1%.[1] Topical nonsteroidal anti-inflammatory drugs (NSAIDs), initiated 2-3 days before surgery, help to maintain mydriasis by reducing prostaglandin-mediated intraoperative miosis.[2] In patients with a history of chronic miotic therapy, atropine 1% may provide additional cycloplegia and improve dilation, although rebound miosis should be anticipated. For patients receiving alpha-1 adrenergic antagonists, particularly tamsulosin, discontinuation of therapy should be considered when clinically feasible, accompanied by appropriate preoperative planning to minimize the risk of IFIS.[4]

INTRAOPERATIVE PHARMACOLOGICAL STRATEGIES

When pharmacological support is required during surgery, intracameral agents provide rapid augmentation of pupillary dilation and iris stability. Epinephrine, typically diluted to concentrations ranging from 1:4,000 to 1:10,000 in balanced salt solution, is among the most widely used agents and has demonstrated efficacy in maintaining mydriasis throughout surgery.[2,4] Intracameral phenylephrine may also be administered, although its effectiveness is reduced in eyes with fixed or fibrotic miosis. Intracameral lidocaine 1%, either alone or in combination with epinephrine, provides additional anesthesia while contributing modestly to pupillary dilation. Mechanical expansion of the pupil may be further facilitated by the use of dispersive ophthalmic viscosurgical devices (OVDs), which expand the pupil mechanically while protecting intraocular tissues and stabilizing the iris throughout phacoemulsification.[5]

MECHANICAL DILATION DEVICES

When pharmacological methods are insufficient, mechanical pupil expansion devices provide reliable intraoperative exposure. Iris hooks are placed through small peripheral corneal incisions and are typically engaged at three or four equidistant points to retract the iris toward the limbus, producing consistent enlargement of the surgical pupil.[1] Their principal advantage is consistent pupillary enlargement even in severely constricted pupils; however, they require multiple additional incisions and may increase the risk of localized iris trauma.[6]

Pupil expansion rings, such as the Malyugin Ring, have become increasingly popular because they provide a stable, round pupil measuring approximately 6–7 mm throughout surgery.[7] Compared with iris hooks, these devices generally produce less iris trauma while offering excellent intraoperative visualization and exposure. Their primary limitation is that successful insertion and removal require familiarity with the implantation technique and specialized instrumentation.[5]

SURGICAL TECHNIQUES

In selected cases, surgical enlargement of the pupil may be necessary. Stretch pupilloplasty is performed using two Sinskey hooks to stretch the iris sphincter mechanically, thereby increasing pupillary diameter.[1] Alternatively, radial sphincterotomies may be created using microsurgical scissors or a microscalpel to enlarge the pupil.[6] Although this technique does not require specialized expansion devices, it permanently alters pupillary architecture and may result in postoperative glare or dysphotopsia. Consequently, radial sphincterotomies are generally reserved for refractory cases in which other methods have failed.[8]

INTRAOPERATIVE FLOPPY IRIS SYNDROME (IFIS)

Successful management of intraoperative floppy iris syndrome begins with careful preoperative identification of patients receiving alpha-1 adrenergic antagonists and the initiation of topical NSAIDs when appropriate.[4] During surgery, fluidic parameters should be adjusted by reducing aspiration flow and vacuum settings to minimize iris billowing. Cohesive ophthalmic viscosurgical devices may be used to stabilize the iris and maintain anterior chamber configuration.[5] Excessive hydrodissection should be avoided because it may further destabilize the iris. Early deployment of iris hooks or pupil expansion rings should be considered when progressive iris prolapse or miosis is anticipated.[9] If necessary, intracameral epinephrine may be administered as a bolus to

restore iris tone and maintain adequate pupillary dilation.[2]

PEARLS AND PRACTICAL CONSIDERATIONS

Successful management of small pupils during cataract surgery depends largely on anticipation, preparation, and timely intervention. Patients at increased risk, including those with pseudoexfoliation syndrome, diabetes mellitus, or systemic tamsulosin therapy, should be identified during the preoperative assessment.[1,3] Preparation involves ensuring availability of a wide range of pharmacological agents and mechanical expansion devices to allow prompt escalation of management when needed.[4] Early intervention before significant intraoperative miosis develops generally results in safer surgery and reduces the risk of complications.[5] Throughout the procedure, maintaining anterior chamber stability is essential for protecting both the iris and the corneal endothelium.[2] Gentle tissue handling should always be emphasized to preserve iris architecture, minimize surgical trauma, and optimize postoperative visual outcomes.[8]

DISCUSSION

Management of small pupils in phacoemulsification requires a stepwise, individualized approach. Pharmacological methods should be attempted first, escalating to viscoelastic expansion and mechanical devices as needed.[1,5] Pupil expansion rings such as the Malyugin ring provide excellent stability and are associated with favorable safety profiles, though surgeon familiarity is critical.[7] In contrast, pupilloplasty and sphincterotomies are best reserved for severe, refractory cases.[6,8] With appropriate anticipation and technique, most cases of poor dilation can be managed successfully, minimizing complications and ensuring optimal visual outcomes.[10]

CONCLUSION

Small pupils present a frequent and significant challenge in phacoemulsification. Anticipation, thorough preparation, and judicious use of both pharmacological and mechanical interventions are essential for safe and efficient surgery. With skillful planning and execution, the risks associated with poor dilation can be mitigated, leading to improved surgical safety and patient satisfaction.

Conflict of Interest: There is no conflict of interest

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Factors Associated with Uptake of Second Eye Cataract Surgery amongst Patients Attending University College Hospital, Ibadan, Nigeria

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ABSTRACT

Purpose: To identify the factors affecting the uptake of second eye cataract surgery in patients with bilateral visually significant cataract with a view to making appropriate recommendations for improved uptake.

Methods: This was a cross-sectional and hospital-based study, carried out at the Eye clinic of the University College Hospital (UCH), Ibadan, Nigeria. A total of 427 patients with bilateral age-related cataract, that had undergone cataract surgery in at least one eye, were recruited and administered a questionnaire to identify factors associated with uptake of second eye cataract surgery (SECS), as well as the barriers to uptake. Data was analyzed using IBM-SPSS version 25 and summary statistics are presented using frequency tables, means and rates. Chi–square test was used to test for associations between qualitative variables while Student's T-test was used for quantitative variables.

Results: Only 124 (29.0%) underwent SECS within 2 years of the first eye cataract surgery (FECS) with an average interval of 12 ±7.4 months. Factors associated with uptake of SECS include having formal education (p=0.004) and counseling patients on the benefits of SECS and risk of hypermaturity-related complications (p<0.001). While the barriers include insufficient income (p<0.001) and telling patients the cataract is not mature (p=0.003).

Conclusion: Formal education and counselling patients on the benefits of SECS may improve the uptake of SECS while informing patients that "Cataract is not mature" may discourage uptake of SECS and should be avoided by ophthalmic professionals after FECS.

Keywords: Cataract, First eye cataract surgery (FECS), Second eye cataract surgery (SECS)

INTRODUCTION

Cataract is still the commonest cause of blindness and severe visual impairment in Nigeria.[1] Currently, surgical removal of the lens and replacement with an artificial intraocular lens is the only available orthodox treatment for cataract. Phacoemulsification, Manual small incision cataract surgery (MSICS) and Extracapsular cataract extraction (ECCE) are the major surgical procedures employed for cataract treatment throughout the world. Other less commonly employed procedures include Intracapsular cataract extraction (ICCE) and Femtosecond laser-assisted cataract surgery.[2]

Age-related cataract is usually bilateral, even though rate of progression may differ between the two eyes. However, owing to the fear of devastating complications such as endophthalmitis, toxic anterior segment syndrome, surgery is usually carried out on one eye at a time.[3,4] First eye cataract surgery (FECS), though immensely beneficial,[3,5,6] does not completely correct all visual impairments, i.e. patients with bilateral visually significant cataract still have vision-related problems following first eye cataract surgery, attributed to the differences in vision between the operated and unoperated eye.[3,5,7,8] Hence, it is of utmost importance for patients to have prompt second eye cataract surgery in order to optimize vision.

Second eye cataract surgery causes improvement in contrast sensitivity, stereoacuity and binocular function.[5,7] Increasing Second Eye Cataract Surgery (SECS) rate will also improve cataract surgery rate, thereby reducing the burden of cataract as a cause of blindness and severe visual impairment. There is low uptake of SECS globally, although rates are increasing in Western countries.[6,8–11] Although there's paucity of data on the SECS rate in our environment, available data, however, suggest an abysmally low rate. Previous studies in our hospitals revealed a SECS rate of 0.9%,[12] in spite of about 25% of patients being bilaterally blind at presentation,[13] although being a hospital-based retrospective study, this rate may not include patients who had their SECS done in other facilities. This extremely low rate of second eye cataract surgery implies that only a few patients achieve their optimum visual potential. To our knowledge, no previous studies have explored the factors that could be responsible for the abysmally low uptake of SECS in our environment . Hence, it is imperative to carry out such a study, which will identify the factors associated with the uptake of SECS as well as the barriers to it, with a view towards improving the uptake of second eye cataract surgery.

METHODS

The study was a cross-sectional, descriptive hospital-based study, carried out at the Eye Clinic of the University College Hospital (UCH), Ibadan, Nigeria. Patients aged 50 years and above who initially presented with bilateral visually significant age-related cataract, had best corrected visual acuity worse than or equal to 6/18 in both eyes at diagnosis, and who had undergone first eye surgery not more than 2 years prior to recruitment were included. Patients who had visual impairment from other ocular co-morbidities such as glaucoma, diabetic retinopathy, age-related macular degeneration and patients who had a history of uveitis or ocular trauma were excluded. Sample size was calculated using the Leslie Kish formula, and a total of 427 patients was calculated after accounting for a 10% attrition rate.

Ethical approval was obtained from the ethical committee of the University College Hospital, Ibadan, and the study adhered to the Tenets of the Helsinki Declaration. Informed consent was obtained from all participants prior to recruitment, and the study duration was 6 months (September 2021 – March 2022), which was prolonged due to a decline in clinic attendance as a result of the COVID-19 pandemic.

SAMPLING TECHNIQUE

The list of eligible patients was compiled from the clinic and surgery registers of the Ophthalmology department of University College Hospital, Ibadan, and patients were contacted on phone and a clinic appointment was scheduled. All consecutive patients who met the eligibility criteria were then recruited into the study until the sample size was complete.

DATA COLLECTION

A brief explanation of the survey was given to the participants, and consent was obtained. Data of interest obtained from clinical records and participants via the interviewer-administered questionnaire included sociodemographic data, information about the time of surgery (first and second eye), pre- and post-operative best corrected visual acuity, type of surgery, as well as complications.

Other information obtained using the questionnaire included factors responsible for the interval between both surgeries and reasons for not yet undergoing SECS (barriers to SECS).

The barriers of interest were classified into:

Attitudinal barriers:

- Can manage routine work
- Can see with the other eye
- Fear of complications
- Cataract not mature
- Preoccupied with work
- Old age

Barriers related to service delivery, cost and affordability

- Insufficient Income
- Complicated First Eye Surgery
- Admission Logistics and Stress
- Distance/transport system

Difficulty in getting a surgery appointment
Systemic Contraindication
No one to accompany

Each participant underwent a detailed clinical assessment, which included: visual acuity assessment, Pen torch and slit lamp examination of the anterior segment, Applanation tonometry, dilated fundoscopy using 90D lens.

STATISTICAL ANALYSIS

Data entry, cleaning and analysis were done using IBM-SPSS version 25. Descriptive statistics such as means, medians, ranges and standard deviations were used to summarize quantitative variables, while categorical variables were summarized using proportions and percentages. A one-way ANOVA test was used to find the difference between means of some quantitative variables in order to identify the factors associated with a shorter interval between FECS and SECS. A cross-tabulation to compare the frequencies of the barriers in both the FECS and SECS groups was done, using the Chi-square test, to identify the statistically significant barriers. Analyses were carried out at 5% level of statistical significance.

RESULTS

Sociodemographic characteristics of participants

A total of 427 participants completed the study. Males were 212 (49.6%), giving a male-to-female ratio of 1:1.01. The participants' ages ranged between 52 and 108 years, with a mean age of 70.1 ± 8.8 years. Table 1 presents the sociodemographic characteristics of all participants.

Table 1: Sociodemographic characteristics of participants

Variable	Frequency (n=427)	Percentage (%)
Mean Age ± Standard deviation (years)	70.1 ± 8.79	
Age Categories (years)		
<65	109	25.6
65-74	196	46.0
>74	122	28.4
Gender		
Male	212	49.6
Female	215	50.4
Marital Status		
Married	344	80.6
Widowed	76	17.8
Divorced	3	0.6
Single	2	0.5
Separated	2	0.5
Occupation		
Employed	287	67.4
Retiree	125	29.3
Unemployed	15	3.3
Average Monthly Income		
< 30,000 naira/month	308	72.2
30,000 – 60,000 naira/month	95	22.2
>60,000 naira/month	24	5.6
Average distance from the hospital by road (hours)	1.4 ± 1.32	
Living alone		
Yes	41	9.6
No	386	90.4

Proportion of participants who had undergone second eye cataract surgery
A total of 124 (29.0%) participants had Second Eye Cataract Surgery (SECS) done within two years of First Eye Cataract Surgery (FECS), while 303(71.0%) were yet to have SECS. Of the 303 FECS-only participants, 220 (72.6%) expressed interest in having their SECS done. The average interval between FECS and SECS was 12 ± 7.4 months.

Factors associated with uptake of SECS
In order to determine the factors associated with uptake of SECS, a comparison of sociodemographic and clinical characteristics of the two groups of participants was done. A greater proportion of the participants with formal education underwent SECS as compared with those without formal education (32.0% versus 20.4%) (Table 2). This difference was statistically significant (p= 0.004).

Table 2: Comparison of demographic features between First Eye Cataract Surgery (FECS) only and Second Eye Cataract Surgery (SECS) groups

Sociodemographic characteristics	FECS only(n=303) Number (%)	SECS (n=124) Number (%)	P value
Gender:			
Male	143(67.5)	69(32.5)	0.113
Female	160(74.4)	55(25.6)	
Age (mean age in years)	70.3±8.9	69.4± 8.4	0.893
Age in Category(years)			
<65	77(70.6%)	32(29.4%)	0.973
65-74	141(71.9%)	56(28.1%)	
>74	85(70.2%)	36 (29.8%)	
Level of education			
No formal education	86(79.6)	22(20.4)	0.004
Formal	217(68.0)	102(32.0)	
Occupation			
Employed	204(71.1)	83(28.9)	0.994
Retiree	89(71.2)	36(28.8)	
Unemployed	10(66.7)	5(33.3)	
Living Alone			
Yes	34(82.9)	7(17.1)	0.076
No	269(69.7)	117(30.3)	
Average Monthly Income			
<30,000 naira/month	224(72.7)	84(27.3)	0.061
30,000 - 60,000 naira/month	67(70.5)	28(29.5)	
>60,000 naira/month	12(50.0)	12(50.0)	

Table 3: Comparison of clinical characteristics between First Eye Cataract Surgery (FECS) only and Second Eye Cataract Surgery (SECS) groups

Clinical Characteristics	FECS only (n=303) Number (%)	SECS (n=124) Number (%)	Total(n=427) Number (%)	P value
Systemic co-morbidities:				
No systemic co-morbidity	202(71.4)	81(28.6)	283(100.0)	0.163
Hypertension	77(72.0)	30(28.0)	107(100.0)	
Diabetes	10(66.7)	5(33.3)	15(100.0)	
Both hypertension and diabetes	11(78.6)	3(21.4)	14(100.0)	
Others (Peptic ulcer disease, Asthma)	3(37.5)	5(62.5)	8(100.0)	
Pre-operative BCVA in other eye as at time of FECS				
6/18	100 (74.6)	34 (25.4)	134(100.0)	0.425
<6/18 – 6/60	97(70.3)	41(29.7)	138(100.0)	
<6/60 – HM	92(70.2)	39(29.8)	131(100.0)	
LP	7(53.8)	6(46.2)	13(100.0)	
Missing data	7(63.6)	4(36.4)	11(100.0)	
Told about the benefits of second eye surgery				
Yes	209(65.5)	110(34.5)	319(100.0)	<0.001
No	94 (87.0)	14 (13.0)	108(100.0)	
Aware that hypermature cataract predisposes to complications				
Yes	131(58.7)	92(41.3)	223(100.0)	<0.001
No	172(84.3)	32(15.7)	204(100.0)	
Portal of entry for first eye surgery				
Walk-in	223(70.6)	93(29.4)	316(100.0)	0.058
Clinic referral	42(63.6)	24(36.4)	66(100.0)	
Outreach	38(84.4)	7(15.6)	45(100.0)	
Source of funds for first eye surgery				
1. Self	85(64.9)	46(35.1)	131(100.0)	<0.001
2. Family	157 (70.1)	67(29.9)	224(100.0)	
3. Sponsorship	57(93.4)	4(6.6)	61(100.0)	
4. Insurance	04(36.4)	7(63.6)	11(100.0)	
Satisfaction with the outcome of first eye surgery				
Satisfied	274(72.4)	111(27.6)	385(100.0)	0.801
Indifferent	11(64.7)	6(35.3)	17(100.0)	
Unsatisfied	18(72.0)	7(28.0)	25(100.0)	
Type of Surgery done (first Eye)				
ECCE + PCIOL	74(71.8)	29(28.2)	103(100.0)	0.662
SICS + PCIOL	214(70.9)	87(29.1)	301(100.0)	
ECCE Only	3(75.0)	1(25.0)	4(100.0)	
SICS Only	11(64.7)	6(35.3)	17(100.0)	
PHACO + PCIOL	1(50.0)	1(50.0)	2(100.0)	

BCVA- best corrected visual acuity
ECCE -extracapsular cataract extraction
PCIOL- posterior chamber intraocular lens implant
SICS- small incision cataract surgery
PHACO- phacoemulsification

A greater proportion of the participants who reported that they were told about the benefits of SECS had SECS compared with those who were not told about these benefits (p<0.001) (Table 3). Similarly, those who were aware of hypermaturity- related complications had SECS compared with those who were not aware of these complications (p<0.001) (Table 3). Also, 63.6% of participants who paid for their FECS through insurance had SECS, while only 6.6% of those who were sponsored for FECS had SECS (p=0.003) (Table 3).

