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OPHTHALMOLOGY | RESEARCH ARTICLE

Outcome of trachoma lid surgeries in Jigawa state, Nigeria

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Abstract: *Background:* Following the implementation of the SAFE strategy in Jigawa state, ophthalmic nurses trained as lid surgeons perform trichiasis surgery in the state. This study aimed to determine the early outcome of these surgeries with the specific objectives to determine the recurrence rate of trichiasis; the incidence of eyelid contour abnormality and incidence of eyelid closure defects 3–6 months postoperatively. *Methods:* A retrospective cohort study of patients operated for the first time between December 2012 and April 2013 in four zones in Jigawa state. Zones were selected based on the location of the most active surgeons. Patients were examined with torchlight for presence of recurrent trichiasis (TT recurrence), eyelid contour abnormality (ECA) and eyelid closure defects (ECD). *Results:* 133 eyes of 77 patients were examined; incidences recorded were TT recurrence 17.29% (95% CI 11.29–24.80%), ECA 18.93% (95% CI 12.64–26.67%) and ECD 5.3% (95% CI 2.15–10.62%). Incidence of poor outcome varied with zone and was associated with female sex, duration of symptoms >1 year preoperatively, bilaterally operated eyes, and paid surgery. *Conclusion:* The incidence of poor outcome measures was high across all zones evaluated. The risk factors associated with poorer outcome include late presentation, female sex, Bilateral surgery, and paid surgery.

ABOUT THE AUTHORS

The authors are a group of professionals made up of Ophthalmologists and an Ophthalmic Statistician whose research interests are mainly centered around eye health particularly public health for eye care and ophthalmic statistics. Alice Ramyil and Caleb Mpyet are specifically interested in trachoma and trichiasis related research; as well as Caleb Mpyet being part of the ongoing Global Trachoma Mapping Project (GTMP).

PUBLIC INTEREST STATEMENT

Trachoma is an infectious eye disease caused by the organism *Chlamydia trachomatis*. It is the leading cause of blindness from an infectious agent worldwide. The blinding forms of the disease affect adults especially women. The SAFE strategy (Surgery for Trichiasis the blinding form of the disease, Antibiotics for active disease, Facial cleanliness and Environmental Improvement to reduce disease transmission) for the prevention and control of Trachoma has been adopted by the World Health Organization (WHO). In order to reduce the burden of trachoma in Jigawa state, ophthalmic nurses trained as lid surgeons have performed over 20,000 trichiasis surgeries since 2007. The importance of regular good quality surgeries cannot be overemphasized if blinding trachoma is to be eliminated by the year 2020. This study evaluates the outcome of trichiasis surgery and factors relating to poor surgical outcomes in Jigawa state, with a view to improving quality and acceptability.

Subjects: Ophthalmology; Public Health - Medical Sociology; Public Health Policy and Practice

Keywords: outcome; trachoma; lid surgery; Jigawa state; Nigeria

1. Introduction

Trachoma is the leading cause of blindness due to an infectious agent worldwide (Resnikoff et al., 2004). It is a disease of poverty found in the poorest communities of developing countries and is endemic in 53 countries most of which are in sub-Saharan Africa and Asia (Pascolini & Mariotti, 2012). Over 40 million people are estimated to suffer from active trachoma, and about 8.2 million have trichiasis; 2.2 million have visual impairment and 1.2 million of these are irreversibly blind from trachoma (Mariotti, Pascolini, & Rose-Nussbaumer, 2009; Pascolini & Mariotti, 2012). The disease occurs in two phases, with the active phase commoner in young children and the blinding/cicatricial phase commoner in adults especially women (Mpyet, Lass, Yahaya, & Solomon, 2012; Mpyet, Ogoshi, & Goyol, 2008; West, Munoz, Turner, Mmbaga, & Taylor, 1991).

Implementation of the WHO (World Health Organization) SAFE strategy (Surgery for trichiasis, Antibiotics, Facial cleanliness and Environmental change, such as clean water, latrines and good sanitation) has brought about a 50% reduction in the magnitude of active trachoma from over 81 million in 2003. However, the magnitude of trichiasis has risen by about 10% from 7.6 million in 2003 with resultant marked increase in the number of people at risk of blindness from the disease. There is therefore a need for concerted efforts to increase the number and quality of lid surgeries in endemic areas to deal with the backlog of the trichiasis cases requiring surgery and prevent the huge economic loss attributed to visual loss from trachoma which has been estimated to be about US\$ 5.3 billion or more annually (Buchan, Limburg, & Burton, 2011; Frick, Hanson, & Jacobson, 2003).

