VOLUME 39, NUMBER 10
October 2022

ISSN 0189 - 160X

WAJM

WEST AFRICAN JOURNAL OF MEDICINE

ORIGINALITY AND EXCELLENCE IN MEDICINE AND SURGERY

OFFICIAL PUBLICATION OF
THE WEST AFRICAN COLLEGE OF PHYSICIANS *AND*
WEST AFRICAN COLLEGE OF SURGEONS

www.wajmed.org

WEST AFRICAN JOURNAL OF MEDICINE

TABLE OF CONTENTS

WEST AFRICAN JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Trends in Eye Removal Surgeries at a Tertiary Care Hospital Over Three Decades

Tendances des Opérations d'Ablation de L'œil dans un Hôpital de Soins Tertiaires sur Trois Décennies

[1]*B. A. Adewara, [1]S. A. Badmus, [1]B. O. Adegbehingbe, [1]O. O. Awe, [1]O. H. Onakpoya, [1]A. O. Adeoye

ABSTRACT

PURPOSE: To determine the trends in eye removal surgeries at a tertiary hospital in Nigeria over 26 years.

METHODS: A retrospective comparative review of clinical records of all patients who had eye removal surgery at a tertiary hospital in Ile-Ife, Nigeria, between 2014 and 2019 was done. Patients' demographic and clinical data, including indication for eye removal and type of surgery were analysed and compared with two earlier studies at the same hospital between 1994 and 2013.

RESULTS: There was an average of 14.3 surgeries per year between 2014 and 2019. Patients' ages ranged from 2 to 102 years, M:F was 1.5:1, the commonest indication for eye removal was infection (n=30, 34.9%), and the most common surgery was evisceration (n=70, 81.4%). Studies from 1994 to 2003 and 2005 to 2013, reported an average of 9.2 and 10 surgeries per year; ages ranging from 4 days to 88 years and 3 months to 88 years; with a M:F of 2.1:1 and 3.4:1 respectively. In both studies, the commonest indication for eye removal was trauma (43.4% and 43.8% respectively) and the most common surgery was enucleation (57.6% and 55% respectively). Trend data showed a progressive increase in eye infections (12% vs 15% vs 34.9%) and eviscerations (19.6% vs 31.2% vs 81.4%) over time.

CONCLUSION: There was a change in trend towards an increase in eviscerations and infective indications for eye removal at the hospital over three decades. Prompt and optimal treatment of orbito-ocular infections is recommended to reduce the incidence of eye removal surgeries. **WAJM 2022; 39(10): 1068–1074.**

Keywords: Anaesthesia, Enucleation, Evisceration, Exenteration, Orbital implant, Trends.

RÉSUMÉ

BUT: Déterminer les tendances des chirurgies d'ablation de l'oeil dans un hôpital tertiaire du Nigeria sur une période de 26 ans.

MÉTHODES: Un examen comparatif rétrospectif des dossiers cliniques de tous les patients ayant subi une chirurgie d'ablation de l'œil dans un hôpital tertiaire d'Ile-Ife, au Nigeria, entre 2014 et 2019, a été effectué. Les données démographiques et cliniques des patients, y compris l'indication de l'ablation de l'œil et le type de chirurgie, ont été analysées et comparées à deux études antérieures menées dans le même hôpital entre 1994 et 2013.

RÉSULTATS: Il y avait une moyenne de 14,3 chirurgies par an entre 2014 et 2019. L'âge des patients allait de 2 à 102 ans, le rapport M:F était de 1,5:1, l'indication la plus courante pour l'ablation de l'œil était l'infection (n=30, 34,9%), et la chirurgie la plus fréquente était l'éviscération (n=70, 81,4%). Les études menées de 1994 à 2003 et de 2005 à 2013 ont fait état d'une moyenne de 9,2 et 10 interventions chirurgicales par an, d'âges allant de 4 jours à 88 ans et de 3 mois à 88 ans, et d'un rapport M:F de 2,1:1 et 3,4:1 respectivement. Dans les deux études, l'indication la plus courante pour l'ablation de l'œil était le traumatisme (43,4 % et 43,8 % respectivement) et la chirurgie la plus courante était l'énucléation (57,6 % et 55 % respectivement). Les données sur les tendances ont montré une augmentation progressive des infections oculaires (12 % vs 15 % vs 34,9 %) et des éviscérations (19,6 % vs 31,2 % vs 81,4 %) au fil du temps.

CONCLUSION: On constate un changement de tendance vers une augmentation des éviscérations et des indications infectieuses pour l'ablation des yeux à l'hôpital sur trois décennies. Un traitement rapide et optimal des infections orbito-oculaires est recommandé pour réduire l'incidence des chirurgies d'ablation des yeux. **WAJM 2022; 39(10): 1068–1074.**

Mots clés: Anesthésie, énucléation, éviscération, exentération, implant orbitaire, tendances.