Multivariate analysis of factors associated with the uptake of SECS

None of the variables was statistically significantly associated with uptake of SECS on multivariate analysis (Table 4).

Table 4: Multivariate analysis of factors associated with uptake of Second Eye Cataract Surgery

Factor	Odds Ratio	95% C.I	P-Value
Level of Education			
No formal Education	**Ref**		
Formal Education	1.444	0.567 – 3.677	0.440
Being told about the benefits of second eye surgery			
Yes	1.626	0.418 – 6.322	0.483
No	**Ref**		
Being aware of hypermaturity-related complications?			
Yes	**Ref**		
No	0.940	0.349 – 2.532	0.902
Who paid for the first eye surgery:			
1. Self	0.611	0.118 – 3.169	0.558
2. Family	1.338	0.259 – 6.917	0.728
3. Sponsorship	0.302	0.019 – 4.818	0.397
4. Insurance	**Ref**		

Barriers to uptake of SECS

Both groups of participants identified barriers to SECS (the SECS group identified these barriers as responsible for the interval between surgeries), and participants were allowed to give multiple reasons. Further analysis showed that the FECS-only group had more barriers than the SECS group (average of 2.3 vs. 1.8 per participant, respectively), as shown in Table 5. Barriers that were significantly more commonly reported by the FECS-only group were "Cataract not mature" (p =0.003) and "Insufficient income" (p<0.001).

DISCUSSION

The SECS rate in this study was 29% with an average interval of 12 ± 7.4 months between FECS and SECS. Although this represents a significant improvement in SECS rate as compared with a previous study from the same hospital[12], it is still low with a prolonged interval between the two surgeries as compared with rates in the Western world.[8,14–16] This study, therefore, sought to identify the factors that could be responsible for the low and frequently delayed uptake of SECS.

Factors associated with uptake of SECS included:

a. Level of education: One-third of participants with formal education had SECS compared with one-fifth of those without formal education. This implies that having formal education may be associated with improved uptake of SECS. This may also be related to the increased need for binocular vision by those with formal education.
b. Awareness about the benefits of second eye cataract surgery: 35% of participants who were counselled about the benefits of cataract surgery had SECS, while only 13% of those who were not counselled had it

Table 5: Comparison of barriers between First Eye Cataract Surgery only and Second Eye Cataract Surgery groups

BARRIERS	FECS(n = 303) Number (%)	SECS (n = 124) Number (%)	P Value
Attitudinal Barriers			
Can manage routine work	52 (72.2)	20 (27.8)	0.887
Can see with other eye	76 (76.0)	24 (24.0)	0.257
Fear of complications	44 (80.0)	11 (20.0)	0.151
Cataract not mature	56 (58.3)	40 (41.7)	0.003
Preoccupied with work	18 (78.3)	5 (21.7)	0.489
Old age	18 (85.7)	3 (14.3)	0.146
Barriers related to service delivery, cost and affordability			
Insufficient Income	208 (82.2)	45 (17.8)	<0.001
Complicated First Eye Surgery	21 (72.4)	8 (27.6)	0.524
Admission Logistics and Stress	87 (74.4)	30 (25.6)	0.403
Distance/transport system	60 (78.9)	16 (21.1)	0.096
Difficulty in getting surgery appointment	14 (63.6)	8 (36.4)	0.472
Systemic Contraindication	28 (71.8)	11 (28.2)	0.534
No one to accompany	14 (73.7)	5 (26.3)	0.510

done. This suggests that counselling and educating patients about the benefits of having SECS could improve the uptake of SECS, which should be included in the preoperative counselling session.

c. Awareness about hypermaturity-related cataract complications: Similarly, more participants who were aware of hyper maturity related complications had SECS compared to those who weren't aware. Such information should also be included in the preoperative counseling of patients with bilateral visually significant cataracts.

d. Health Insurance cover: Two-thirds of participants who paid for FECS through insurance cover had SECS, while less than a tenth of those who were sponsored for their FECS had SECS. Having insurance coverage obviates cost as a barrier. It is therefore recommended that more patients be enrolled in insurance schemes to improve the uptake of SECS. Sponsorship opportunities, on the other hand, are severely limited, and so patients with more severe visual needs, such as the bilaterally blind, are usually prioritized. Hence, those in need of second eye surgery may not get the opportunity through sponsorship programs. Encouraging more cataract surgery sponsors may contribute substantially towards improving the uptake of SECS.

Although there is paucity of studies carried out to identify the factors associated with uptake of SECS, nonetheless, our findings are at variance with that of Castels et al[17] in the UK, who identified worse visual acuity in the second eye and younger age as being strongly associated with both eyes cataract surgery. In our study, there were no statistically significant differences in these factors between the FECS-only and the SECS group. This may be related to the barriers faced by our patients, as discussed below.

Barriers to uptake of SECS

This study revealed that participants in both groups had barriers to SECS. However, the barriers were more for the FECS-only group than the SECS group, with an average of 2.3 vs 1.9 barriers per participant. Further analysis revealed the barriers listed below were statistically significantly more common in the FECS only group. These findings, though consistent with the findings of Malik et al,[18] are at variance with those from studies identifying barriers to cataract surgery in

general, which identified attitudinal and service delivery factors as the main barriers to surgery.[19] Hence, Malik *et al*[18] opined that "possibly, where the second eye surgery was concerned, our patients faced multiple, interrelated barriers, or their barriers were other than the ones we tested"

a. Cataract not mature: This study identified this as the only attitudinal barrier that reached statistical significance, p<0.001. Studies have shown that telling a patient the cataract is not ready for surgery is a major barrier, as such patients may never return, only to present when complications ensue.[19] Patient education on the need for cataract surgery as soon as the visual threshold is surpassed, as well as a regular schedule of follow-up, has been advocated so as not to lose such patients to follow-up.
b. Insufficient income: Over 80% of participants who identified insufficient income as a barrier did not undergo SECS. This suggests that the cost of surgery, which has been identified as a barrier to FECS, is also a barrier to SECS. It is therefore not surprising that our study identified insurance cover as a factor associated with uptake of SECS.
c. Other barriers that did not reach statistical significance include attitudinal barriers, such as being able to see with the other eye and can manage routine work may be related to the age group of the study population being elderly and mainly retirees with reduced need for binocular vision. Worthy of mention are barriers related to service delivery, cost and affordability, such as admission logistics and stress, as mentioned by about a quarter of the participants. This is likely related to the administrative bottlenecks associated with payment and admission protocol in a federal teaching hospital such as UCH, Ibadan, as against the practice of "cataract surgery pack" where the patient simply pays for all needed consumables at once. Therefore, ensuring ease of admission and surgery logistics could improve the uptake of SECS.

Limitations

Being a hospital-based cross-sectional study with a retrospective component, recall bias and missing records could have affected the outcome of this study. Also, the factors associated with uptake of SECS and the barriers identified may be different from the findings of a community-based study.

CONCLUSION

This study has revealed that having formal education could be associated with uptake of SECS, while counseling patients on the benefits of SECS and the risk of hyper maturity related complications may help improve uptake. This study further revealed that messaging that cataract surgery should be delayed until the cataract is "mature" may inadvertently discourage uptake of SECS; hence, proper patient education is advocated. Cost is also a barrier to SECS. We therefore recommend more insurance cover, sponsorship opportunities and discounts on SECS to improve uptake of surgery.

Conflict of Interest: None to declare

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Ocular Manifestations of Connective Tissue Diseases in Patients Attending Clinics in Aminu Kano Teaching Hospital, Northwestern Nigeria

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ABSTRACT

Purpose: The study determined the ocular manifestations of connective tissue diseases in Nigerian patients.

Methods: A single-centre cross-sectional study conducted at Aminu Kano Teaching Hospital, Kano, northwestern Nigeria. Study participants were patients aged 18years and above who had already been diagnosed with connective tissue diseases (CTDs). Participants were interviewed and examined; and data was collected using a semi-structured questionnaire. Data obtained was analysed using IBM SPSS version 22, Armonk, NY.

Results: A total of 140 patients were recruited and examined. Of these, 123 (87.9%) were females, and 17 (12.1%) were males (M:F =1:7), with mean age of 37.1±13.9 years. Majority of them (86.4%) had ocular manifestations. The commonest type of CTDs with ocular manifestation was rheumatoid arthritis (43.8%), followed by systemic lupus erythematosus (28.5%) and systemic sclerosis (6.6%). Among the patients with ocular manifestations, 70 (57.9%), presented with dry eye disease, 17 (14.0%) had cataract, 10 (8.3%) had episcleritis and 7 (5.8%) had keratitis. Dry eye syndrome (55%), cataract (13.3%) and episcleritis (5.0%) were found to be more frequent in patients with rheumatoid arthritis. There was a statistically significant association between the presence of CTD-related ocular manifestations and female gender ($p<0.001$).

Conclusion: Dry eye syndrome, episcleritis, keratitis and cataract were frequent ocular manifestations of CTDs. Periodic ophthalmic examination is important for patients with CTDs.

Keywords: Connective tissue, Diseases, Ocular manifestations, Nigeria.

INTRODUCTION

Connective tissue diseases comprise a heterogeneous group of disorders that have connective tissue of the body as the primary target of pathology. Connective tissue diseases are important structures that hold the cells of the body together and form a matrix for the body.[1] Connective tissues are composed of two main structural protein molecules, collagen and elastin, which are frequently injured by inflammation. Specific causes of connective tissue diseases are not known; however, there are genetic and environmental factors that are considered to increase the risk of developing the disease.[1] There are several interfaces between ophthalmology, rheumatology and dermatology. Ophthalmologists face the dilemma of whether ocular inflammation is due to a systemic connective tissue disease, while, on the other hand, the rheumatologists and dermatologists have to consider the possibility of ocular manifestations that are relatively common in some connective tissue diseases. Moreover, these ocular manifestations may influence therapeutic decisions of both rheumatologists and dermatologists. The role of the ophthalmologist is to manage these patients with severe active disease from the acute phase to the long-term management of complications arising from the disease or related to its treatment.[2]

There are two categories of connective tissue diseases. The first category consists of those that are inherited due to a single gene defect e.g. Ehlers-Danlos syndrome, Epidermolysis

bullosa, Marfan syndrome, Osteogenesis imperfecta, Stickler and Alport syndrome. The second category, which is commonly seen as autoimmune, consists of disorders in which antibodies directly target connective tissues, e.g. systemic lupus erythematosus, rheumatoid arthritis, scleroderma, Sjogren's syndromes, spondyloathropathies, polymyositis, dermatomyositis, sarcoidosis, systemic vasculitides, mixed and undifferentiated connective tissue diseases.[3] Patients are clinically diagnosed and labelled with connective tissue diseases by consultant rheumatologists and dermatologists who offer treatment and management in their clinics.

Some selected ocular manifestations of connective tissue diseases include: dry eye syndrome (gritty sensation, redness, burning, photophobia or blurring of vision),[4,5] scleritis,[6] episcleritis[7] and scleromalacia perforans.[8] Episcleritis presents with a painless red eye or minimal discomfort, but vision is preserved.[9] Connective tissue diseases can present with perilimbal corneal involvement known as peripheral ulcerative keratitis (PUK),[10] punctate epithelial erosions,[11] corneal scarring,[12] corneal ulceration,[13] corneal hemorrhage and retinal vasculitis.[14]

In Nigeria, connective tissue diseases are not as uncommon as once thought,[15] and the ocular manifestation of these diseases in Nigeria is grossly understudied.

According to the Sustainable Development Goals (SDG) 3- "Good Health and Wellbeing," investment in health care capacity and health care quality translates into positive health outcomes. Every individual in a society, including patients with connective tissue diseases, has the right to access quality health care services.[16]

In the Nigeria National Blindness and Visual Impairment Survey, the prevalence of ocular manifestations of connective tissue diseases was not studied,[17] thus contributing to a wide gap in the literature on connective tissue diseases that needs to be addressed.

There is poor understanding of the ocular manifestations of connective tissue diseases among physicians; many rheumatologists and dermatologists also miss the diagnosis of ocular manifestations of connective tissue diseases.[15]

There has been an increase in the number of reports of rheumatoid arthritis (RA) from West Africa in the last decade that has shed some light on the fallacy of the earlier belief that RA and other systemic autoimmune connective diseases are rare in Africa.[18] While various extra-articular manifestations of RA have been documented in patients from this region, the extent and the distribution of ophthalmic disorders due to RA and its treatment have not been reported.[18]

The aim of this study is to determine the ocular manifestations of connective tissue diseases in patients attending rheumatology and dermatology clinics in Aminu Kano Teaching Hospital (AKTH), Kano, Nigeria, in order to identify specific patterns of ocular features associated with connective tissue diseases for the purpose of early detection and prompt management of patients with connective tissue diseases. This will ultimately promote interdisciplinary practice patterns and establish a strong working link between ophthalmologists, rheumatologists and dermatologists in patient management.

METHODS

This is a hospital-based cross-sectional study carried out in the rheumatology, dermatology and ophthalmology clinics of Aminu Kano Teaching Hospital (AKTH), Kano State. The study was conducted from January 2023 to July 2023. The study population consisted of patients already diagnosed with connective tissue disease who were more than 18 years old. Patients with other systemic diseases with ocular manifestations, such as diabetes mellitus and hypertension, and those with pre-existing ocular morbidity, such as orbital tumours, glaucoma, and cataract, were excluded.

The study commenced following ethical approval by the AKTH research ethics committee, and adhered to the tenets of the Helsinki Declaration. Written informed consent was obtained from participants before recruitment into the study. A simple random sampling technique was employed in recruitment of study participants. All patients clinically diagnosed with connective tissue diseases during the period of data collection constituted the sampling frame. Clinic day appointment register was used to identify and obtain the list of patients with connective tissue disease. The total numbers of patients that met the inclusion criteria were pooled and a computer generated simple random technique was used to select the patients until the required sample size was obtained. Patients who had other systemic diseases with ocular manifestations, coexisting ocular morbidities, were too ill to allow for detailed examination or declined consent were not included.

All patients who fulfilled the eligibility criteria were interviewed using the interviewer-administered semi-structured questionnaire, to collect information on demographic characteristics, connective tissue disease history, ocular/ visual symptoms associated with the diseases and history of drug treatment. Patients then underwent eye examination aimed at assessing the following: Visual acuity, Adnexa / Anterior segment structures, Dry eye test, Intraocular pressure, Posterior segment structures, Refraction, Colour vision test and Ocular ultrasound brightness mode scan (where indicated).

The data collated was coded and entered into a spreadsheet for statistical analysis with IBM SPSS version 23, Armonk, NY. Data was expressed as mean, ratio, standard deviations, ranges and frequencies.