1.1. Rationale

Jigawa is one of the states with high prevalence of trachoma. A population-based survey conducted showed a high prevalence of the blinding forms of trachoma-trachomatous trichiasis (TT: 5%) and corneal opacity (CO: 2.5%) in the age group 15 years and above (Ramyil et al., 2015). Since 2007, records show over 22,000 lid surgeries have been carried out by ophthalmic nurses trained as lid surgeons. However the outcome of these surgeries is unknown and patients' perception of the outcomes and their surgical experiences have not been evaluated. This study was done to determine the outcome of trachoma lid surgery, assess the lid surgery workforce and to assess patient satisfaction after trichiasis surgery in Jigawa state.

This article presents the findings of the outcome of trichiasis surgery 3–6 months post-operatively in Jigawa state.

The primary outcome measure assessed was trichiasis recurrence 3–6 months post operatively, while the secondary outcome measures were incidence of eyelid contour abnormalities (ECA) and eyelid closure defects (ECD) 3–6 months post operatively.

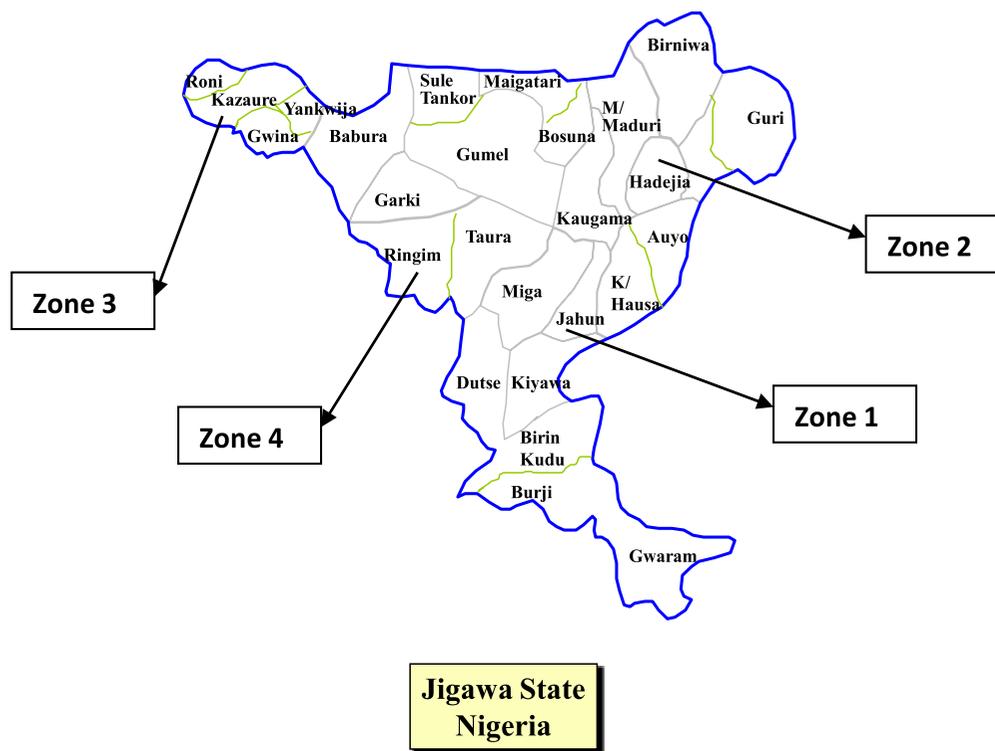
2. Methodology

This was a retrospective cohort study of patients who had lid surgery for trichiasis between December 2012 and April 2013.

2.1. Study area

Four zones in the state as shown in Figure 1 were included in the study. The zones were purposefully selected based on the location of the most active surgeons and their catchment areas. Study participants were subsequently grouped according to this zoning system. The state capital was excluded based on the fact that it is an urban settlement and most of the patients accessing lid surgery in that zone come from neighbouring states and were therefore likely to be unreachable for assessment during the study.