[1]**Department of Ophthalmology, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria.**

***Correspondence: Dr. Bolajoko A. Adewara,** Department of Ophthalmology, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria. Email: dr.bolajoko@yahoo.com

INTRODUCTION

Eye removal surgeries include evisceration, enucleation, and exenteration. They account for about 3.6–10.8% of all eye surgeries.[1–4] Some of the indications are preventable or treatable.[4,5] Indications include disorders such as malignant tumours, severe orbito-ocular infections, severe ocular trauma, disfigured blind eyes, and painful blind eyes.

The loss of an eye has a wide-ranging emotional and psychosocial impact on the patient.[6] For instance, eye removal surgeries have been reported as a source of anxiety and depression due to appearance concerns.[7] Consequently, eye removal surgeries have evolved over the years to reduce morbidities after surgery and improve cosmetic outcomes. Some improvements include the use of periocular anaesthesia,[8] myoconjunctival enucleation,[9] four-petal evisceration,[10] and orbital implants.[11,12]

There are varied reports on the pattern of eye removal surgeries. Hime, *et al.* in Brazil,[13] reported that ocular melanoma and retinoblastoma were the most common indications for eye removal, hence, enucleations were the most common type of surgery. Conversely, Mukona, *et al.* in Zimbabwe,[14] reported that the most common indication was ocular surface squamous neoplasia, and the most common type of surgery was evisceration followed by exenteration and enucleation. In Nigeria, Ubah, *et al.,*[15] reported that evisceration was more often performed than enucleation or exenteration, and the most common indications for eye removal in children and adults were retinoblastoma and ocular trauma respectively.

Similarly, there are reports on changing trends in eye removal surgeries over time. Hansen, *et al.* in Denmark,[16] reported a change in the choice of operation from enucleation to evisceration between 1975 and 1996. This was attributed to the improved treatment of glaucoma and a decrease in trauma-related enucleations. Filatova, *et al.* in Russia,[17] also reported a 4.2 times increase in eviscerations particularly for post-traumatic aetiology, and a decrease in enucleations from 84% to 33.4% from 2002 to 2016.

Identifying the pattern and trend of eye removal surgeries is an important evaluation. This is because it has the potential to influence the decisions made on the type and method of eye removal surgery performed, the improvement in cosmetic outcome achieved, and the preventive strategies that can reduce the need for such surgeries.

This study aimed to identify the pattern of eye removal surgeries over a recent six-year period and make comparisons with previously reported patterns over a three-decade period.

METHODOLOGY

This was a retrospective comparative study of all patients who had eye removal surgery at the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, a public tertiary hospital in Southwest Nigeria, between January 2014 and December 2019. Ethical approval for the study was obtained from the Ethics and Research Committee of the hospital. The study adhered to the tenets of the Helsinki declaration.

The ophthalmic theatre records were reviewed to identify patients who had undergone eye removal surgery between January 2014 and December 2019. 'Eye removal surgeries', with or without orbital implant placement using standard techniques,[8,18] were defined as evisceration, enucleation, and exenteration surgeries. 'Evisceration' was defined as the removal of all the intraocular contents, while preserving the remaining scleral shell, extraocular muscle attachments, and surrounding orbital adnexa.[8] 'Enucleation' was defined as the removal of the entire globe, including the optic nerve and its intraocular contents, with the preservation of all other periorbital and orbital structures.[8] 'Exenteration' was defined as the removal of the orbital contents, including orbital fat, conjunctival sac, globe, and part or all of the eyelids depending on the extent of the disease being treated.[18]

The medical records of all the identified patients were then reviewed for data collection. The data collected included patient's age at the time of surgery, gender, occupation, mechanism of ocular trauma, eye laterality, visual acuity at presentation, ophthalmic diagnosis, indication for eye removal surgery, type of anaesthesia administered, and type of surgery done. Modifications in surgical technique were also noted.

The 'mechanism of ocular trauma' and 'indication for eye removal surgery', were determined from the history, examination findings, and ophthalmic diagnosis documented in the clinical notes. 'Blindness' was defined as a best-corrected visual acuity of less than 3/60. Anaesthesia administered was categorized as 'general anaesthesia' or 'periocular anaesthesia'. 'Periocular anaesthesia' was defined as an injection of 5 millilitres of 50:50 lidocaine with 1:100,000 adrenaline and bupivacaine hydrochloride administered into the peribulbar space or the sub-tenon space.