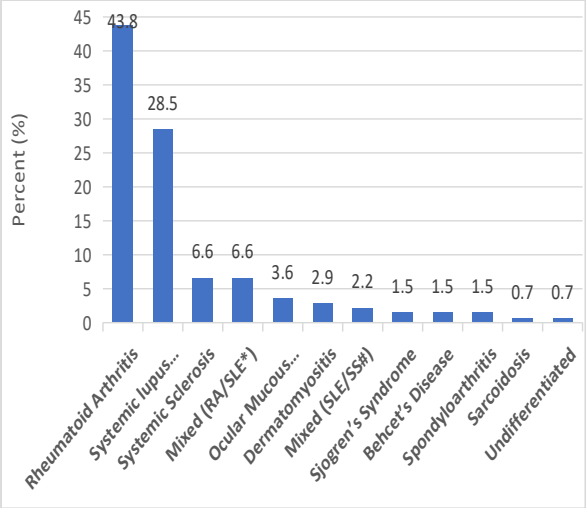
Frequency distributions of relevant variables were generated and presented in tables and charts. Bivariate analysis was conducted using cross-tabulations, and Chi-square test was used to determine associations between socio-demographic and clinical characteristics. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 140 patients diagnosed with connective tissue diseases (CTDs) were included in the study. The participants' ages ranged from 18 to 85 years, with a mean age of 37.1 ± 13.9 years. There were 123 (87.9%) females and 17 (12.1%) males (M:F ratio =1:7).

Distribution of connective tissue diseases among study participants

There were 137 patients with autoimmune connective tissue diseases, while three had heritable connective tissue diseases. Out of the 137 patients with autoimmune connective tissue diseases, 60 (43.8%), had rheumatoid arthritis, 39 (28.5%) had systemic lupus erythematosus, nine (6.6%) had systemic sclerosis, while five (3.6%) had ocular mucous membrane pemphigoid (Figure 1). Among the three patients who had heritable connective



**RA/SLE – rheumatoid arthritis/ systemic lupus erythematosus*
 # SLE/SS – systemic lupus erythematosus/systemic sclerosis

Figure 1: Distribution of autoimmune connective tissue diseases in the patients

tissue diseases, 2 patients had Marfan's syndrome, and 1 had epidermolysis bullosa.

Ocular manifestations of connective tissue diseases among study participants

Among 140 patients included in the study, 121 (86.4%) had ocular manifestations, while 19 (13.6%) did not have any ocular manifestations. The frequency of ocular manifestations among patients with the various connective tissue diseases was as follows: Rheumatoid arthritis -50 (83.3%), Systemic lupus erythematosus - 34 (87.2%), Systemic sclerosis 9(100.0%), sarcoidosis -1 (100.0%), Sjogren's syndrome - 2 (100.0%), Behcet's disease -1 (50.0%), Mucous membrane pemphigoid -4 (80.0%), dermatomyositis -4 (100.0%), Marfan's syndrome -2 (100.0%) and epidermolysis bullosa -1 (100.0%) as shown in Table 1.

Majority of the patients with ocular manifestations, 70 (57.9%), had dry eye syndrome (DES), while episcleritis was observed in 10 (8.3%) patients and keratitis in 7 (5.8%), as shown in Table 2. The pattern of ocular manifestations within specific autoimmune connective tissue diseases is presented in Table 3.

With regards to the heritable connective tissue diseases, the two patients with Marfan's syndrome had dry eye syndrome, iridodonesis,

Table 1: Frequency of ocular manifestations within different connective tissue diseases

Connective tissue diseases	Frequency	Percentage
Rheumatoid Arthritis (n= 60)	50	83.3
Systemic lupus Erythematosus (n= 39)	34	87.2
Systemic Sclerosis (n= 9)	9	100.0
Mixed (RA/SLE*) (n=9)	9	100.0
Ocular Mucous Membrane Pemphigoid (n= 5)	4	80.0
Dermatomyositis(n=4)	4	100.0
Mixed (SLE/SS#) (n=3)	3	100.0
Sjogren's Syndrome (2)	2	100.0
Behcet's Disease (n=2)	1	50.0
Spondyloarthritis (n=2)	0	0.0
Marfan's Syndrome (n=2)	2	100.0
Sarcoidosis (n=1)	1	100.0
Undifferentiated (n=1)	1	100.0
Epidermolysis Bullosa (n=1)	1	100.0

Table 2: Overall pattern of ocular manifestations among the patients

Anterior segment manifestations	Right Eye Freq	%	Left Eye Freq	%
Dry eye syndrome	70	57.9	68	56.2
Cataract	17	14.0	17	14.0
Episcleritis	10	8.3	10	8.3
Low IOP	9	7.4	9	7.4
Keratitis	7	5.8	7	5.8
Anterior uveitis	4	3.3	8	6.6
Corneal ulcer	3	2.5	3	2.5
Symblepharon	3	2.5	3	2.5
Scleritis	2	1.7	2	1.7
Conjunctival granuloma	2	1.7	2	1.7
Keratic precipitates	2	1.7	2	1.7
Lens subluxation	2	1.7	2	1.7
Iris atrophy	2	1.7	2	1.7
Iridodenesis	2	1.7	2	1.7
High IOP	2	1.7	2	1.7
Keratoconjunctivits	1	0.8	1	0.8
Posterior segment manifestations				
Color vision defect	9	7.4	14	11.5
Retinal vasculitis	8	6.6	8	6.6
Macular edema	6	5.0	6	5.0
Optic disc swelling	5	4.1	5	4.1
Secondary Glaucoma	4	3.3	5	4.1
Optic neuritis	3	2.5	2	1.7
Posterior uveitis	2	1.7	1	0.8
Vitritis	1	0.8	1	0.8
Vitreous opacity	1	0.8	0	0.0
Optic atrophy	1	0.8	5	4.1
Retinal detachment	1	0.8	1	0.8
Macular Scar	1	0.8	2	1.7
Adnexal manifestations				
Eyelid stiffness	3	2.5	3	2.5
Heliotrope rash	3	2.5	3	2.5
Eyelid blister	1	0.7	1	0.7

Table 3: Pattern of ocular manifestations within autoimmune connective tissue diseases

Connective tissue disease/ ocular manifestations	Frequency	Percentage
Rheumatoid Arthritis (n=60)		
Dry eye syndrome	33	55.0
Cataract	8	13.3
Episcleritis	3	5.0
Systemic lupus erythematosus (n=39)		
Dry eye syndrome	17	43.6
Retinal vasculitis	4	10.3
Systemic sclerosis (n=9)		
Dry eye syndrome	8	88.9
Eyelid stiffness	2	22.2
Symblepharon	2	22.2
Dermatomyositis (n=4)		
Heliotrope rash	3	75.0
Dry eye syndrome	1	25.0
Eyelid stiffness	1	25.0
Behcet's disease (n=2)		
Conjunctival granuloma	2	100.0
Dry eye syndrome	1*	50.0
Keratitis	1*	50.0
Anterior uveitis	1*	50.0
Sarcoidosis (n=1)		
Conjunctival nodule	1	100.0
Posterior uveitis	1	100.0
Sjogren's syndrome (n=2)		
Dry eye syndrome	2	100.0
Ankylosing spondylitis (n=2)		
Episcleritis	1#	50.0
Dry eye syndrome	1#	50.0
Retinal vasculitis	1#	50.0
Mucous membrane pemphigoid (n=5)		
Keratitis	3	60.0
Dry eye syndrome	3	60.0
Episcleritis	2	40.0
Symblepharon	1	20.0

*"*manifestations in the same patient with Behcet's disease*
#manifestations in the same patient with Ankylosing spondylitis"

lens subluxation, lens opacity, RD, color vision defect and low intraocular pressure. While the patient with epidermolysis bullosa had dry eye syndrome and eyelid blister.

All the three patients with mixed systemic lupus erythematosus and systemic sclerosis presented with non-microbial conjunctivitis, dry eye syndrome, corneal ulcer, and anterior uveitis. Whereas, of the nine patients with mixed rheumatoid arthritis and systemic lupus erythematosus, six had dry eye syndrome, four patients had lens opacity, retinal vasculitis and color vision defect, two had optic neuritis and disc edema, and one patient had optic atrophy. The only patient who had undifferentiated CTD presented with lens opacity and low intraocular pressure.

Risk factors associated with ocular manifestations of connective tissue diseases among study patients

Female gender was statistically significantly associated with ocular manifestations of CTDs, with a p-value of <0.001. The associations

Table 4: Socio-demographic factors associated with ocular manifestations connective tissue diseases

Sociodemographic Characteristics	Ocular manifestation Yes (n=121) Freq (%)	No(n=19) Freq (%)	Test of association	P Value
Age			Fisher's exact test	0.092
18-25	19(76.0)	6(24.0)		
>25	102(88.7)	13(11.3)		
Gender			Pearson chi-square	<0.001*
Male	6(35.3)	11 (64.7)		
Female	115(93.5)	8 (6.5)		
Religion			Fisher's exact test	0.523
Islam	117(86.7)	18(13.3)		
Christian	4(80.0)	1(20.0)		
Ethnicity			Fisher's exact test	0.703
Hausa	114(86.4)	18(13.6)		
Non-Hausa	7(87.5)	1(12.5)		
Education			Fisher's exact test	0.619
Formal	101(86.3)	16(13.7)		
Informal	20(87.0)	3 (13.0)		
Occupation			Fisher's exact test	0.527
Employed	35 (87.5)	5 (12.5)		
Unemployed	86 (86.0)	14 (14.0)		

** statistically significant at p-value of <0.05*

between other sociodemographic factors and CTD-related ocular manifestations were not statistically significant, with p values > 0.05 (Table 4).

DISCUSSION

The overall prevalence of ocular manifestations among patients with CTDs in the study was 86.4%. This is much higher than the figure from a previous study which showed a global pooled prevalence of 30%.[19] The marked difference may be related to the differences in the study design and the study populations. Majority of the patients studied were females between the age of 24 to 50 years. This is in keeping with a study that showed CTDs are commonly seen in females.[20] This may also contribute to the higher prevalence seen in this study.

The prevalence and pattern of ocular manifestations in patients with RA were found to be similar to some previous studies.[18,21,22] Dry eye syndrome (DES) was the most common ocular manifestation found. Other less common manifestations include: anterior uveitis and secondary glaucoma. This slightly varies from another study, which reported DES (16%) and glaucoma (5%) to be the most common ocular presentation in patients with RA.[19] Our findngs are comparable to a study in India, which reported 77 (39%) had ocular manifestations among 196 patients, DES occurred in 28% and was similarly the most common ocular manifestation.[23] The study also showed that 3% had episcleritis, 2% had scleritis, and 1% had PUK and sclerosing keratitis.[23] This study demonstrates that ocular manifestations account for common extra-articular manifestations of patients with RA.

The prevalence and pattern of ocular manifestations in patients with SLE were found to be similar to a study[24] in which DES was the most common ocular manifestation. Other less common ocular presentations include episcleritis, scleritis, anterior uveitis and optic disc edema. This is similar to a study which reported the prevalence of ocular manifestations of SLE to be 35% and DES is the most common ocular manifestation.[24] However, this finding differs from a study which reported blepharitis (53.5%) as the most common ocular manifestation, followed by madarosis (28.2%) and stromal keratitis (5.6%), but the patients were Caucasians (32%), Africans (11%) and Indians (1%).[25] This suggests that ocular manifestation in patients with SLE is common across all geographic locations, including Africa.

The prevalence of ocular manifestations in patients with systemic sclerosis appears to be low. The most common ocular presentations are DES, eyelid stiffness and symblepharon. This varies from the findings of a previous study that reported the prevalence of ocular manifestations in systemic sclerosis to be 47% in Australia.[26] This difference can be due to the number of patients with systemic sclerosis studied being higher (n=92) than the patients in this study (n=9). The study reports DES (37-39%) to be the most common ocular manifestation, eyelid stiffness (29-65%), blepharophimosis (37-40%) and rarely lagophthalmos.[26] Although it is a rare condition worldwide, there is an increase in incidence and prevalence occurring between 30 to 50 years of age, three times more common in women than men. Patients of African descent are affected by the condition twice as often as patients of Caucasian descent.[27]

The ocular manifestations of the five patients with mucous membrane pemphigoid (MMP) were keratitis, DES, episcleritis and symblepharon. This finding is similar to a study which reported 60-70% of patients with MMP have ocular manifestations.[28] Although mostly seen in women 2 to 3 times more than in men at an average of 65 years with no ocular predilection, this study probably found few patients because the patients that were studied were younger. Another study similarly showed ocular manifestations of MMP to be 70%,[29] mean age of 60-65 years,(M:F = 1:2) and can affect any race, but more common in Caucasians.[29] Patients presented with conjunctivitis, keratitis, symblepharon, conjunctival keratinization and entropion.[27]

Risk factors for CTDs related to ocular manifestation may include sociodemographic characteristics, treatment and type of

medication. There was a statistically significant association ($p < 0.05$) between ocular manifestations of CTDs and female gender in this study. This shows that ocular manifestation occurs more commonly in females than in males. This is similar to a study on CTDs and the overall influence of gender, which reported that autoimmune diseases are more common in women than in men, and females have a higher prevalence of ocular manifestations compared to males.[20] Another study has also mentioned that female gender is a risk factor in the occurrence of ocular manifestations.[30] This is in keeping with what was obtained in this study, with ocular manifestations being more common in females. Another study also reported that age is a positive predictor of ocular manifestation.[18] This is different from the finding in this study, in which most of the female patients were found to be between 24 to 50 years of age but ocular manifestation was not found to be associated with age.

Geographic differences in patients with ocular manifestations of CTDs have been reported in another study, with a higher prevalence in East Asian populations.[30] The heterogeneity between the studies is possibly due to different patient populations, non-standardized definitions of ocular manifestations, where some studies were using manifestations or presentations, while others were using involvement or complications. Most studies did not separate the age of onset. All of these may contribute to the differences in the results seen.[31] Akintayo et al reported female gender to be associated with a higher prevalence of ocular manifestation than male gender, a mean age of presentation of 47.2 ± 12.5 years.[18] This is similar to what is obtained in this study, where the female gender with a mean age of 37.1± 13.9 years has more ocular manifestations of CTDs. Some studies reported that the black race/ethnicity is associated with a higher incidence and prevalence of ocular manifestations, with the difference being marked in women.[18,30] This is not in keeping with the findings in this study, because there was no comparison with any other race.

It is crucial for medical professionals to collaborate on the diagnosis, treatment and research of ocular manifestations of CTDs across subspecialties. The ophthalmologist may encounter these conditions and fail to recognize the background systemic disease, while a rheumatologist and dermatologist may be preoccupied with the other aspects of CTDs and miss ocular manifestations[4] and overlook the smouldering morbidity due to the disease or its treatment in the eye.[18] Early diagnosis, treatment and prompt referral of patients to these specialists is significant in reducing ocular morbidity and mortality of patients with CTDs.

CONCLUSION

Ocular involvement is commonly seen in CTDs, with dry eye syndrome, episcleritis, keratitis and cataract being the more frequent ocular manifestations. Periodic ophthalmic examination is important for patients with CTDs, as ocular changes may be observed in asymptomatic patients.

RECOMMENDATIONS

All patients with connective tissue disease should have a detailed ophthalmic assessment at diagnosis and periodically. There is a need for full collaboration among rheumatologists, dermatologists and ophthalmologists, with prompt ophthalmic assessment and treatment of patients suspected to have eye manifestations. There is a need to carry out more in-depth studies to further assess the risk factors for ophthalmic manifestations of connective tissue disease.

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Prevalence of Common Ocular Disorders among Secondary School Students in Yola North, Adamawa State, Nigeria

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ABSTRACT

Introduction: Early eye screening is recommended for detecting ocular disorders in children. Schools offer a strategic platform for such public health interventions. Up to about 26% of school-aged children experience visual impairment, emphasizing the need for the timely identification and treatment of eye disorders among this population.

Aim: This study assessed the prevalence and pattern of common ocular disorders among secondary school students in Yola North Local Government Area, Adamawa State, Nigeria.

Methods: A school-based cross-sectional study was conducted from January to February 2024, utilizing a multistage sampling technique. Students from both public and private schools were recruited. Eye examinations included visual acuity assessment, external ocular examination using a pen torch, and fundal examination using a direct ophthalmoscope. Data were analyzed using IBM SPSS version 26.

Results: Out of 460 students screened 94% were under 18 years (mean age of 14.2 ± 2.3 years) and 50.4% were female. The most prevalent ocular conditions were allergic conjunctivitis 176(38.3%), bacterial conjunctivitis 59(12.8%), and refractive error 18(3.9%). Fundus abnormalities included suspicious discs 23(5%), glaucomatous changes- 3(0.7%). Referral uptake was 57.4%.

Conclusion: A significant burden of preventable ocular disorders exists among secondary school students in Yola North, with allergic conjunctivitis being the most prevalent condition and referral uptake for specialist care is suboptimal.

INTRODUCTION

High-quality vision is essential for children to attain their full academic capability in the classroom environments, as most of what is presented for learning needs to be visualized.[1,2]Young children with early onset of vision impairment can face poorer levels of academic work attainment and delayed motor, verbal, emotional, social, and cognitive development, with long-term effects.[3] Visual problems have serious negative consequences on academic achievements, among schoolchildren when they are not recognized early.[1] This has a lasting impact on the individual child, his/her immediate family, and the wider society as educational and economic opportunities may be adversely affected.[2]

Vision screening is the search for unrecognized eye disease or defects by means of a rapid-applied test, examination, or other procedure in apparently healthy individuals. A screening test is not intended to be a diagnostic test; it is only an initial examination.[4] Vision screening in children is important for the early detection of visual impairment, its causes, and the institution of timely interventions.[5,6] Vision screening as part of primary eye care is the primary health care approach to the prevention of blindness.[7] To ensure the eye health of children, appropriate measures must be instituted from early childhood and sustained throughout

adolescence and adulthood to detect developmental defects.