Figure 1. Map of Jigawa state showing the four zones (study sites).



2.1.1. Inclusion criteria

- (1) Only patients who had surgery between December 2012 and April 2013 (3–6 months before the commencement of the field work) were included.
- (2) Only eyes that have been operated upon for the first time within the study period were included.

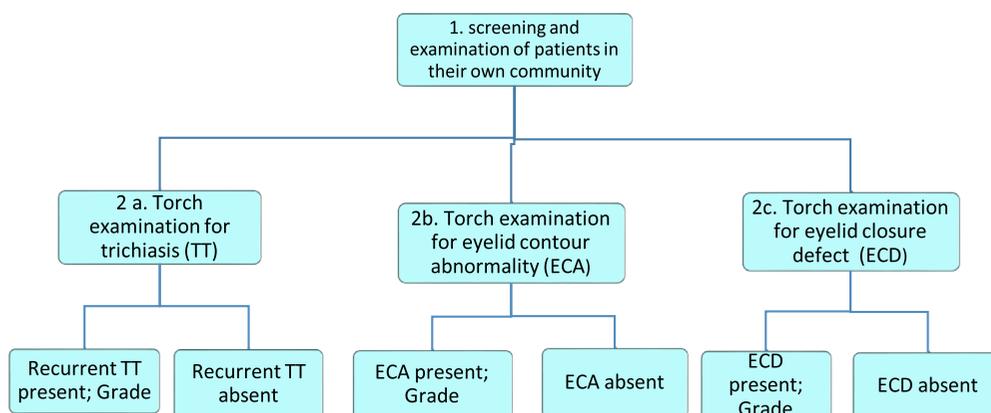
2.1.2. Exclusion criteria

- (1) Patients who were operated upon outside the study period: Patients operated upon less than 3 months before commencement of field work were excluded to allow for early effects of swelling and inflammation post-operation to subside. Patients operated upon more than six months before the study commenced were excluded to enhance recall of the patients' surgical experiences (important for the patient satisfaction aspect of the study).
- (2) Eyes with repeat surgery: These were excluded as they were thought to be more prone to higher rates of recurrence and other poor outcomes (Reacher et al., 1992). Data collection was done between mid-June and mid-July 2013.

The survey team was made up of an Ophthalmologist who conducted all examinations and interviews; a senior registrar in ophthalmology, two ophthalmic nurses (one from the zone), a local guide and a driver.

A list of all persons who had surgery for trichiasis in the four zones was obtained from the ophthalmic nurses in charge of each zone. The nurses and local guides in each LGA traced, informed and invited the patients for examination at the different centres where they had been operated upon. A time table was made and each of the communities listed was visited. Prior to this, radio announcements sponsored by the state primary eye care coordinator's office reminded patients and the community leaders of the examination dates.

Figure 2. Examination protocol.



Patients who failed to turn up at the examination centres were traced to their communities and examined either in their homes or in the home of the local community leader.

On arrival at the facility, all patients present were sorted accordingly. Patients not on the list were included if they had their hospital card with documented date of surgery as proof, or if they were identified by other patients who had surgery on the same day at the same facility. The participants were examined according to the flowchart in Figure 2.

Definitions for this study were:

- (1) Recurrent trichiasis was defined as the presence of at least one eyelash touching the eyeball at the time of examination; trichiasis was graded as minor (≤ 5 lashes) or major (≥ 6 lashes) (Rajak et al., 2013; Reacher, Huber, Canagaratnam, & Alghassany, 1990).
- (2) Eyelid Contour Abnormalities (ECA) defined as distortion of the normal lid contour on straight ahead gaze and graded as mild, moderate and severe using the grading system described by Gower et al. (2012) as shown in Table 1.
- (3) Eyelid closure defects (ECD) defined as lagophthalmos on gentle closure of the eyelids and for the purpose of this study graded into mild (lagophthalmos with no corneal exposure); moderate (lagophthalmos with less than half of the cornea exposed) and severe (lagophthalmos with up to half of the cornea exposed).

The presence or absence of other complications such as granuloma, wound dehiscence, infection, and lid margin necrosis were noted.