Eyes that underwent modified eye removal surgical techniques were noted. The "four-petal evisceration" was defined as evisceration done with quadrisectioning of the sclera to allow the placement of an adequately sized orbital implant followed by suturing of the sclera in two layers to cover the implant.[10] The "myoconjunctival enucleation" was defined as enucleation done with suturing each rectus muscle just short of the respective fornix using preplaced absorbable sutures passing through the anterior tenon-conjunctival complex and subsequent polymethyl methacrylate orbital implant placement to improve prosthesis motility.[9] The "eyelid-sparing exenteration" was defined as exenteration done sparing the eyelids by making the skin incisions a few millimetres above and below the upper lash line and the lower lash line respectively, and extending the incisions in the sub-orbicularis plane until reaching the orbital rim and to just beyond the medial and lateral canthi.[19]

Data on patients' demographics and surgical characteristics were then analysed and compared with two earlier reports from the same hospital by Adeoye *et al.,*[4] from January 1994 to December 2003 and Awe *et al.,*[5] from July 2005 to June 2013. Surgical characteristics included type of surgery, indication for surgery, type of anaesthesia, and orbital implant placement.

Data analysis was done using SPSS version 25 (IBM Corp. Armonk, New York, U.S.A.). Normality of distribution was tested for age using the Kolmogorov-Smirnov test. Categorical variables were presented as frequencies with percentages. Age, which was not normally distributed, was presented as median with range and mean with standard deviation for ease of comparison with the two earlier study reports. Age was further categorized into <15years, 15–59 years, and ≥60 years for ease of comparison. A p-value of <0.05 was considered statistically significant.

RESULTS

In this current study, 86 (3.78%) unilateral eye removal surgeries were performed for 86 patients out of a total of 2,274 eye surgeries performed in the hospital between January 2014 and December 2019. The Kolmogorov-Smirnov test indicated that patients' ages at the time of surgery did not have a normal distribution [D (86) = 0.109, *p*-value = 0.013]. Overall, the patients' median age was 49 years (range, 2–102 years) and mean age ± standard deviation (SD) was 46.9 ± 26.3 years. For eviscerations, the median age was 54 years (range, 8–102 years) and mean age ± SD was 52.3 ± 24.1 years. For enucleations, the median age was 31 years (range, 2–80 years) and mean age ± SD was 28.2 ± 22.8 years. For exenterations, the median age was 3.1 years (range, 2.5–4 years) and mean age ± SD was 3.2 ± 0.8 years. Overall, males were 52 (60.5%) and females were 34 (39.5%) with a male to female ratio of 1.5:1.

Concerning patients' occupation, farming was most common among patients aged 60 years or older. There were five (5.8%) artisans, including one tiler, bricklayer, carpenter, plumber, and electrician each. The occupation group 'Others' (n = 42, 48.8%) consisted of 13 (15.1%) patients who were retired, 12 (14.0%) children less than 15 years old, 10 (11.6%) students aged between 16 and 38 years, two (2.3%) bankers; and one (1.2%) pilot, engineer, teacher, tailor, and clergyman each. (Table 1).

Overall, infection (n=30, 34.9%) was the most common indication for eye removal surgery. However, retinoblastoma (n = 6, 7%) was the most common indication among patients less than 15 years old and infection (n=18, 20.9%) was the most common indication among patients 60 years or older. (Table 1). Eyes with infection included 13 (15.1%) cases of panophthalmitis with partial evisceration, 12 (14.0%) cases of panophthalmitis without perforation, and 5 (5.8%) cases of infective keratitis with corneal melting. Eyes with ocular trauma included 21 (24.4%) ruptured globes and one (1.2%) partially enucleated globe. Mechanisms of ocular trauma consisted

Table 1: Distribution of Patients' Occupation and Indications for Eye Removal Surgery by Age Group

	Age Group (years)			
	<15 n = 12 (14%)	15 – 59 n = 38 (44.2%)	≥ 60 n = 36 (41.9%)	Total N = 86 (100%)
Occupation				
Trading	0 (0.0)	9 (10.5)	11 (12.8)	20 (23.3)
Farming	0 (0.0)	5 (5.8)	8 (9.3)	13 (15.1)
Driving	0 (0.0)	4 (4.7)	1 (1.2)	5 (5.8)
Artisan	0 (0.0)	3 (3.5)	2 (2.3)	5 (5.8)
Hunting	0 (0.0)	1 (1.2)	0 (0.0)	1 (1.2)
Others*	12 (14.0)	16 (18.6)	14 (16.3)	42 (48.8)
Indication for Surgery				
Infection	0 (0.0)	12 (14.0)	18 (20.9)	30 (34.9)
Ocular trauma	2 (2.3)	12 (14.0)	8 (9.3)	22 (25.6)
Anterior staphyloma	4 (4.7)	9 (10.5)	5 (5.8)	18 (20.9)
Painful blind eye	0 (0.0)	3 (3.5)	3 (3.5)	6 (7.0)
Retinoblastoma	6 (7.0)	0 (0.0)	0 (0.0)	6 (7.0)
Malignant melanoma	0 (0.0)	2 (2.3)	1 (1.2)	3 (3.5)
Phthisis bulbi	0 (0.0)	0 (0.0)	1 (1.2)	1 (1.2)