According to the World Health Organization (WHO), approximately 2.2 billion individuals worldwide are affected by near- or far-vision impairment, and in at least one billion of these cases, the impairment could have been avoided or corrected.[8] One million, five hundred thousand children worldwide are blind, of which 1.0 million live in Asia, 0.3 million in Africa, 0.1 million in Latin America, and 0.1 million live in the rest of the world.[9,10,] The Nigeria National Blindness and Low vision survey reported the prevalence of blindness among children aged 10-15 years to be 0.6%.[11]

Under the Vision 2020 programme, the World Health Organization reported posterior segment lesions as the leading cause of childhood visual impairment in developed countries. Whereas, refractive errors and vitamin A deficiency were the most prevalent treatable and preventable causes of childhood blindness and visual disturbances in developing countries.[12,13]

Balarabe *et al.*[14] conducted a study among secondary school students aged 11–20 years in Kebbi State, Nigeria, identifying uncorrected refractive error as the most prevalent visual issue, accounting for approximately 33.3% of cases. Among these, myopia was the most common type (60%), followed by hypermetropia (23.3%), astigmatism (16.7%), and amblyopia (0.16%).[14] Maduka-Okafor *et al.*[15] in a school-based cross-sectional study conducted in 5 south-eastern states of Nigeria, reported that refractive error (hyperopia 0.1% and myopia 2.0%, respectively) was the leading cause of visual impairment and amblyopia, satisfying the predefined criteria, was the second main cause of visual impairment in 30 eyes (5.8%). The cause of visual impairment was undetermined in 19 eyes.[15] Ayanniyi *et al*.[15], in a cross-sectional survey of primary school children in Ilorin, Nigeria, found that the most common ocular disorders among the pupils were refractive errors and vernal conjunctivitis with a prevalence of 6.9% and 6.7% respectively. Other causes included genetic/congenital/ developmental ocular disorders 2.8%, glaucoma /glaucoma suspect 1.4%, ocular infections 1.3%, and ocular trauma 0.8%. Majority of the causes of visual impairment and blindness among the children were avoidable.[16] Similarly, in another study conducted by Adejumo *et al.*[17], in Southwest Nigeria among preschool children, the common ocular disorders among participants were refractive error 3.9%, allergic conjunctivitis 1.3%, strabismus 0.9%, congenital cataract 0.4%, congenital ptosis 0.4%, optic atrophy 0.4%, ectopia lentis 0.2%, and phthisis bulbi 0.2%. However, there was no statistically significant difference in the distribution of ocular disorders by age or gender.[17] In another cross-sectional study conducted among school children in Ifo LGA of Ogun State the common ocular morbidities reported were refractive error 39.7%, glaucomatous optic neuropathy 33.5%, allergic conjunctivitis 19.2%, corneal opacity 2.7% and lenticular opacity 2.2%. Also, ocular morbidities reported among children with severe visual impairment included refractive error 71.4%, allergic conjunctivitis and corneal opacity 14.3%.[18]

Vision plays a crucial role in a child's learning and development.[1,2] Unrecognized visual impairment can negatively affect academic performance, social integration, and overall quality of life.[1] School-based eye screenings offer a practical approach to early detection and intervention, especially in low-resource settings.[18,19] This study assessed the prevalence, types of ocular disorders and referral attendance rate among secondary school students in Yola North, Adamawa State, Nigeria.

METHODS

This school-based descriptive cross-sectional study was conducted between January and February 2024. Ethical clearance for the study was obtained from the Human Research Ethics Committee (HREC) at the National Eye Centre, Kaduna, and permission was granted by the Adamawa State Ministry of Education and Human Capital Development. Assent and parental informed consent were obtained from adolescents aged 10 to 17 years, and informed consent was obtained from those aged 18 to

21 years before recruitment into the study. Using a multistage sampling technique, four hundred and ninety-six (496) students from ten (10) schools (public and private) were selected. Sociodemographic information was obtained using a questionnaire. All students underwent comprehensive eye examinations, which included visual acuity (VA) assessment (using Snellen's chart) in a hallway with access to daylight illumination, external ocular examination with a pen torch, and fundal examination with a direct ophthalmoscope in a dimly lit classroom. Students with VA $\leq$ 6/12 who improved with pinhole (PH) were refracted using the auto-refractor and referred to Modibbo Adama University Teaching Hospital (MAUTH), Yola, for spectacles. Students with VA <6/12 who did not improve with PH or refraction and students with identified ocular pathologies such as allergic conjunctivitis (hyperpigmentation of the periocular skin and brownish discoloration of the eyes), infective conjunctivitis (redness of the eyes and or copious whitish discharge from the eye), cataract/leukocoria (white pupil), corneal opacity, strabismus, suspicious disc (defined by cup disc ratio of >0.5 and asymmetry of 0.2 or more) were referred to MAUTH for further evaluation and management.

Adherence of the students and their parents/ guardians to referral was encouraged via written, text, and phone call reminders, and subsequently confirmed with a referral feedback slip from MAUTH. Referral attendance was assessed three weeks after referral.

IBM SPSS Software (version 26), Armonk, NY, USA, was used to analyze the data obtained, and the data were presented in percentages and means.

RESULTS

Out of the 496 students recruited, 460 (92.7%) were examined. The ages of these students ranged from 10 to 21 years, with 94.1% being under 18 years old and an average age of 14.2 ± 2.3 years. Students from all classes were examined, with Junior Secondary School One and Senior Secondary School One students accounting for a greater proportion of the students (45.2%). Among the students, 57.4% were from privately owned schools. One hundred and forty-eight (32.2%) students had a family history of ocular disorders (Table 1).

The overall prevalence of ocular disorders was 63.9%, as 294 students presented with one or more ocular abnormalities, while 166 (36.1%) had normal ocular findings. The most common ocular disorder identified was allergic conjunctivitis (38.3%), followed by bacterial conjunctivitis (12.8%). Refractive errors were found in 3.9%; myopia (2.2%), hypermetropia (1.5%), and astigmatism (0.2%). Other ocular findings included suspicious disc changes (5.0%), glaucomatous disc (0.7%), corneal opacity (0.7%), cataract (0.4%), and unilateral macular pathology/ optic atrophy (0.4%), as shown in Table 2

A total of 47 (10.2%) students with presenting visual acuity <6/12 that did not improve with pinhole/refraction or with ocular pathology were referred to the tertiary eye care center for further evaluation and treatment. Of the 47 students referred, 27 (57.4%) attended the referral center and received specialist evaluation, while 20 (42.6%) did not honor their referral appointments.

DISCUSSION

The overall prevalence of ocular disorders in this study, 63.9% is considerably higher than findings from other school-based studies conducted in Nigeria. Abah *et al*.[20] in Zaria reported a prevalence of 22.6% among school-aged children, while Ayanniyi *et al*.[16] in Ilorin documented 19.9%**.** This difference may be attributed to the high occurrence of allergic and bacterial conjunctivitis, which together accounted for over half of all detected abnormalities, and may be partly explained by variations in operational definitions of ocular disorders, sample size and sampling methods. The prevalence of allergic conjunctivitis in this study is comparable to the 48.7% found in the study in Ile Ife, Osun state, by Adegbehingbe et al[21] , but higher than 7.4% and 7.3% reported by Ajaiyeoba *et al* [22] and Abah *et al*[20], respectively. The warm, dry, and dusty weather in Adamawa state, Northern Nigeria, in addition

Table 1: Socio-demographic characteristics of the students

Socio-demographic variables	Frequency (n = 460)	Percentage %
Age group (years)		
<18	433	94.1
≥18	27	5.9
Mean age ± SD	14.2 ± 2.3 years	
School type		
Private	264	57.4
Public	196	42.6
Sex		
Male	228	49.6
Female	232	50.4
Class		
JSS1	110	23.9
JSS2	72	15.7
JSS3	49	10.7
SS1	98	21.3
SS2	77	16.7
SS3	54	11.7
Father's educational qualification		
No formal education	6	1.3
Primary	1	0.2
Secondary	92	20.0
Tertiary	361	78.5
Mother's educational qualification		
No formal education	15	3.3
Primary	9	2.0
Secondary	151	32.8
Tertiary	285	61.9
Family history of eye disorder		
No	230	50.0
Yes	148	32.2
Don't know	82	17.8

JSS =junior secondary school, SSS =senior secondary school

Table 2: Prevalence of eye disorders among the students

Eye Disorder	Frequency (n)	Percentage (%)
Allergic conjunctivitis	176	38.3
Bacterial conjunctivitis	59	12.8
Refractive errors (total)	18	3.9
• Myopia	10	2.2
• Hypermetropia	7	1.5
• Astigmatism	1	0.2
Suspicious disc	23	5.0
Glaucomatous disc	3	0.7
Corneal opacity	3	0.7
Cataract	2	0.4
Unilateral macular pathology	2	0.4
Total with ocular disorders	**294**	**63.9**
Normal ocular findings	**166**	**36.1**

to differences in operational definitions of allergic conjunctivitis, study design and population may have accounted for these differences.

The prevalence of refractive error observed in this study is lower than most regional reports[16,23,24] but comparable to Kebbi (4.8%).[14] This may be likely due to differences in diagnostic criteria and students' reading habits.

The prevalence of suspicious optic discs is notably higher than in other Nigerian studies, which reported rates between 0.8% and 3.7%. This could reflect geographic variation or differences in examiner interpretation and sample size.[20,25,26] Other, less frequent conditions like corneal opacities and optic atrophy point to underlying early childhood eye health conditions and poor eye care access.

Referral attendance was suboptimal, with only 57.4% of referred students presenting for further care. Possible reasons for this low referral attendance rate may include parental absence, financial constraints, and academic schedules. Comparable rates have been documented internationally, with improvements seen following structured follow-up interventions.[27,28]

CONCLUSION

Ocular morbidity is prevalent among secondary school children in Yola North, with allergic conjunctivitis being the most common. Referral uptake was suboptimal. Further research into referral systems for school base-screening programmes is recommended.

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Simple Limbal Epithelial Transplantation (SLET) for Chemical Injury: A Case Report from National Eye Centre, Kaduna

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ABSTRACT

Chemical injury to the eye is a sight-threatening emergency that can result in limbal stem cell deficiency (LSCD), which may lead to persistent epithelial abnormalities, corneal opacity and eventual vision loss. Simple Limbal Epithelial Transplantation (SLET) has evolved as a successful, one-stage, minimally invasive surgical approach for restoring the ocular surface in LSCD. We report the case of a 21-year-old male who suffered a serious alkali burn to his left eye after being accidentally exposed to herbicide. Despite initial treatment with extensive irrigation, topical nonsteroidal anti-inflammatory drugs and antibiotics, the patient acquired chronic epithelial abnormalities and corneal conjunctivalization.

Following a diagnosis of unilateral LSCD, autologous SLET was conducted using about 2 × 2 mm limbal sample from the contralateral healthy eye, spread over an amniotic membrane put on the corneal surface with bandage contact lens. Topical antibiotics, corticosteroids and preservative-free lubricants were administered postoperatively. The patient was observed for the first three months. Within three weeks, the ocular surface had stabilized and epithelialized completely. There was no recurrent conjunctivalization or irritation. Best-corrected visual acuity had improved from counting fingers to 6/12 as at the first year post-SLET.

This case demonstrates the safety, ease of use and efficacy of SLET in recovering corneal epithelial integrity and visual function in young individuals with unilateral LSCD following chemical injury. Early referral and adequate surgical intervention are critical for the best results.

Keywords: Limbal Stem Cell Deficiency (LSCD), Simple limbal epithelial transplantation (SLET), conjunctival-limbal autografting (CLAU) and Amniotic Membrane Graft (AMG).

INTRODUCTION

Corneal blindness remains a significant global health challenge, especially in developing nations[1]. Among its causes, Limbal Stem Cell Deficiency due to chemical injuries is particularly prevalent in our environment[2]. Simple limbal epithelial transplantation SLET is a surgical treatment option for unilateral limbal stem cell deficiency[1,3]. It involves the harvesting of healthy limbal stem cells from the healthy contralateral eye and autologous transplantation into the diseased eye to restore vision, improve corneal transparency and prevent conjunctivalization. In the year 2012, SLET was first described by Sangwan and colleagues[4] as an improvement of existing techniques of conjunctival-limbal autografting CLAU and cultured limbal epithelial transplantation CLET[5]. SLET has a success rate that is comparable to the CLAU with similar biopsy size, is more cost-effective due to single -day harvest and transplantation, and eliminates the need for specialized culture media[3].

The aim of this report is to demonstrate the cost-effectiveness of simple limbal epithelial transplantation in reducing avoidable blindness in this part of the world and the need to train our ophthalmologists to acquire the skills to perform SLET.

CASE PRESENTATION

A 21-year-old man from Tegina, Niger State presented to our facility following an accidental alkaline injury to his left eye one year previously while applying herbicides 'Gramazol' (Paraquat dichloride). His main complaints were essentially those of dry eye symptoms, namely: redness, pain, tearing and photophobia. Ocular examination of the right eye at presentation revealed essentially normal findings (Figure 1). The left eye had a best corrected visual acuity of counting fingers at 1m with symblepharon, shallow superior and inferior fornices with nearly 360-degree thick vascularized fibrotic pannus extending from the periphery to the visual axis (Figure 2).

There was only a glimpse of a deep anterior chamber and faint iris details under slit lamp examination. He underwent simple limbal epithelial transplantation by taking an autologous limbal biopsy from the superior limbus of the right eye, which was divided into 10-12 pieces and disseminated on the corneal surface after delicate and comprehensive pannus dissection with a crescent blade (Figures 3-5). A 40mm × 40mm dry amniotic membrane was tucked between the superior and inferior fornices and fastened with nylon 10/0 nylon sutures at the left eye's bulbar and forniceal conjunctiva. Multiple pieces of limbal biopsy from the contralateral healthy eye were evenly distributed on the amniotic membrane, which served as a scaffold for the graft over the cornea (Figure 6). A soft bandage contact lens with a diameter of 16mm was used for mechanical protection against tears and topical medication washout.

The eye was then padded for about 18-20hours while he was administered oral analgesics. On the first post-operative day, the eye pad was gently removed, followed by 4-hourly topical steroids, 6-hourly antibiotics and preservative-free tears supplement using the standard regimen. Follow-up visits were at 1 week (Figures 7 and 8), 2 weeks, 1 month, 3 months and 1 year (Figure 9). At the 2nd week post-operative visit the bandage contact lens, and conjunctival nylon sutures were removed. Topical steroids were tapered for one month, and refraction was performed three months later. This resulted in a stable ocular surface, and visual acuity increased dramatically to 5/60 one week after SLET. The best corrected visual acuity one year after SLET assessment was 6/12 with a refractive correction of -0.25Ds/-0.50Dcyl x 150. Specular microscopy (Figure 10) was performed to evaluate endothelial cell count and morphology at 1 year post SLET (Table 1).

Table 1: Summary of Specular Microscopy results at 1 year follow up

Parameters	Right Eye	Left Eye
CCT	530	526
ECD	2878	2862
CV	26	24
HEX	73	68

CCT-Central Corneal Thickness,
ECD-Endothelial Cell Density,
CV-Coefficient of Variation, HEX-Hexagonality.

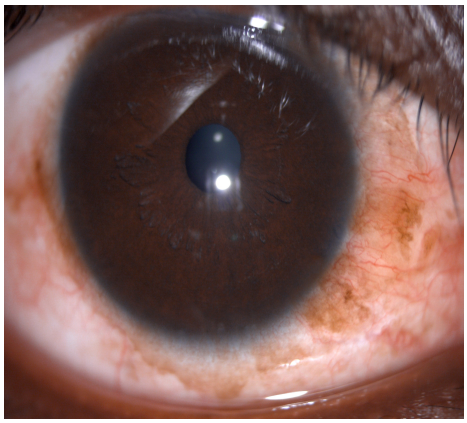

Figure 1: Pre-operative picture of Right Eye

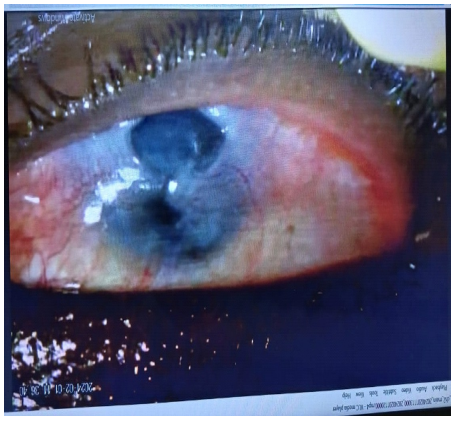

Figure 2: Pre-operative picture of Left Eye

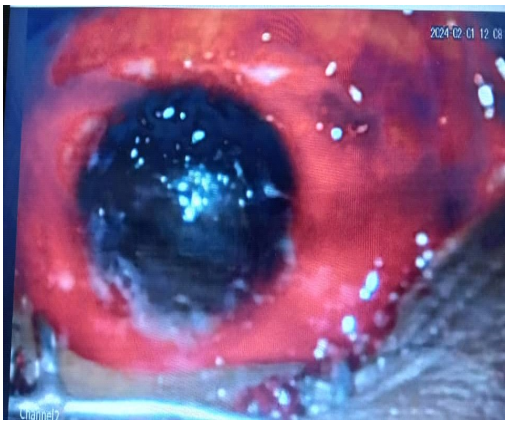

Figure 3: Intraoperative picture after dissection of fibrovascular pseudopterygium in Left Eye

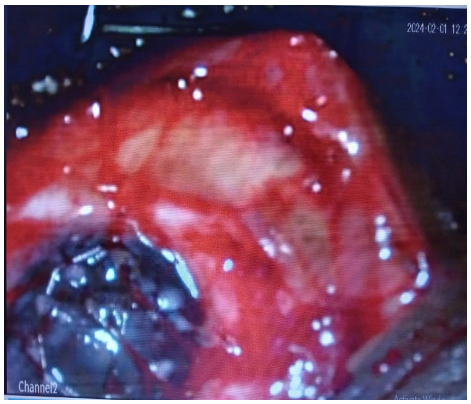

Figure 6: Intraoperative picture showing Amniotic Membrane Graft and freshly harvested Limbal Epithelial Tissue over Left Eye

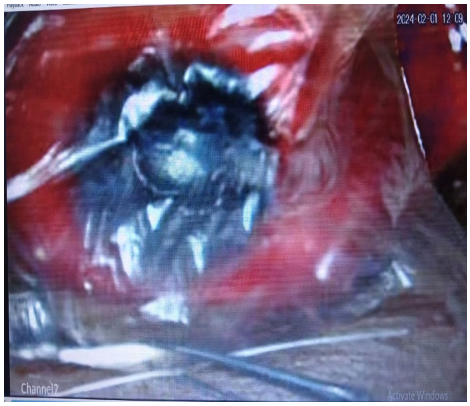

Figure 4: Intraoperative picture after dissection of fibrovascular pseudopterygium and placement of Amniotic Membrane Graft in Left Eye

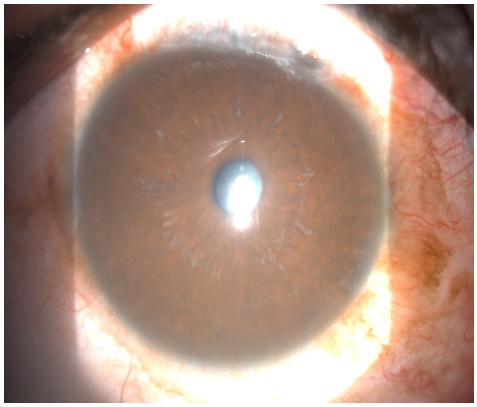

Figure 7: One Week Post-operative picture of Right Eye

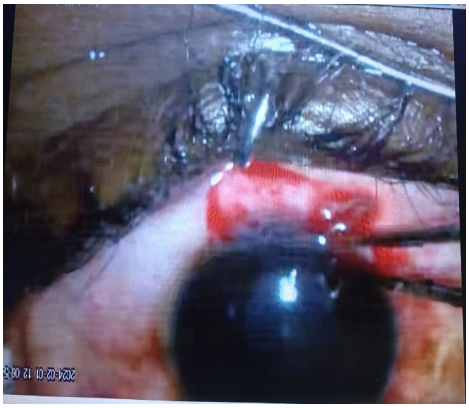

Figure 5: Harvesting Limbal epithelial tissue from the Right Eye at 10 - 2 O'clock position

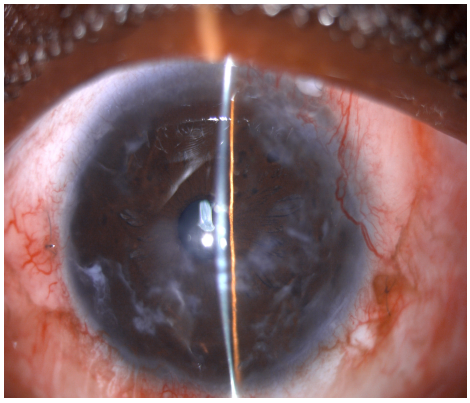

Figure 8: One Week Post-operative picture of Left Eye

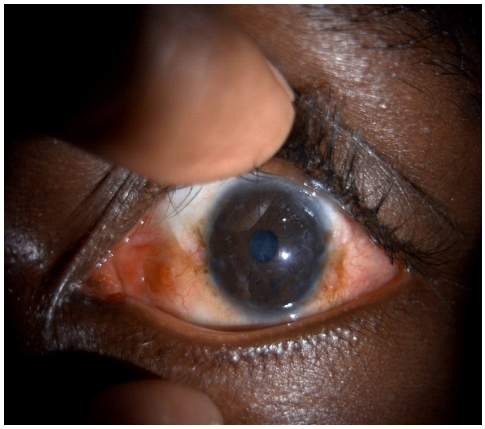

Figure 9: 1-year Post intervention picture of Left Eye

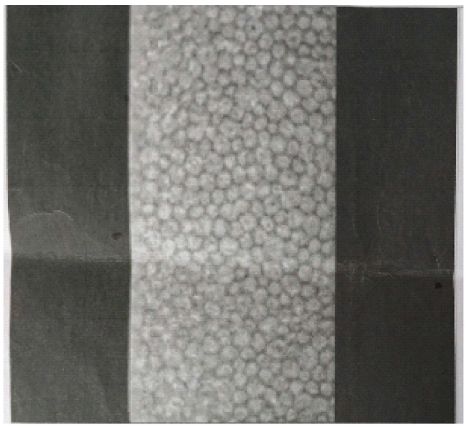

Figure 10: Left Eye Endothelial Cells

DISCUSSION

Accidental chemical burns are still very common in our environment[2] and can result in severe ocular surface injuries. Alkaline agents, which are found in most household chemicals cause rapidly progressive damage due to their characteristic ability to penetrate and result in saponification of cellular membranes.

The advent of cost-effective procedures like SLET and the replicability of its results has made life significantly easier for corneal specialists[4] in restoring vision caused by unilateral LSCD from chemical burns. The success of SLET has also been adapted by other specialties like oculoplastic to treat LSCD following large ocular surface squamous neoplasia excision. However, very little of this procedure is done and reported in this part of the world. The reason for this low uptake may be due to lack of skill among ophthalmologists as well as lack of motivation to acquire the skills for such vision-saving procedures. It may also be due to the lack of availability of affordable bandage contact lenses, and processed dry amniotic membrane graft.

The reports from most studies on SLET showed up to 70-85% stable epithelialization and visual improvement of eyes with chemical-related injury leading to LSCD[6]. Like in our case, complete epithelialization and residual corneal opacity occurred within the first three months post-operatively, with improved best-corrected visual acuity, while recurrence of conjunctivalization was not observed. These findings were in keeping with prior studies reporting excellent anatomical and functional outcomes in young adults with unilateral LSCD[7]. According to most studies done in Asia, there is a long-term decrease in total endothelial cell count in eyes affected by unilateral chemical injury leading to LSCD. This was not so in our case. Specular microscopy done one year post SLET showed normal findings although a longer follow up with a repeated specular microscopy is necessary for long-term evaluation.

In conclusion, SLET procedure is simple, cost-effective and does not require sophisticated instrumentation like other corneal surgical procedures.[8] However, the procedure is not commonly done in Nigeria hence there is a critical need for training and re-training of ophthalmologists in Nigeria to improve skills particularly in performing SLET. Such efforts are crucial in reducing widespread causes of avoidable corneal blindness.

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GLAUCOMA

Pattern of presentation and risk factors of dry eye disease among glaucoma patients on topical medications in Ahmadu Bello University Teaching Hospital, Zaria

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Introduction: Glaucoma is the second leading cause of blindness in the world. Globally, 36 million are blind[1], and of these, 4.5 million (12%) are blind from glaucoma.[2] There is strong evidence suggesting that glaucoma medications may contribute to ocular surface disease (OSD) and the development of dry eye disease (DED).[3,4]

Methods: This was a hospital-based descriptive, cross-sectional study of 181 adult glaucoma patients seen at the Eye Clinic of Ahmadu Bello University Teaching Hospital, Zaria, Kaduna State, Nigeria. Ethical approval for the study was obtained from the Ethics and Research Committee of the Hospital and informed consent was obtained from the participants.

For the purpose of this study, the diagnosis of dry eye disease was based on the Dry Eye WorkShop Diagnostic Methodology[5] as follows: presence of a positive Ocular Surface Disease Index(score of $\geq$ 13)[6] together with either an abnormal Schirmer's 1 test (reading of less than 10mm wetting in 5 minutes)[7] or an abnormal Tear Break Up Time (an appearance of the first randomly distributed dry spot in less than 10 seconds).[7]

Chi-square test and binary logistic regression were used to check for the association of risk factors with DED and statistical significance was set at 95% confidence interval (<0.05).

Results: A total of 181 participants were studied with a mean age of 54±15.7 years.

Table 1: Pattern of symptoms of dry eye disease among 181 glaucoma patients using Ocular Surface Disease Index (OSDI) Questionnaire

SYMPTOM	PRESENT(%)	ABSENT(%)	TOTAL
Ocular symptoms			
Blurred Vision	98(54.1)	83(45.9)	181
Gritiness	92(50.8)	89(49.2)	181
Sensitive to light	67(37)	114(63)	181
Painful or sore eyes	62(34.3)	119(65.7)	181
Poor vision	48(26.5)	133(73.5)	181
Vision related symptoms			
Discomfort with: Reading	56(30.9)	125(69.1)	181
Driving at night	54(29.8)	127(70.2)	181
Working with a computer	44(24.3)	137(75.7)	181
Watching television	36(19.9)	145(80.1)	181
Environmental triggers:			
Windy conditions	37(20.4)	144(79.6)	181
Dry areas	20(11)	161(89)	181
Air conditioned room	17(9.4)	164(90.6)	181

There were 115 (63.5%) females with a female-to-male ratio of 1.74:1. The prevalence of dry eye disease was found to be 40.9%. Grittiness (51%) and blurring (54%) of vision were the most common presenting symptoms (Table 1). Older age, female gender, longer duration of drug administration and mean deviation were found to be statistically significantly associated with a diagnosis of DED (Table 2).

Table 2: Binary logistic regression for predictors of dry eye disease among glaucoma patients in Ahmadu Bello University Teaching Hospital, Zaria

		B	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	**Age**		0.006			
	40-59 Years	1.036	0.274	2.818	0.440	18.060
	60-69 years	1.583	0.0101	4.8730	0.736	32.25
	80 and above	2.326	0.014	10.237	1.603	65.362
	Female	-0.721	0.049	2.486	0.230	5.028
	Duration of Diagnosis >4 years)	-0.593	0.028	1.553	0.258	3.186
	Treatment regimen		0.434			
	Timolol	-0.153	0.854	0.858	0.169	4.364
	Brimonidine	1.094	0.280	2.988	0.410	21.771
	Timolol+Dorzalamide	0.397	0.689	1.487	0.213	10.366
	Timolol+Travoprost	0.105	0.894	1.110	0.238	5.182
	Timolol+Brimonidine	0.636	0.487	1.890	0.314	11.381
	Timolol+D+T	2.180	0.062	8.848	0.900	87.041
	Timolol+D+B	0.196	0.803	1.216	0.260	5.685
	Treatment period (> 5 years)	1.860	0.003	6.425	1.872	22.055
	Mean deviation		0.007			
	Moderate	1.281	0.008	3.599	1.388	9.333
	Severe	1.367	0.004	3.925	1.561	9.866
	Constant	-3.546	0.008	0.029		

D- Dorzalamide; T- Travoprost; B- Brimonidine

Discussion: The commonest presenting symptoms of dry eye disease in this study were blurred vision (54 %) and grittiness (51%). This differs from the study by Sarimiye et al[8] that reported stinging (38%) and burning (25%) as predominant complaints. While Pisella et al[9] in a multicenter study of 4107 patients in France documented 'discomfort' as the most common symptom. There was higher propensity of dry eye disease among those 60-79 years (Odds ratio 4.9) and 80 years and older (Odds ratio: 10) compared to those below 40 years in this study. This finding was corroborated by Fetchner et el[4] in their study. Gender also had a significant association with DED. This is consistent with other studies.[10,11]Duration of treatment of glaucoma with topical antiglaucoma medications was significantly associated with DED and this is corroborated by other studies.[12,13]

Conclusion: Dry eye disease is a common association of topical antiglaucoma medications; it predominantly presents with

blurred vision and grittiness. Identified risk factors include: Older age, female gender, increased duration of drug use and severity of glaucoma. The assessment and treatment of dry eye disease should be integrated in the management of glaucoma to ensure total ocular care of these patients. The screening for dry eye disease should be periodic to ensure early diagnosis and treatment.

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Case report on recurrent Retinoblastoma

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Introduction: Retinoblastoma is the commonest childhood ocular malignancy, accounting for about 2.5 to 4 % of all paediatric malignancies.[1,2] The disease is a life-threatening cancer though good survival rates have been reported especially in advanced countries, where detection is early with good care.[3] The challenges of management in low- and middle-income countries are late presentation and paucity of trained manpower for cancer care.[3] However, cases of recurrence have been recorded despite optimal care.[2,3] The purpose of this case report is to highlight the need for vigilance, lifelong follow up and optimal care, with a high index of suspicion for recurrence.

Case Presentation: A 10-year-old boy, born in Zaria, Nigeria, first presented on 12/08/2016 after his mother noticed a whitish speck in his right Eye (RE) at 18 months of age. Examination revealed a healthy-looking child with stable vital signs. Visual acuity was uncentral, unsteady and unmaintained fixation on the right eye and central, steady and maintained fixation on the left eye. There was a whitish mass filling the whole of the vitreous of the RE. Examination under anesthesia (EUA) done on 30/08/2016 showed tumour in the left eye (LE). A diagnosis of bilateral retinoblastoma: RE group E and LE group C was made. His parents were subsequently counselled on their child's condition. He had right eye (RE) Enucleation with orbital implant. Histology report revealed nuclei hyperchromasia with scanty cytoplasm, and necrotic fleurettes, pathognomonic of Retinoblastoma. The tumor involved the optic nerve stump. He received 15 cycles of high-dose chemotherapy [HDC] (Vincristine, etoposide and carboplatin), at monthly intervals, plus 3 cycles of transpupillary thermotherapy (TTT) in the left eye. EUA done on 11/04/2017 revealed no evidence of disease. He had 6 more cycles of HDC in view of optic nerve involvement. EUA done on 11/01/2018 showed tumour tumour-free status with visual acuity of 6/6 in the LE. He subsequently underwent 6-monthly EUA until late 2021 and continued follow-up in another facility throughout 2022. He presented on 20/02/2023 with complains of deterioration of vision in LE. His visual acuity was 6/18, with a hypopyon like deposit in the anterior chamber

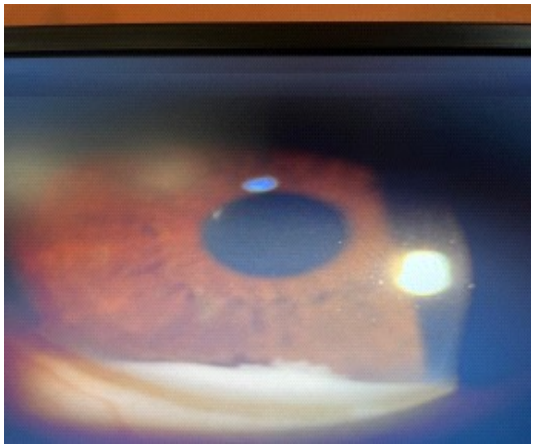

Figure 1. Clinical photograph of the left eye showing hypopyon-like deposit in the anterior chamber

(Figure 1). EUA confirmed a tumour recurrence in the LE.