**Includes 13 patients who were retired, 12 children, 10 students, 2 bankers, and one pilot, engineer, teacher, tailor, and clergyman each.*

Table 2: Distribution of Surgery Characteristics by Patients' Gender

	Gender		
Characteristics	Male n = 52 (60.5%)	Female n = 34 (39.5%)	Total N = 86 (100%)
Indication for Surgery			
Infection	14 (16.3)	16 (18.6)	30 (34.9)
Ocular trauma	20 (23.3)	2 (2.3)	22 (25.6)
Anterior staphyloma	13 (15.1)	5 (5.8)	18 (20.9)
Painful blind eye	2 (2.3)	4 (4.7)	6 (7.0)
Retinoblastoma	3 (3.5)	3 (3.5)	6 (7.0)
Melanoma	0 (0.0)	3 (3.5)	3 (3.5)
Phthisis bulbi	0 (0.0)	1 (1.2)	1 (1.2)
Type of Surgery			
Evisceration	45 (52.3)	25 (29.1)	70 (81.4)
Enucleation	6 (7.0)	7 (8.1)	13 (15.1)
Exenteration	1 (1.2)	2 (2.3)	3 (3.5)
Type of Anaesthesia			
Periocular*	27 (31.4)	16 (18.6)	43 (50.0)
General	25 (29.1)	18 (20.9)	43 (50.0)
Orbital Implant Placement			
Yes	31 (36.1)	20 (23.3)	51 (59.3)
No	21 (24.4)	14 (16.3)	35 (40.7)

**Patients' ages ranged from 16 years to 102 years.*

of road traffic accidents (n=13, 59.1%), accidental stick injuries (n=5, 22.7%), gunshot injuries (n=3, 13.6%), and an accidental blow from a fist (n=1, 4.5%). Eyes with melanoma consisted of two (66.7%) eyes with choroidal melanomas and one (33.3%) eye with a ciliary body melanoma.

All eyes that had eye removal surgery were blind at presentation (visual acuity of less than 3/60). There were 46 (53.5%) right eyes and 40 (46.5%) left eyes. The most common type of eye removal surgery was evisceration (n=70, 81.4%). Concerning modifications in surgical technique, 43 (50%) adult patients had periocular anaesthesia and 51 (59.3) eyes had orbital implant placement, of which 20 (23.3%) were done in females. (Table 2). In addition, four-petal evisceration technique was done for 21 (30%) out of 70 eyes that were eviscerated and myoconjunctival enucleation was done for six (46.2%) out of 13 eyes that were enucleated. All exenterations performed were eyelid-sparing exenterations (n = 3, 3.5%), and none of these patients had an orbital prosthesis fitted post-operatively.

The most common indications for evisceration and enucleation were infection (n = 30, 34.9%) and tumour (n = 6, 7.0%) respectively. The only indication for exenteration was retinoblastoma (n = 3, 3.5%) and the most common surgery that had orbital implant placement was evisceration (n = 44, 51.2%). (Table 3). All eyes with infection (n = 30, 34.9%) had evisceration and 18 (20.9%) eyes with ocular trauma also had evisceration. Four (4.7%) eyes with ocular trauma had enucleation performed. They included three (3.5%) eyes with ruptured globes and one (1.2%) partially enucleated eye.

The results from this current study were compared to two earlier reports from the same hospital by Adeoye, *et al.,*[4] and Awe, *et al.*[5] Trend data over 26 years showed there was a consistent preponderance of male patients and a progressive increase in the average annual incidence of eye removal surgeries by 55.4% and 43% respectively. Conversely, there was a 65.1% reduction in the prevalence of eye removal surgeries from 10.83% reported by Adeoye, *et al.,*[4] to 3.78% found in this current study. (Table 4).

The most common indications for eye removal surgery in this current study were infection (n=30, 34.9%), followed by ocular trauma (n = 22, 25.6%), and anterior staphyloma (n = 18, 20.9%). Conversely, the most common indications for surgery in both earlier studies were ocular trauma (43.4% and 43.8% respectively), followed by retinoblastoma (22.8% and 18.8% respectively), and infection (12% and 15% respectively). (Table 5).

Furthermore, the most common type of surgery in this current study was evisceration (n=70, 81.4%) as opposed to enucleation (57.6% and 55% respectively) in both earlier studies. In addition, this current study found that there was a 2.9 and 1.8 times increase in eviscerations, a 75.5% and 70.5% reduction in enucleations, and an 85.7% and 72.7% reduction in exenterations respectively when compared to both

Table 3: Distribution of Surgery Characteristics by Type of Eye Removal Surgery

	Type of Eye Removal Surgery			
Characteristics	**Evisceration n = 70 (81.4%)**	**Enucleation n = 13 (15.1%)**	**Exenteration n =3 (3.5%)**	**All Eyes N = 86 (100%)**
Indication for surgery				
Infection	30 (34.9)	0 (0.0)	0 (0.0)	30 (34.9)
Ocular trauma	18 (20.9)	4 (4.7)	0 (0.0)	22 (25.6)
Anterior staphyloma	17 (19.8)	1 (1.2)	0 (0.0)	18 (20.9)
Painful blind eye	4 (4.7)	2 (2.3)	0 (0.0)	6 (7.0)
Tumour	0 (0.0)	6 (7.0)	3 (3.5)	9 (10.5)
Retinoblastoma	0 (0.0)	3 (3.5)	3 (3.5)	6 (7.0)
Melanoma	0 (0.0)	3 (3.5)	0 (0.0)	3 (3.5)
Phthisis bulbi	1 (1.2)	0 (0.0)	0 (0.0)	1 (1.2)
Type of anaesthesia				
Periocular	43 (50.0)	0 (0.0)	0 (0.0)	43 (50.0)
General	27 (31.4)	13 (15.1)	3 (3.5)	43 (50.0)
Orbital implant placement				
Yes	44 (51.2)	7 (8.1)	0 (0.0)	51 (59.3)
No	26 (30.2)	6 (7.0)	3 (3.5)	35 (40.7)

Table 4: Comparison of Demographic Characteristics of Patients Who had Eye Removal Surgery between 1994 and 2019

Characteristics Study Period	**Adeoye, *et al.*[4] N = 92 Patients Jan. 1994–Dec. 2003**	**Awe, *et al.*[5] N = 79 Patients July 2005–June 2013**	**Current Study N = 86 Patients Jan. 2014–Dec. 2019**
Study duration (years)	10	8	6
Number of eye removal surgeries, n	92	80	86
Average number of eye removal surgeries per year, n	9.2	10.0	14.3
Prevalence of eye removal surgeries (%)	10.83	NS	3.78
Age at presentation			
Mean ± SD (years)	NS	30.7 ± 24.2	46.9 ± 26.3
Median (years)	NS	28	49
Range	4 days–88 years	3 months–88 years	2 years–102 years
Age group, n (%)			
<15 years	31 (33.7)	27 (43.2)	12 (14.0)
15–59 years	48 (52.2)	40 (50.6)	38 (44.2)
≥ 60years	13 (14.1)	12 (15.2)	36 (41.9)
Male : Female	2.1:1	3.4:1	1.5:1

NS, Not stated; SD, Standard Deviation.

Table 5: Comparison of Surgery Characteristics of Patients Who had Eye Removal Surgery between 1994 and 2019

Characteristics Study Period	Adeoye, *et al.*[4] N = 92 Eyes Jan. 1994–Dec. 2003	Awe, *et al.*[5] N = 80 Eyes July 2005–June 2013	Current Study N = 86 Eyes Jan. 2014–Dec. 2019
Eye Laterality, n (%)			
Unilateral	92 (100.0)	79 (98.7)	86 (100.0)
Right	47 (51.1)	46 (57.5)	46 (53.5)
Left	45 (48.9)	34 (42.5)	40 (46.5)
Bilateral	0 (0.0)	1 (1.3)	0 (0.0)
Indication for Surgery, n (%)			
Ocular trauma	40 (43.4)	35 (43.8)	22 (25.6)
Tumour	28 (30.4)	18 (22.5)	9 (10.5)
Retinoblastoma	21 (22.8)	15 (18.8)	6 (7.0)
Melanoma	0 (0.0)	3 (2.8)	NS
Other tumours	7 (7.6)	0 (0.0)	3 (3.5)
Infection	11 (12.0)	12 (15.0)	30 (34.9)
Panophthalmitis	NS	NS	25 (29.1)
Infective keratitis with corneal melting	0 (0.0)	NS	5 (5.8)
Staphyloma	10 (10.9)	10 (12.5)	18 (20.9)
Painful blind eye	1 (1.1)	NS	6 (7.0)
Phthisis bulbi	1 (1.1)	NS	1 (1.2)
Glaucoma	1 (1.1)	NS	0 (0.0)
Type of Surgery, n (%)			
Evisceration	18 (19.6)	25 (31.2)	70 (81.4)
Enucleation	53 (57.6)	44 (55.0)	13 (15.1)
Exenteration	21 (22.8)	11 (13.8)	3 (3.5)
Orbital Implant Placement			
Yes	NS	NS	51 (59.3)
No	NS	NS	35 (40.7)

NS, Not stated.

earlier studies. The type of anaesthesia used and the frequency of orbital implant placement were not stated in either of both earlier studies. (Table 5).