He was reviewed by the Oncologist who recommended administration of 2nd line drugs. He subsequently had 3 doses of intracameral and intravitreal Topotecan, 1 mg. The tumor in the anterior chamber (AC) disappeared after two doses. He subsequently developed cataract for which he had lens washout with foldable intraocular lens (IOL) implant. His current V/A in the LE is 6/36. The most recent magnetic resonance imaging (MRI) done revealed no intracranial involvement. The oncologist plan is

to continue with chemotherapy, and also discussed with the national Retinoblastoma Network (RB- NET)who advised on counselling

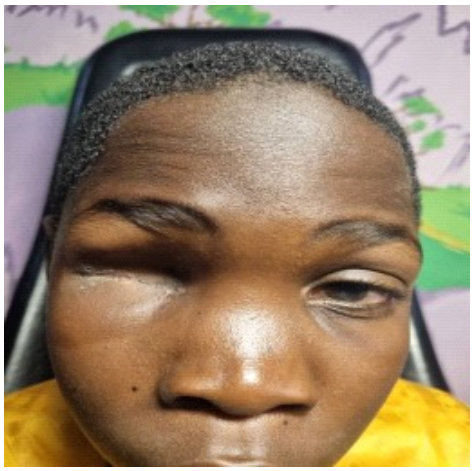

Figure 2: Clinical photograph showing the right enucleated socket and the left only eye.

parents for enucleation of the remaining only eye (Figure 2).

Discussion: Reese[4] published the first study on RB recurrence in 1948, and estimated an orbital recurrence rate of 72 %. A review of RB recurrence done in 2019 noted that recurrence is usually intraocular with rates ranging from 6 to 45 percent[5]. In another study, the estimated rate of recurrence was 46% at 3 years and 50% at 5 years.[2] Despite the use of many treatment options that salvage the globe and life of children, recurrence rates have been on the increase,[2] especially where late presentation, anterior chamber involvement and intracranial spread has occurred.[4] Most recurrences occur within 3 years of treatment, though late recurrence that occurred after more than 10 years has been reported[4]. Following systemic chemoreduction, which was the first-line treatment for this patient, it is estimated that the rate of development of new retinal tumors range from 24 to 44 %.[4] For the index patient, recurrence was noticed 6 years after initial diagnosis. It is worthy to note that most studies stated diagnosis and treatment were delayed in about one third of patients [4] which is a common problem in developing countries like Nigeria, mainly because paucity of trained personnel e.g. paediatric ophthalmologists. Patients have to travel across different geopolitical zones to access paediatric cancer care. However, in this index case who presented quite early to one of the best tertiary eye care centers and had the best optimal treatment possible, recurrence still occurred. This underscores the need for strict vigilance and maintaining high index of suspicion for recurrence, so that the correct plan of treatment can be continued with regards to second line and adjuvant treatment. Regular and lifelong follow up of the patient is required to prevent recurrent RB.

Conclusion: Retinoblastoma care and treatment remain a challenge in developing countries. Cases of recurrence have been recorded years after successful treatment as in this index patient. Follow-up should be for life despite successful treatment.

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Real World Experience of Intravitreal Faricimab for Retinal Vascular Disease in Ibadan

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Background: Retinal vascular diseases constitute a leading cause of global visual impairment.[1] This challenge is amplified in developing countries like Nigeria, where the intersection of increasing diabetes prevalence and limited access to subspecialty retinal care creates a growing unmet medical need.[2]

Evidence-based treatment guidelines from the American Academy of Ophthalmology have established intravitreal Anti-Vascular Endothelial Growth Factor (Anti-VEGF) agents as the standard of care for centre-involving Diabetic Macular edema with vision loss[3], Retinal Vascular Occlusion-related macular edema[4], and neovascular Age-related Macular Degeneration[5]. Nevertheless, the treatment paradigm faces practical limitations due to the frequent injection schedules required by current anti-VEGF monotherapies, resulting in considerable patient and healthcare system burden.

Faricimab (Vabysmo®) introduces a breakthrough bispecific approach by simultaneously targeting Vascular Endothelial Growth Factor-A (VEGF-A) and angiopoietin-2 pathways.[6] This dual mechanism reduces vascular permeability and neovascularization while stabilizing blood vessels and decreasing VEGF-A sensitivity, achieving longer treatment intervals than conventional anti-VEGF agents.[7-11] Following faricimab's recent introduction in Nigeria, we present our initial real-world experience at University College Hospital, Ibadan.

Methods: A retrospective case series of patients who received intravitreal faricimab injections for retinal vascular diseases at the Department of Ophthalmology, University College Hospital, Ibadan. Patients' demographic characteristics, diagnosis, baseline and follow-up best corrected visual acuity (BCVA), optical coherence tomography findings, number of injections, and adverse events were obtained from the patients' records and analysed. Cases included diabetic macular edema (DME), central retinal vein occlusion with macula edema (CRVO + ME), and choroidal neovascular membrane (CNVM) from wet age-related macular degeneration.

Results: Ten patients were treated with faricimab, including 4 cases of DME, 3 cases of CRVO with macular edema, and 3 cases of wet AMD with CNVM. Their ages ranged from 56 to 79 years. Visual acuity (VA) improvements were observed after the first injection in 8 cases. Notable outcomes included: Case 1 (CRVO) - VA improved from counting fingers to 6/12; Case 2 (CRVO) - VA improved from counting fingers to 6/18; Case 7 (CNVM) - VA improved from 6/60 to 6/12 after switching from bevacizumab; Case 10 (CNVM) - VA improved from 6/36 to 6/12 after failed bevacizumab and aflibercept therapy. Complete resolution of macular edema and subretinal fluid was achieved in 8 cases after the first injection and all cases after the third injection. Two cases (20%) developed sterile intraocular inflammation with elevated intraocular pressure (28-40 mmHg) occurring 1-2 weeks after the third injection, which resolved with topical anti-inflammatory and anti-glaucoma medications.

Conclusion: Real-world application of faricimab in Ibadan demonstrates significant therapeutic potential for retinal vascular diseases, with patients achieving rapid visual and anatomical improvements. Careful surveillance for inflammatory responses remains essential, particularly after the second injection. Region-specific randomized controlled

trials are needed to establish evidence-based treatment algorithms for our population.

Keywords: Faricimab, retinal vascular disease, diabetic macular edema, retinal vein occlusion, age-related macular degeneration, Nigeria

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Interrelationship between glycated hemoglobin and fasting blood sugar on status of diabetic retinopathy among type 2 diabetic patients at a tertiary hospital in northwestern Nigeria

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Introduction: Diabetic retinopathy (DR) is the most common cause of preventable blindness in the world's adult working population.[1] More than 60% of patients with type 2 diabetes mellitus (DM) will develop some degree of retinopathy after 20 years with the disease.[2] DR is the most common complication of DM and is expected to increase substantially by 2045.[3]

Glycated hemoglobin (HbA1c) reflects the average blood glucose level over about three months, but may mask clinically significant glycemic fluctuations.[4] Current screening methods may be missing those at highest risk of DR. Glycemic gap refers to the difference between the estimated average glucose derived from HbA1c and the measured fasting blood sugar (FBS). Glycemic gap can act as a useful surrogate marker of glycemic fluctuation.[5]

Methods: The study was a hospital-based observational cross-sectional study involving 329 patients selected consecutively. The study population were type 2 diabetic patients attending routine diabetic clinic at Aminu Kano Teaching Hospital (AKTH). Patients with chronic kidney disease and media opacities were excluded.

All participants underwent:

- Fasting blood samples for HbA1c and FBS, collected at the same time
- Comprehensive ophthalmic examination including dilated fundoscopy and fundus photography
- Early Treatment Diabetic Retinopathy Study (ETDRS) grading of DR
- Calculation of Glycemic Gap = FBS - [(28.7 × HbA1c) – 46.7][5]

Results: The participants' ages ranged from 26 to 77 years with a mean of 53.78 ± 11.58 years. The prevalence of diabetic retinopathy was 28.9%. The mean glycemic gap for the entire study population was 10.0 mg/dl, with a range of -63.5 mg/dl to +52.8 mg/dl. Among the participants, 187 (56.8%) had a positive glycemic gap and 142 (43.2%) had a negative glycemic gap. There was a significant association between the level of glycemic gap and the presence of diabetic retinopathy (p = 0.015). Patients with positive glycemic gap were significantly more likely to have diabetic retinopathy compared to those with negative glycemic gap (Table 1).

Table 1: Association between glycemic gap and presence of Diabetic Retinopathy

	Diabetic Retinopathy			
Glycemic gap	Yesn = 94	Non = 232	$\chi 2$	P value
Positive	79 (42.2%)	108 (57.8%)	37.714	<0.001
Negative	16 (11.3%)	126 (88.7%)		

Discussion: The prevalence of DR in this study is comparable to the global prevalence[6] and the prevalence figures from a pooled analysis of various hospital-based studies in Africa[7] and in Enugu[8] and Katsina[9] states. The mean glycemic gap was lower than that reported by Sonoda[10] and slightly higher than that reported by Caprnda[11]. This may be due to differences in the study design. A significant association was found between glycaemic variability (GV) measured as glycemic gap and diabetic retinopathy, aligning with findings from several recent studies. [5,12,13,14] However, studies by Sonoda[10] and Caprnda[11] reported no association. This discrepancy may be attributed to differences in the methods used to evaluate GV, as both studies utilized the mean amplitude of glycemic excursions index. A positive glycemic gap drives DR through repetitive oxidative stress and endothelial dysfunction, triggering pericyte loss, VEGF upregulation and blood-retinal barrier breakdown.

Conclusion: This study showed a significant association between glycemic gap as a marker for glycemic variability and diabetic retinopathy.

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Clinical features of patients presenting with choroidal melanoma at Eye Foundation Hospital, Ikeja, Lagos, Nigeria

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Background: Ocular melanomas are the most common primary intraocular tumors in adults, with the choroid being the most frequently affected uveal site.[1,2] Their incidence is highest among populations of European ancestry and lowest among Asian and African populations. Clinical presentation varies depending on tumor location. Diagnosis is typically non-invasive, relying on slit-lamp examination, fundus evaluation, and ultrasonography.

This case series describes four patients seen between 2010 and 2025 with choroidal melanomas, highlighting their clinical presentations, fundus findings, and ultrasonographic features (A- and B-scan).

Case Series

Case 1

A 58-year-old female of British (Caucasian) origin presented with a 6-week history of progressive vision loss in the right eye. Visual acuity (VA) was 3/60 (right) and 6/6 (left). Fundoscopy revealed a large pigmented mushroom-shaped lesion in the inferotemporal quadrant, within 2 disc diameters of the optic disc, measuring approximately 8 disc diameters, with adjacent subretinal fluid. Cup–disc ratio was 0.2. The left fundus was normal. Ultrasound B scan showed an inferotemporal dome-shaped mass with low reflectivity on A-scan and orbital shadowing.(Table 1, Figure 1a) A diagnosis of right choroidal melanoma was considered, and patient was referred to an ocular oncology center in her home country.

Case 2

A 46-year-old male of African descent presented with complaints of an overhanging shadow in the superior visual field of the right eye. VA was 6/6 bilaterally. Fundoscopy showed a dome-shaped hyperpigmented inferonasal mass overlapping the optic disc, measuring 8 disc diameters, with perilesional orange pigments but no sentinel vessels or subretinal fluid. The left fundus was normal. Ultrasound revealed a mushroom-shaped mass with homogeneous opacity on B-scan, low internal reflectivity on A-scan, choroidal excavation, and orbital shadowing.(Table 1, Figure 1b) A diagnosis of right choroidal melanoma was made, and the patient was referred to the oncology unit of a tertiary hospital.

Case 3

A 45-year-old female of African descent presented with reduced vision in her left eye. VA was 6/6 (right) and 6/18 (left). Fundoscopy showed a large parapapillary hyperpigmented mass (>12 disc diameters) in the nasal and superonasal quadrants, with indistinct margins and extensive subretinal hemorrhage obscuring the optic disc.

Ultrasound demonstrated a large dome-shaped choroidal mass with low reflectivity, choroidal excavation, orbital shadowing, and associated exudative retinal detachment.(Table 1, Figure 1c) A diagnosis of left choroidal melanoma was considered, and the patient was referred to the teaching hospital's ocular oncology service.

Case 4

A 29-year-old male of African descent presented with a 1-month history of progressive visual loss, diplopia, and floaters in the right eye. He had previously received 3 intravitreal bevacizumab injections at another facility without improvement. His initial diagnosis was not available for review. VA was 6/12 (right) and 6/6 (left). Fundoscopy showed a large superotemporal choroidal mass overlapping the optic disc (~10 disc diameters), with associated exudate and exudative retinal detachment. The left eye was normal.

Ultrasound revealed a large dome-shaped choroidal mass with exudative detachment. A-scan showed low internal reflectivity with choroidal excavation and orbital

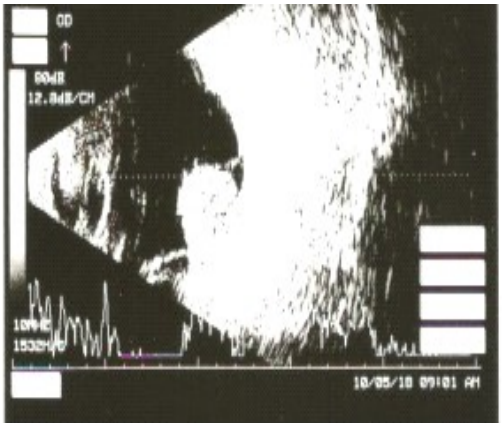

Figure 1a

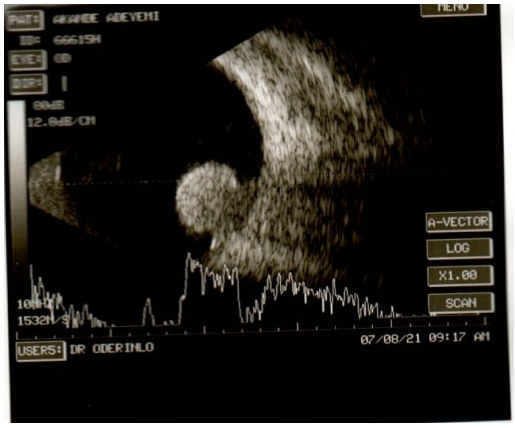

Figure 1b

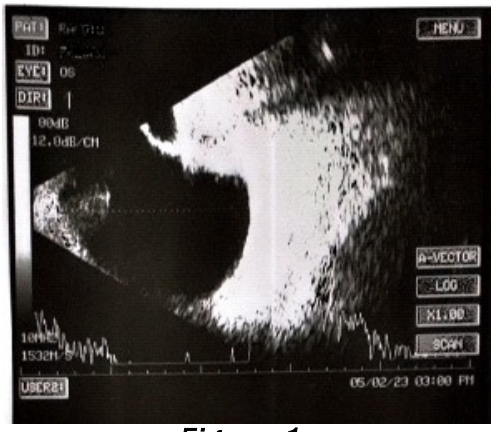

Figure 1c

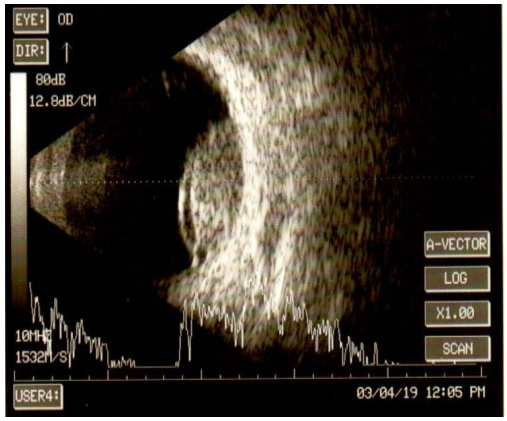

Figure 1d

Figure 1. Ultrasound A and B scan features of patients presenting with ocular melanoma in Eye Foundation Hospital Lagos, Nigeria. Showing mushroom and dome shaped choroidal masses with orbital shadowing.

shadowing.(Table 1, Figure 1d) Right choroidal melanoma was diagnosed, and a Positron Emission Tomography (PET) scan was requested, but the patient was lost to follow-up.

Discussion: This case series highlights the rarity of choroidal melanoma in our setting: only four patients were diagnosed over 15 years (2010–2025). This reflects the lower incidence of ocular melanoma in African populations, possibly due to the protective effect of increased choroidal melanin in darker skin.

Ultrasonography was the principal diagnostic tool, with consistent findings across cases: dome- or mushroom-shaped masses, low internal reflectivity on A-scan, homogeneous opacities on B-scan, choroidal excavation, orbital shadowing, and frequent association with subretinal fluid or exudative retinal detachment.

Outcomes of management of reported cases were not available to the authors.The low awareness of intraocular tumors in Africa may delay diagnosis.[8,9] Increased clinical vigilance is therefore warranted, even in populations with low incidence.