DISCUSSION

This study describes the pattern of eye removal surgeries at a tertiary care hospital in Ile-Ife, Southwestern Nigeria during a recent six-year period and compares the findings with existing literature, particularly two earlier reports from the same hospital. Although there was a paucity of literature on the incidence and prevalence of eye removal surgeries between the years 2014 and 2019, the findings were compared with some reports close to this period of study.

In this current study, the average incidence of 14.3 eye removal surgeries per year with a prevalence of 3.78% was higher than reports from a tertiary hospital in Southwestern Nigeria between January 2010 and July 2017,[1] and another in Ivory Coast between 2010 and 2016.[20] Conversely, the incidence was lower than reports from Eastern India between 2017 and 2019.[21] Differences in the study locations, study periods, or study durations may have influenced these findings. Similarly, differences in the manpower and expertise of ophthalmologists working at the different hospitals may also explain the varied incidences of eye removal surgeries reported.

Eye removal surgeries in this current study were more common among males and patients aged between 15 and 59 years. This age group consisted majorly of students and working adults who could be more predisposed to ocular trauma,[5,22,23] as they are generally more active and therefore more likely to need transportation. This was consistent with our findings that road traffic accidents were the most common mechanism of ocular trauma and ocular trauma was the most common indication for eye removal surgeries in males. The above findings suggest that eye health education programmes and eye health interventions aimed at preventing eye removal surgeries should be targeted at males and persons in this age group to achieve their maximum impact. These findings concerning gender and age group were also similar to reports from a recent study by Chakraborti, *et al.,*[21] in India.

The majority of the patients aged 60 years or older were either traders or farmers and the most common indication for eye removal surgery in this age group was an eye infection. These patients could have been predisposed to infections as a result of malnutrition due to low socioeconomic status or the occurrence of occupational accidents while on the farm. Similarly, Chan, *et al.,*[24] in Canada reported a mean age of 71.2 ± 17.1 years in patients with infection or inflammations. Age-related immunosuppression or the presence of systemic comorbidities such as diabetes mellitus,[25] could also predispose elderly patients to infections. More detailed studies would be required to further investigate these causal relationships. Conversely, retinoblastoma was the most common indication for eye removal surgery in children. Therefore, health education of caregivers on signs of retinoblastoma and early presentation to the hospital for eye screening is recommended to reduce such surgeries in children.

Overall, infection, which is largely avoidable,[4] was the leading indication for an eye removal surgery in this current study. This suggests that the prompt treatment of orbito-ocular infections could reduce the current need for eye removal surgeries in this study location. Conversely, the most common indications for eye removal surgery reported by some researchers such as painful blind eyes in Canada,[24] neoplasms in Nepal,[26] and phthisis bulbi in Hungary,[25] are more difficult to prevent. These dissimilar patterns of indications for eye removal may be due to differences in geographic locations and study periods. Hence, strategies to reduce the need for such surgeries should be based on what is applicable at different locations and periods.

The most common type of eye removal surgery was evisceration. This finding could be because infection was

responsible for more than a third of all the eye removal surgeries. This is consistent with a report by Fu, *et al.,*[27] that suggested evisceration was preferred to enucleation for the treatment of infected eyes because of the reduced risk for intracranial spread of infection. Similarly, the use of primary sutures for traumatic eye injuries and focal treatments for malignant tumours, to salvage the eye whenever possible, could be responsible for a relative decrease in enucleations and exenterations respectively.[19,28]

Some advances in surgical techniques for eye removal surgeries were observed in this current study. Periocular anaesthesia was used in half of the surgeries, and all were eviscerations in adults. This form of anaesthesia for eviscerations in adults has good outcomes and better safety benefits compared to general anaesthesia.[29] The use of the four-petal evisceration surgery was also observed in about a third of the eviscerations. This method uses sclerotomies to allow the placement of orbital implants of any size that will prevent a disfiguring contracted socket and improve cosmesis.[10,30] In addition, the myoconjunctival technique for enucleation was used for almost half of the eyes requiring enucleation. This technique improves postoperative ocular prosthesis motility compared to the traditional method of enucleation surgery.[9,12] In general, with the advent of orbital implant placement, there has been an increased emphasis on optimal cosmetic rehabilitation following eye removal surgeries. This rehabilitation could help to improve patient acceptability for such surgeries when indicated.

The comparison of this current study with two earlier studies carried out by Adeoye, *et al.,*[4] from 1994 to 2003 and Awe, *et al.,*[5] from 2005 to 2013, found that there was a consistent preponderance of male patients and a decrease in the prevalence of eye removal surgeries over almost three decades. There was also a progressive increase in the incidence of eye removal surgeries, an increase in the prevalence of infectious indications for surgery, an increase in the prevalence of eviscerations, and some advances in surgical techniques over the same period.

There could be various reasons for these trends in eye removal surgeries over time. For instance, a male preponderance for eye removal surgeries was consistent with reports from other researchers.[16,31,32] However, the decrease in the prevalence of surgeries may be a result of a relative increase in the total volume and spectrum of eye surgeries at the hospital on account of an increase in ophthalmic subspecialisation services or an increase in the number of ophthalmologists over time. Conversely, the increase in the incidence of eye removal surgeries may be due to a rise in the acceptability of such surgeries as a consequence of improved surgical techniques and cosmetic outcomes.[30]

Furthermore, the increase in eye infections may be attributed to a relative decrease in the high prevalence of ocular trauma from communal clashes in Ile-Ife as previously reported by Adeoye, *et al.*[4] Similarly, the increased availability and advances in eye salvage treatments for malignant tumours such as cryotherapy, laser therapy, and intra-arterial chemotherapy for intraocular retinoblastoma,[19,33] may have resulted in a relative decrease in the prevalence of tumours requiring eye removal.

It was noted that there was only one case of bilateral eye removal reported by Awe, *et al.,*[5] over the 26 year period. Although uncommon, it is important to note that such a patient may require more psychosocial support and cosmetic rehabilitation compared to patients who had only one eye removed. Also, the lack of reports concerning the placement of orbital implants in both earlier studies may suggest that the use of such implants to enhance cosmesis postoperatively was not a common practice at the time.

The retrospective nature of this study was an inherent limitation, as all the data collected was based on the documentation in the patients' clinical records. Despite this, however, the available data was used to identify the new and relevant changing trends in eye removal surgeries at the hospital over a period of 26 years.

CONCLUSION

There was a progressive increase in the incidence of eye removal surgeries at the hospital over a period of three decades. These surgeries were common among male patients and adults in the working-age group. In addition, there was a change in trend towards an increase in evisceration surgeries as well as an increase in infective indications for eye removal. There was also an increase in the use of modified surgical techniques aimed at improving cosmetic outcomes. Consequently, adopting preventive policies and eye health education programmes that target males and working adults, as well as promoting the prompt and optimal treatment of orbito-ocular infections by healthcare professionals, are recommended to reduce the need for eye removal surgeries.

Conflict of Interest

Authors have no conflicts of interest to disclose.

ACKNOWLEDGEMENTS

None.

REFERENCES

1. Joseph OO, Adeseye AI, Oluseye AO. Patients' satisfaction with destructive eye surgery in ophthalmic plastic clinic in a tertiary institution. *Int J Health Sci Res.* 2017; **7:** 25–30.
2. Musa KO, Aribaba OT, Onakoya AO, Rotimi-Samuel A, Akinsola FB. Indications for destructive eye surgeries at a Nigerian tertiary eye care centre: A ten-year review. *Niger Postgrad Med J.* 2016; **23:** 12-16.
3. Ibanga A, Asana U, Nkanga D, Duke R, Etim B, Oworu O. Indications for eye removal in southern Nigeria. *Int Ophthalmol.* 2013; **33:** 355–360.
4. Adeoye AO, Onakpoya OH. Indication for eye removal in Ile-Ife, Nigeria. *Afr J Med Med Sci.* 2007; **36:** 371–375.
5. Awe O, Adeoye A, Onakpoya O. Surgical eye removal in Ile-Ife, Nigeria. *Niger J Ophthalmol.* 2016; **24:** 31–34.
6. Saxby E, Davies R, Kerr J. Living with an artificial eye – the emotional and psychosocial impact. *Eye.* 2019; **33:** 1349–1351.
7. Sadiq SA, Pattinson R, Poole HM, Bundy C. Psychological distress and coping following eye removal surgery. *Orbit.* 2020; 39: 175–182.
8. Ababneh OH, AboTaleb EA, Abu Ameerh MA, Yousef YA. Enucleation and evisceration at a tertiary care hospital in a developing country. *BMC Ophthalmol.* 2015; **15:** 120.