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Table 1: Summary of the clinical and ultrasonic features of patients with ocular melanoma

Case	Age	Gender	Melanoma location	Subretina fluid	Shape on B scan	A scan reflectivity	Orbital shadowing	Choroidal excavation
1	58	Female	Inferotemporal	Yes	dome	low	Yes	Yes
2	46	Male	Inferonasal	No	Mushroom	low	Yes	Yes
3	45	Female	Superonasal and Nasal	Yes	dome	low	Yes	Yes
4	29	Male	Superotemporal	Yes	dome	low	Yes	Yes

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Panretinal photocoagulation: Indications, outcomes, and complications in retinal ischemic disorders at a tertiary eye care center in Kano State

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Introduction: Panretinal photocoagulation (PRP) remains the gold standard for managing proliferative diabetic retinopathy (PRP) and other retinal ischemic disorders.[1,2] By applying laser burns to the peripheral retina, PRP reduces oxygen demand and promotes regression of neovascularization.[3,4] While its efficacy in reducing the risk of severe vision loss is well established, PRP may be associated with adverse effects that impact visual

outcomes.[5,6,7] The objective of this study was to describe the indications, visual outcomes, and complications associated with PRP in patients treated at a tertiary eye care center.

Methods: A retrospective review was conducted of patients who underwent PRP at Makkah Eye Specialist Hospital, Kano over a period of two years (July 2022 to June 2024). Data extracted included demographic characteristics, clinical indications, number of PRP sessions, visual acuity (pre-and post-treatment), complications, and need for adjunctive therapy. Descriptive analysis was performed using IBM SPSS version 26.

Results: A total of 61 eyes of 33 patients (mean age: 51.1 ± 10.3 years, 69.7% male) were included. The most common indication was Proliferative diabetic retinopathy (39.4%), followed by Advanced diabetic eye disease in 27.3% of patients (Table 1). Visual acuity improved in 23.0% of patients, remained stable in 57.4%, and worsened in 19.6% (Table 2). Reported complications included Vitreous hemorrhage (8.3 %), and Tractional retinal detachment (5.0 %). Anti-VEGF therapy was required in 5.0% of cases, while 25.8% of patients underwent subsequent vitrectomy.

Conclusion: PRP is effective in stabilizing vision and slowing disease progression in ischemic retinopathies. Majority of patients achieve visual stability, although some may require adjunctive interventions. Close

Table 1. Indications for panretinal photocoagulation among 33 patients

Indication	Frequency	Percentage (%)
Proliferative Diabetic Retinopathy	13	39.4
Advanced Diabetic Eye Disease	9	27.3
Non-Proliferative Diabetic Retinopathy	3	9.2
Vitreous Haemorrhage	2	6.1
Cystoid Macular Oedema	1	3.0
Tractional Retinal Detachment	1	3.0
Neovascularisation elsewhere	1	3.0
Central Retinal Vein Occlusion	1	3.0
Branch Retinal Vein Occlusion	1	3.0
Proliferative Sickle Cell Retinopathy	1	3.0

Table 2: Outcome of panretinal photocoagulation among 61 eyes

Outcomes	Frequency	Percentage
Complications		
Vitreous Haemorrhage	5	8.3
Tractional Retinal Detachment	3	5.0
None	53	86.7
Visual outcome		
Improved	14	23.0
Stable	35	57.4
Worsened	12	19.6
Further intervention		
Yes	36	59.0
No	25	41.0

monitoring is essential to manage potential complications and optimize outcomes.

Keywords: Panretinal photocoagulation, proliferative diabetic retinopathy, retinal ischemia, laser photocoagulation, visual outcome.

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From beautiful nails to sore eyes: a case of ocular super glue injury in Abuja

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Introduction: Commercial cyanoacrylate glue (super glue) has gained popularity among young ladies due to its high adhesive ability when used to hold stick-on artificial nails.[1–3] Artificial nail fixing accounts for 3.8% of cases of ocular super glue injury.[4] Previous cases of ocular super-glue instillation have been reported in Nigeria, in two patients who mistook it for their ophthalmic eye ointment.[5,6] Burning sensation and inability to open the eyelids are common symptoms. Ocular findings may include: inadvertent tarsorrhaphy, eyelash loss, bruises along the eyelid margins, conjunctival hyperemia, chemosis, and corneal epithelial defects.[5–8] Ocular super glue instillation can be prevented by the use of protective eyewear during use, proper handling and a change in packaging to avoid accidental instillation in place of an eye ointment.[1,5] We present a case of ocular super glue injury.

Case Report: Miss A.E., a 25-year-old lady presented to the hospital's emergency department on account of inability to open the left eye for 2 hours after super glue accidentally squirted into her left eye while trying to fix nail extensions. She also had tearing, mild eye pain and foreign body sensation in the left eye. Prior attempts to open the eye after irrigation proved abortive. Examination of the left eye showed dried glue residue on the eyelids and eyelashes, chemical tarsorrhaphy involving more than two-thirds of the eyelids, and mild lid margin hyperemia (Figure 1).

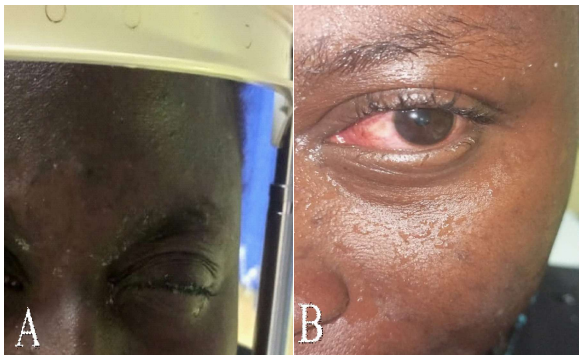

Figure 1. A: *Glue crusts and inadvertent chemical tarsorrhaphy of the left eyelids.* ***B:*** *Open left eyelids after gentle manipulation, conjunctival hyperemia and mild cornea haze are also shown*

The right eye was essentially normal. Copious irrigation with 1 litre of normal saline was done, amethocaine eye drops were instilled, and KY-jelly mixed with 0.1mls of lidocaine was applied over the eyelid margin and lashes. Gentle manipulation was done using KY-jelly lubricated cotton buds to open the lids. On further examination, visual acuity was 6/12 on the right and 6/9 on the left. Slit lamp examination showed glue crusts on the ocular surface, which were removed under topical anaesthesia, and corneal abrasions mildly staining with fluorescein (Figure 2).

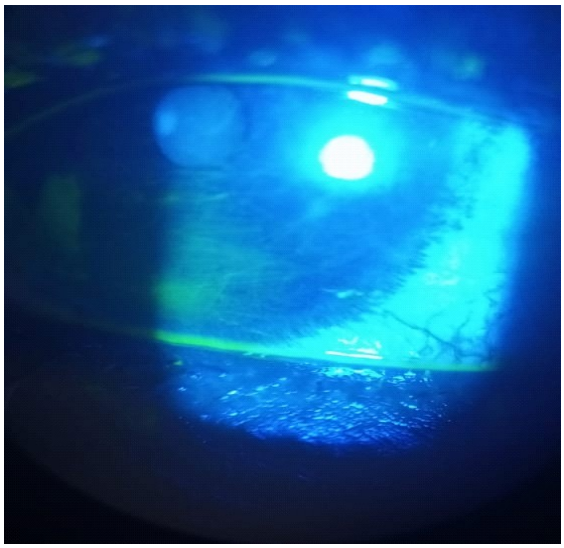

Figure 2: Fluorescein-stained cornea abrasions caused by superglue

She was placed on tetracycline ointment and nepafenac eye drops.She was commenced on steroid ointment after 48 hours, and this was used for 10 days. An artificial tear gel was used for another 2 weeks. At 6 weeks post-injury, visual acuity was 6/6 BE, and she also had a refraction with BCVA of 6/5 in both eyes. The patient's informed consent was obtained for the clinical photographs and this case report.

Discussion: Cosmetic-related cyanoacrylate glue injuries following nail and eyelash fixing are becoming popular. [2,4,9] Improper handling is a common risk factor in adults.[7] Like the index case, other studies have reported chemical tarsorrhaphy and corneal abrasions after these injuries.[2,5-7,9] Although thorough irrigation is advised by cyanoacrylate glue manufacturers, the rapid polymerization when in contact with fluid makes this poorly effective. Thorough ocular lubrication, lash trimming, and surgical separation have been used in other studies. [2,5-7,9] Our report describes an effective and low-cost method of managing cyanoacrylate glue-induced chemical tarsorrhaphy by gentle manipulation using a lubricant mixed with a local anaesthetic agent.

Conclusion: Accidental splash of superglue into the eyes can occur during nail fixing, and protective eye wear is advised to prevent this. Management consists of copious lubrication, gentle eye opening under topical anaesthesia, and topical steroid/antibiotic ointments. Prompt management results in complete recovery and good visual prognosis.

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Surgically induced astigmatism following manual small incision cataract surgery versus phacoemulsification in age-related cataract: a comparative analysis

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Background: Cataract surgery is among the most common and successful procedures globally.[1,2] While phacoemulsification is the more advanced method, manual small incision cataract surgery (MSICS) remains prevalent in developing countries due to its affordability, shorter duration, and comparable visual outcomes.[3-5] There is limited comparative data from Nigeria on corneal astigmatism and refractive stability between MSICS and phacoemulsification. This study aims to compare these outcomes between the two techniques.

Materials and Methods: The study was a prospective hospital-based, comparative study of consecutive patients with age-related cataracts, randomized into 2 groups by randomly assigning letters A and B in a ratio of 1:1 to undergo MSICS (group A) or phacoemulsification (group B) using the superior approach, comparing the surgically induced corneal astigmatism (SIA) between the two techniques. SIA was calculated through vector analysis using the Warren Hill SIA calculator and the Holladay SIA method while stable corneal astigmatism was defined as average keratometry readings (average K in dioptres) within ± 0.50D[6] and axis within 30 degrees of the last follow-up.[7] The results were compared between the two groups, with a p-value of less than 0.05 indicating statistical significance. Ethical approval was obtained from the Lagos State University Teaching Hospital Health Research Ethical Committee (HREC) and written informed consent was obtained from the patients.

Results: A total of 214 eyes were studied, with 107 in each surgical group. Age and gender distribution were similar (p=0.153 and 0.218) as seen in Table 1. Preoperative against-the-rule (ATR) astigmatism was more common in the phacoemulsification group (66.4%) than in the MSICS group (47.7%). By month 3, ATR astigmatism increased to 76.6% in the MSICS group compared to 49.5% in the phacoemulsification group. As shown in Table 2, the mean SIA in the MSICS group at months 1, 2 and 3 was 1.94D x 19.3°, 1.83D x 18.2° and 1.72D x 20.2°, respectively, while in the phacoemulsification group, the mean SIA was 0.92D x 17.7°, 1.01D x 16.4° and 1.00D x 15.8° at months 1, 2 and 3, respectively. SIA differed significantly between the two groups at all postoperative time points (p<0.001). Final best corrected visual acuity was similar at month 3, with 95.3% of MSICS and 98.1% of phacoemulsification patients achieving 6/12 or better (p=0.324). By the first postoperative month, 96 eyes (89.7%) in the MSICS group and 89 eyes (83.2%) in the phacoemulsification group had achieved stable corneal astigmatism. By the second month, stability was observed in 95 eyes (88.8%) of the MSICS group and 106 eyes (99.1%) of the phacoemulsification group (Figure 1).

Table 1: Demographic distribution of eyes in the manual small incision cataract surgery and Phacoemulsification group

	MSICS	PHACO	P value
Age group [Frequency (%)]			0.390
51 – 60 years	19 (17.8%)	17 (15.9%)	
61 – 70 years	42 (39.3%)	37 (34.6%)	
71 – 80 years	42 (39.3%)	43 (40.2%)	
> 80 years	4 (3.6%)	10 (9.3%)	
Mean age (SD)years	68.2 (7.6)	69.8 (9.1)	0.153
Gender [Frequency (%)]			0.218
Male	56 (52.3%)	47 (43.9%)	
Female	51 (47.7%)	60 (56.1%)	
Laterality [Frequency (%)]			0.618
Right eye	50 (46.7%)	53 (49.5%)	
Left eye	57 (53.3%)	54 (50.5%)	

MSICS - manual small incision cataract surgery; PHACO - Phacoemulsification; SD- Standard deviation

Table 2: Comparison between average K (dioptres), centroid astigmatism (magnitude and axis) and SIA (magnitude and axis) between the two groups at preoperative, month 1, month 2, and month 3

	Pre-op	P value	Month 1	P value	Month 2	P value	Month 3	P value
Average K values								
MSICS	43.56D	0.089	43.96D	<0.001	43.84D	<0.001	43.79D	<0.001
PHACO	43.20D		42.96D		42.75D		42.71D	
Centroid astigmatism								
MSICS	1.05 x 18.6°	0.184	1.98 x 15.2°	<0.001	1.79 x 16.4°	<0.001	1.68 x 17°	<0.001
PHACO	1.17 x 14.3°		0.79 x 19.3°		0.70 x 20.8°		0.63 x 20°	
SIA								
MSICS			1.94 x 19.3°	<0.001	1.83 x 18.2°	<0.001	1.72 x 20.2°	<0.001
PHACO			0.92 x 17.7°		1.01 x 16.4°		1.00 x 15.8°	

MSICS - manual small incision cataract surgery; PHACO – Phacoemulsification; SIA - surgically induced corneal astigmatism

Discussion: This study found that postoperative ATR increased significantly among MSICS patients compared to phacoemulsification, a finding in line with earlier studies[8,9] and likely due to larger incisions, wound construction, and cauterization in MSICS. Surgically induced astigmatism (SIA) was consistently higher in MSICS at all follow-up points, in line with previous evidence by Waghmare et al[9], and Nair et al.[10] Although more of the MSICS eyes stabilized by 1 month compared to phacoemulsification eyes, nearly all phacoemulsification eyes stabilized by the second month. Both procedures produced excellent visual outcomes, with over 96% of MSICS and 98% of phacoemulsification patients achieving 6/12 or better by three months. Nonetheless, phacoemulsification provided slightly better unaided visual acuity, reducing the likelihood of dependence on corrective lenses.

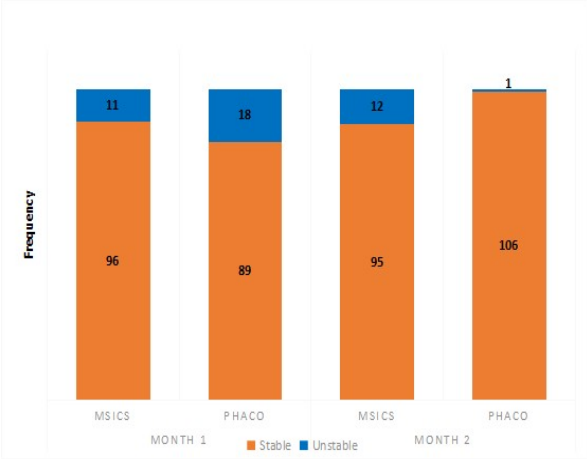

Figure 1: Time to corneal astigmatism stability between manual small incision cataract surgery (MSICS) and Phacoemulsification (PHACO).

Conclusion: Phacoemulsification resulted in lower and more stable SIA. However, both techniques provided excellent final visual outcomes. While Phacoemulsification is more desirable, MSICS is relevant in resource-limited settings.

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Changes in tear film indices following manual small incision cataract surgery for age-related cataract in Northern Nigeria

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Introduction: The tear film is the interface between the ocular surface epithelium and the environment.[1] Mucin, aqueous, and lipid make up its three layers.[1] Cataract is the leading cause of blindness in the world, and Manual small incision cataract surgery (MSICS) is efficient in developing countries such as Nigeria due to its cost-effectiveness. [2]

There is a high prevalence of OSD in the ageing population in Nigeria, with a high proportion of cataract patients suffering from the disease, some of whom will eventually undergo a cataract surgical procedure.[3] Cataract surgeries have widely been seen to adversely affect the tear film status in the early postoperative period, leading to the development of dry eye. [4, 5] Studies showed that it could exacerbate or induce symptoms of dry eye disease postoperatively, at least for the first two months.[4-7] Increased inflammatory mediators, surface irregularity at the site of the incision and/or light from the operating microscope can play a role in the initiation or exacerbation of OSD postoperatively.[4,8 -11]

This study seeks to evaluate changes in tear film indices using Tear break up time, Schirmer's test I, and Tear meniscus height before and after MSICS in patients with age-related cataract.

Methods: A hospital-based prospective observational study. Consenting patients with age-related cataract aged 40 years and above attending ECWA Eye Hospital, Kano, during the study duration and who met the inclusion criteria were recruited.

Tear break-up time, Schirmer's test-1, Tear meniscus height were measured preoperatively, on day 1, at week 4 and at week12 postoperatively. Ocular surface index score was assessed preoperatively, at 4 weeks and at 12weeks.