9. Shome D, Honavar SG, Raizada K, Raizada D. Implant and prosthesis movement after enucleation: a randomized controlled trial. *Ophthalmology.* 2010; **117:** 1638–1644.
10. Sales-Sanz M, Sanz-Lopez A. Four-petal evisceration: a new technique. *Ophthalmic Plast Reconstr Surg.* 2007; **23:** 389–392.
11. Wladis EJ, Aakalu VK, Sobel RK, Yen MT, Bilyk JR, Mawn LA. Orbital Implants in Enucleation Surgery: A Report by the American Academy of Ophthalmology. *Ophthalmology.* 2018; **125:** 311–317.
12. Asari WA, Rawat S, Siddhpura NP. A prospective study of myoconjunctival enucleation for enhanced implant motility. *Int J Res Med Sci.* 2021; **9:** 3547.
13. Hime B, Isenberg J, Rocha G, Lowen M, Morales M, Fernandes BF, *et al.* Indications for eye removal over a 13-year period at an ophthalmology referral center in São Paulo, Brazil. *Arq Bras Oftalmol.* 2017; **80:** 220–223.
14. Mukona MM, Nyandoro G, Chikwasha V, Masanganise R. Prevalence of Destructive Eye Surgery and Their Indications at Sekuru Kaguvi Eye Hospital, Harare: A Review of Surgical Records from 2008 to 2013. *J Clin Ophthalmol Eye Disord.* 2019; **3:** 1027.
15. Ubah J, Fasina O, Otuka O, Oworu O. Eye removal procedures in Nigeria: A review article. *Niger J Ophthalmol.* 2018; **26:** 8–12.
16. Hansen AB, Petersen C, Heegaard S, Prause JU. Review of 1028 bulbar eviscerations and enucleations. Changes in aetiology and frequency over a 20-year period. *Acta Ophthalmol Scand.* 1999; **77:** 331–335.
17. Filatova IA, Kharlampidi MP. Change of priorities when selecting the method of eye removal: enucleation versus evisceration. *Vestn Oftalmol.* 2019; **135:** 16–21.
18. Coston TO, Small RG. Orbital exenteration – simplified. *Trans Am Ophthalmol Soc.* 1981; **79:** 136–152.
19. Martel A, Baillif S, Nahon-Esteve S, Gastaud L, Bertolotto C, Lassalle S, *et al.* Orbital exenteration: an updated review with perspectives. *Surv Ophthalmol.* 2021; **66:** 856–876.
20. Constant S, Koffi B, Serge I, Ellalie K, Francois D, Siméon K, *et al.* Epidemiological Particularities and Indications of the Mutilating Surgery of the Eyeball in Abidjan (Ivory Coast). *Open J Ophthalmol.* 2018; **8:** 91–96.
21. Chakraborti C, Sumiko KV, Singh S, Majumdar S, Ghosh AK. Analysis of Profile of Destructive Eye Surgeries at a Tertiary Eye Care Centre in West Bengal. *J Evid Based Med Healthc.* 2020; **7:** 876–879.
22. Chen H, Han J, Zhang X, Jin X. Clinical Analysis of Adult Severe Open-Globe Injuries in Central China. *Front Med.* 2021; **8:** 755158.
23. Adewara BA, Badmus SA, Awe OO, Onakpoya OH, Adegbehingbe BO, Adeoye AO. Epidemiology and management of oculoplastic disorders at a tertiary hospital: a 4-year review. *WAJM.* 2022; **39:** 635–640.
24. Chan SWS, Khattak S, Yücel N, Gupta N, Yücel YH. A decade of surgical eye removals in Ontario: a clinical-pathological study. *Can J Ophthalmol.* 2017; **52:** 486–493.
25. Tóth G, Pluzsik MT, Csákány B, Sándor GL, Lukáts O, Nagy ZZ, *et al.* Clinical Review of Ocular Traumas Resulting in Enucleation or Evisceration in a Tertiary Eye Care Center in Hungary. *J Ophthalmol.* 2021; **2021:** 1–6.
26. Lavaju P, Badhu B, Shah S, Upadhyaya P. Indications for destructive eye surgeries at tertiary care hospital, eastern Nepal: A five years experience. *Health Renaissance.* 2015; **13:** 161–168.
27. Fu R, Childs J, Nunery W, Timoney P. Surgical preferences in the management of recalcitrant endophthalmitis. *Orbit.* 2018; **37:** 315–320.
28. Heidari E, Taheri N. Surgical treatment of severely traumatized eyes with no light perception. *Retina.* 2010; **30:** 294–299.
29. Chaudhary A, Singh S. Evisceration with acrylic spherical implant: An evaluation. *IP Int J Ocul Oncol Oculoplasty.* 2021; **7:** 55–59.
30. Phan LT, Hwang TN, McCulley TJ. Evisceration in the modern age. *Middle East Afr J Ophthalmol.* 2012; **19:** 24–33.
31. Knezević M, Paović J, Paović P, Sredojević V. Causes of eye removal-analysis of 586 eyes. *Vojnosanit Pregl.* 2013; **70:** 26–31.
32. Fleming JC, Morley I, Malik M, Orfaniotis G, Daniel C, Townley WA, *et al.* Orbital exenteration and reconstruction in a tertiary UK institution: a 5-year experience. *Orbit.* 2021; **40:** 306–315.
33. Chawla B, Jain A, Azad R. Conservative treatment modalities in retinoblastoma. *Indian J Ophthalmol.* 2013; **61:** 479–485.