All patients underwent MSICS under peribulbar anaesthesia by experienced surgeons using a standard technique. IBM-SPSS version 26 was used for data analysis. Ethical approval was obtained from the institution, and informed consent was obtained from the patients. P-value <0.05 was considered statistically significant.

Results: A total of 124 patients were recruited, 6 were lost to follow-up while 118 completed the study. There were more males (78%) than 26 females (22%) with a Male: Female ratio of 3.5:1. The mean age was 63±8.39 years. Tear break up time (TBUT) reduced significantly on day 1, with a gradual improvement observed by 12 weeks (Table 1).

Schimer's test-1 and TMH declined significantly at 1 month, with gradual recovery observed by 12 weeks (Table 2).

Table 1: Comparison of the frequency of preoperative and postoperative dry eye at Day 1, Week 4, and Week 12 using Ocular Surface Disease Index and Tear Break-Up Time

OSDI	Normal	Mild/Mod	Severe	Mean	P-value	T-test
Pre-op (N/%)	5(4.2)	93(78.8)	20(17.0)	26.01±2.81		
4 Weeks (N/%)	72(61)	46(39.0)	0(0)	12.22±6.29	<0.001	12.66
12 Weeks (N/%)	100(84.7)	18(15.3)	0(0)	7.09±4.77	<0.001	17.48
TBUT (sec)	**Normal**	**Mild/Mod**	**Severe**	**Mean**	**P-value**	**T-test**
Preop (N/%)	101(85.6)	17(14.4)	0(0)	10.67±1.55		
Day 1 (N/%)	7(5.9)	83(70.4)	28(23.7)	6.52±1.78	<0.001	27.22
4 Weeks (N/%)	40(33.9)	71(60.2)	7(5.9)	8.00±2.02	<0.001	17.11
12 Weeks (N/%)	86(72.9)	32(27.1)	0(0)	9.49±1.42	<0.001	8.80

OSDI- Ocular surface disease index; TBUT-Tear break-up time

Table 2: Comparison of the frequency of preoperative and postoperative dry eye at Day 1, Week 4, and Week 12 using Schirmer's test-1 and Tear meniscus height

Schirmer's test-1 (mm)	Normal	Mild	Severe	Mean	P-value	T-test
Preop (%)	107(90.7)	11(9.3)	0(0)	19.42±7.68		
Day 1 (N/%)	112(94.9)	6(5.1)	0(0)	23.67±6.65	<0.001	6.403
4 Weeks (N/%)	45(38.1)	71(60.2)	2(1.7)	12.83±5.32	<0.001	7.95
12 Weeks (N/%)	87(73.7)	31(26.3)	0(0)	12.96±6.33	<0.001	9.12
TMH	**>0.25 mm**	**<0.25 mm**	**Mean**	**P-value**	**T-test**	
Preop(%)	114(96.6)	4(3.4)	0.28±0.4			
Day 1 (N/%)	101(85.6)	17(14.4)	0.27±0.06	0.037	2.12	
4 Weeks (N/%)	72(61.0)	46(39.0)	0.24±0.05	<0.001	-8.51	
12 Weeks (N/%)	96(81.4)	22(18.6)	0.26±0.05	<0.001	5.35	

Discussion: The study observed short term variations in tear film indices following MSICS with the most pronounced effects at day 1 and 4 weeks after surgery. Gradual recovery occurred by 12 weeks but was yet to reach baseline, this is consistent with previous studies.[6,13] The reduction in TBUT and TMH is likely due to surgical trauma, conjunctiva manipulation and postoperative use of preserved topical medications. This is comparable to the findings of earlier authors.[6,13-17]

At 12 weeks postoperatively, TBUT detected dry eye in 27.1% of the patients, OSDI score found 15.3% to have dry eye. This study observed high prevalence of dry eye disease (DED) using OSDI score in participants preoperatively (95.8%). The presence of blurred and poor vision as scoring points in OSDI questionnaire may be contributory to higher prevalence in this study since they are also the major symptoms of cataract. However, the mean OSDI score significantly reduced over time post-operatively, because after surgery vision got improved and this might have contributed to improved OSDI score. Even though the blurring of vision was transient preoperatively, it was significant enough to affect the overall OSDI score.

Schimer's test -1 detected dry eye in 26.3% of the participants and TMH observed 18.6% at 12 weeks postoperatively. A statistically significant reduction in the mean values of all assessed tear film indices was observed at postoperative period with p- values of < 0.001. The clinical implication is that patients may

experience early postoperative dry eye symptoms, which can be mitigated by artificial tears, adequate preoperative assessment and counselling.

Conclusion: The study showed statistically significant reduction in tear film indices assessed postoperatively when compared with preoperative values and demonstrates the need for counselling and evaluation for DED to improve postoperative satisfaction and care.

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Effectiveness of a short message reminder on compliance to follow-up after cataract surgery in an outreach setting in Zamfara State, Nigeria: a randomized controlled trial

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Background: Cataract outreach programs aim to deliver cataract surgical services to individuals with cataracts in their communities.[1] Poor follow-up compliance has been one of the major drawbacks of outreach surgery.[2] Various interventions were found to improve follow-up compliance.[3]

The aim of this study was to assess whether a short message service (SMS) reminder would improve compliance with post-operative follow-up and to determine the visual outcome of cataract surgery in patients operated on in an outreach setting.

Methods: The study was a randomized controlled trial, registered with the Pan African clinical trials registry (RCT-PACTR20231 075160700). Ethical clearance was obtained from the Research and Ethics Committee of the National Eye Centre Kaduna and administrative permission was also obtained from the authorities of the Ministry of Health Zamfara State. Written informed consent was obtained from each patient. A total of 125 patients with cataract were recruited. Block randomization was conducted, and randomization codes were generated using Research Randomizer computer software (www.randomiser.org). Sixty-two participants were randomly allocated to the SMS intervention group and 63 participants to the control group. Automated SMS reminders were sent using a Bulk SMS software platform on each follow-up visit. A semi-structured interviewer-administered questionnaire was administered. The data collected included socio-demographic information, follow up visit at day one, weeks one, six and twelve after surgery respectively; pre-operative and post-operative follow up examination findings including visual acuity, anterior segment and fundal examination of all the patients on the scheduled follow up visit.

Results: The age range of participants was between 30 and 87 years, with a mean of 63.00±8.99 years. The sociodemographic characteristics of study participants in the 2 groups were similar (Table 1). Seventy-three (58.4%) of the patients owned a mobile phone, and 52 (41.6%) lived with phone owners; there was no significant difference in phone ownership status between the control and study groups ($p > 0.05$). All the participants turned up for follow-up on day one and week one. But there was a decline in attendance at the subsequent visits at six and twelve weeks. There was no statistically significant difference with respect to follow-up compliance between the groups (Table 2).

Among the participants, 22(35.5%) attended the 12 week follow-up in the intervention and 15(23.8%) in the control groups respectively. There was no statistically significant difference in follow-up between the intervention and control groups ($p > 0.05$).

Discussion: Socio-demographic distribution between the study groups was similar; this enables more reliable comparison of outcomes. Access to mobile phones was similar, indicating that SMS interventions were practical and well-suited for this setting. The decline in follow-up highlights the challenges of maintaining long-term follow-up in an outreach setting. Combining SMS reminders and additional incentives has been shown to improve follow-up.[3] All the participants that completed the study achieved good visual acuity.

Conclusion: The study evaluated whether an SMS reminder would increase follow-up

Table 1: Demographic characteristics of study participants

Variables	Study Groups Intervention (%)	Control (%)	Total (%)	p-value
Age (years)				0.429
<40	0(0.0)	2(3.2)	2(1.6)	
40-49	5(8.1)	2(3.2)	7(5.6)	
50-59	15(24.2)	15(23.8)	30(24.0)	
≥60	42(67.7)	44(69.8)	86(68.8)	
Total	62(100.0)	63(100.0)	125(100.0)	
Mean age ±(SD) in years	63.03±(8.12)	62.97±(9.66)	63.00±(8.99)	
Gender				0.318
Males	37(59.7)	43(68.3)	80(64.0)	
Females	25(40.3)	20(31.7)	45(36.0)	
Total	62(100.0)	63(100.0)	125(100.0)	
Religion				0.496
Islam	61(98.4)	63(100.0)	124(99.2)	
Christianity	1(1.6)	0(0.0)	1(0.8)	
Total	62(100.0)	63(100.0)	125(100.0)	
Education level				0.849
Qur'anic	46(74.2)	45(71.4)	91(72.8)	
Primary	5(8.1)	4(6.3)	9(7.2)	
Secondary	3(4.8)	6(9.5)	9(7.2)	
Tertiary	8(12.9)	8(12.7)	16(12.8)	
Total	62(100.0)	63(100.0)	125(100.0)	
Employment				0.626
Employed	7(11.3)	6(9.5)	13(10.4)	
Famer	23(37.1)	25(39.7)	48(38.4)	
Business	10(16.1)	15(23.8)	25(20.0)	
Others	22(35.5)	17(27.0)	39(31.2)	
Total	62(100.0)	63(100.0)	125(100.0)	
Residence Status				0.94
Rural	26(41.9)	26(41.3)	52(41.6)	
Urban	36(58.1)	37(58.7)	73(58.4)	
Total	62(100.0)	63(100.0)	125(100.0)	

Table 2. Distribution of participants by follow-up after cataract surgery

Variables	Study Group Intervention (%)	Control(%)	Total (%)	P-value
Day One Follow Up Visit				-
Yes	62(100.0)	63(100.0)	125(100.0)	
No	0(0.0)	0(0.0)	0(0.0)	
Total	62(100.0)	63(100.0)	125(100.0)	
Week One Follow Up Visit				-
Yes	62(100.0)	63(100.0)	125(100.0)	
No	0(0.0)	0(0.0)	0(0.0)	
Total	62(100.0)	63(100.0)	125(100.0)	
Six Weeks Follow Up				0.325
Yes	34(54.8)	29(46.0)	63(50.4)	
No	28(45.2)	34(54.0)	62(49.6)	
Total	62(100.0)	63(100.0)	125(100.0)	
Twelve Week Follow Up				0.153
Yes	22(35.5)	15(23.8)	37(29.6)	
No	40(64.5)	48(76.2)	88(70.4)	
Total	62(100.0)	63(100.0)	125(100.0)	

compliance following cataract surgery in an outreach setting. The intervention group's compliance was slightly higher; but the difference was not statistically significant. This suggests that SMS reminders alone may not be sufficient to ensure long-term follow-up.

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Modelling the Factors Associated with Ophthalmic Health Seeking Behaviour and Health Service Utilization among Patients Attending National Eye Centre, Kaduna

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Background: Health is a fundamental human right, with the highest attainable health standards considered a critical global social goal. Poor health significantly impacts households economically, exacerbating poverty, increasing debt, and reducing essential consumption due to productivity losses and out-of-pocket (OOP) healthcare expenses.[1,2] Inflation, an economic phenomenon affecting various sectors, including healthcare, influences healthcare utilization patterns.[3] In recent years, inflation has surged, affecting healthcare prices

and overall health spending. Healthseeking behaviour is the activity undertaken by individuals who perceive to have a health problem for the purpose of finding an appropriate remedy. Visual impairment is a significant public health concern globally, affecting at least 2.2 billion people.[4] The utilization of eye care services is influenced by their availability, affordability, and accessibility.[5,6] This study aims to model the factors associated with ophthalmic health-seeking behaviour and health service utilization among patients attending the National Eye Centre, Kaduna (NECK).

Methods: The study was a hospital-based, cross-sectional study carried out at NECK. Ethical approval was obtained from the National Eye Centre's research and ethics committee and informed consent obtained from study participants. Participants were patients aged 18 years and older attending the hospital. A sample size of 186 was determined, and systematic random sampling was employed to select the study participants. Data was collected using a semi structured, interviewer-administered questionnaire. The data included socio-demographic information, economic factors: health insurance status, transportation costs, and out-of-pocket expenses; knowledge about common eye conditions, awareness of available eye care services, and sources of information; health seeking behaviour: frequency of eye check-ups, reasons for seeking or not seeking care, and history of previous eye conditions; service utilization: type of services utilized, waiting time, satisfaction with services, and barriers to accessing care.

Results: The mean age was 36.5±15.8 years, and the male-to-female ratio was 1:1.45. Eighteen (9.7%) participants had no formal education. Reasons for delay in seeking eye care included financial constraints (33.9%), lack of time (12.5%), distance (23.2%), fear (2.7%) and lack of awareness (22.3%). The participants' monthly income varied, majority earned between N20,000-N50,000 per month, Only 20 (10.8%) earned above N100,000.00 in a month (Figure 1). Only 50 (26.9%) had insurance. Age, occupation and marital status were statistically significantly associated with health-seeking behaviour and service utilization (Table 1). Majority (84.0%) of the participants had knowledge on the importance of eye check but only 28.0% went for check-up regularly, 37.6% went occasionally and 34.4% went rarely or had never gone. Financial constraints, lack of time, distance, fear and lack of awareness are the contributory factors.

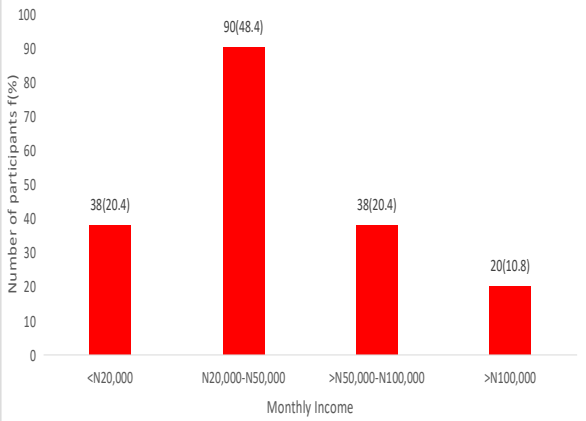

Figure 1. Distribution of participants by monthly income

Discussion: Younger individuals were less likely to seek eye check-ups. This age-related trend is consistent with previous literature.[7] The study suggests that women are less proactive in seeking healthcare services than men. Additionally, marital status and occupation were significant factors. The study also found that only about a quarter of the participants had insurance, which is a critical factor in accessing healthcare services. Knowledge alone is not enough to ensure optimal health-seeking behaviour. This discrepancy between knowledge and behaviour highlights the influence of barriers.

Conclusion: Majority of the study participants had a relatively high level of knowledge about eye health, although significant barriers that hindered optimal health-seeking behaviour and service utilization were noticed. Socio-demographic factors played a significant role

Table 1: Relationship between demographic factors and ophthalmic health seeking behaviour and service utilization

Demographic factors	Health seeking behaviour and service utilization			χ^2	p-value
	Good (N/%)	Bad (N/%)	Total (100%)		
Age group (years)				55.637	0.001
18-29	39(47.6)	43(52.4)	82(100.0)		
30-39	33(91.7)	3(8.3)	36(100.0)		
40-49	5(25.0)	15(75.0)	20(100.0)		
50-59	31(100.0)	0(0.0)	31(100.0)		
60 +	14(82.4)	3(17.6)	17(100.0)		
Total	122(65.6)	64(34.4)	186(100.0)		
Gender				8.254	0.004
Male	59(77.6)	17(22.4)	76(100.0)		
Female	63(57.3)	47(42.7)	110(100.0)		
Total	122(65.6)	64(34.4)	186(100.0)		
Occupation				17.938	0.001
Student	40(50.0)	40(50.0)	80(100.0)		
Unemployed	12(80.0)	3(20.0)	15(100.0)		
Employed	23(71.9)	9(28.1)	32(100.0)		
Self-employed	37(75.5)	12(24.5)	49(100.0)		
Retired	10(100.0)	0(0.0)	10(100.0)		
Total	122(65.6)	64(34.4)	186(100.0)		
Marital status				38.247	0.001
Single	35(44.9)	43(55.1)	78(100.0)		
Married	81(87.1)	12(12.9)	93(100.0)		
Widowed	6(40.0)	9(60.0)	15(100.0)		
Total	122(65.6)	64(34.4)	186(100.0)		
Education level				4.033	0.279[f]
No formal education	12(66.7)	6(33.3)	18(100.0)		
Primary	2(66.7)	1(33.3)	3(100.0)		
Secondary	32(78.0)	9(22.0)	41(100.0)		
Tertiary	76(61.3)	48(38.7)	124(100.0)		
Total	122(65.6)	64(34.4)	186(100.0)		

in shaping individuals' engagement with eye care services.

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Information for Authors

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a. Title, Author(s) and affiliations
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c. Methods/ Patients/ Participants
d. Results including a **maximum of 2 figures or tables**.
e. Discussion/Conclusion
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4. Discussion: This should discuss the implications and significance of the findings with respect to clinical ophthalmic care or public health ophthalmology. It should include a conclusion and recommendations based on the findings earlier presented and discussed.

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References
1. 41st World Medical Assembly. Declaration of research involving human subjects. Bull Pan Am Health Org 1990; **24**: 606-609.

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