Table 1. Grading for eyelid contour abnormality (ECD) (Gower et al., 2012)

Grade	Description
Mild	Vertical deviation from the natural contour, 1 mm in height (less than half the pupil height in daylight) and affecting $<1/3$ of horizontal eyelid length
Moderate	Vertical deviation from the natural contour, 1–2 mm in height (about the pupil height in daylight) or affecting $1/3$ – $2/3$ of horizontal eyelid length
Severe	Vertical deviation from the natural contour, 2 mm in height (more than the pupil height in daylight) or a defect $>2/3$ of the horizontal eyelid length

2.2. Ethical considerations

All patients who did not meet the inclusion criteria were examined, treated and discharged. Those included in the study were addressed as a group. Informed consent was administered to eligible participants in group and individually for those who reported late or who were examined in their homes. Informed consent was obtained from each individual or a guardian (for children less than 12 years of age) evidenced by signing or thumb-printing the consent form.

Appropriate treatment, counselling or referral was given as required.

Ethical Approval was obtained from the London School of Hygiene and Tropical Medicine (LSHTM) and the Operational Research Committee of the Jigawa state Ministry of Health.

2.3. Data management and analysis

All data was double-entered into a pre-coded Microsoft Access database with consistency checks. All data entry was done by the Ophthalmologist on an on-going basis throughout the survey period.

Participants were identified by their unique Study identification numbers.

Data analysis was done using STATA version 12.1 statistical software. Chi square and Fisher's exact tests were used to assess the significance of associations between categorical variables. The significance of observed differences in continuous variables was assessed using two-sample t-tests (if data appeared symmetric) and rank-sum tests (if asymmetry suggesting non normality was detected).

3. Results

A total of 268 patients were expected to be examined (made up of 263 from the surgeons' lists and five patients not listed by surgeons), 212 (79%) were traced/presented for examination while 56 (21%) were absent.

A total of 133 eyes of 77 participants were examined, 56 (72.73%) participants were females. The mean age of the participants was 54.9 years (± 17.6 years) with a range of 8–90 years; females were relatively older ($\chi^2 p = 0.04$).

Of the 133 eyes operated for the first time within the study period, 112 (84.21%) had bilateral surgery, 12 (9.02%) were right eyes only, and 9 (6.77%) were left eyes only. Bilateral surgeries were commoner in females (89.11%) than males (68.75%), $\chi^2 p = 0.01$. Sixty-nine eyes (51.88%) were operated at the base hospitals. Surgery was free for 92 (69.17%) eyes and paid for 41 (30.83%) eyes. Postoperative visual acuity was $\geq 6/18$ in 43 eyes and $< 3/60$ in 47 eyes, with no difference between

Figure 3. Age/sex distribution.

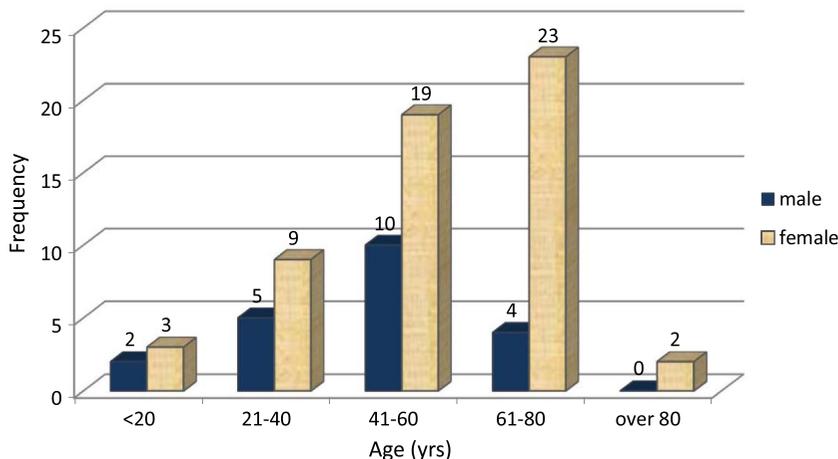


Table 2. Distribution of eyes operated by laterality and sex, age, place of surgery and visual acuity

Variable		Eye operated				Total	
		Unilateral		Bilateral		No	(%)
		No	(%)	No	(%)		
Sex	Male	10	31.25	22	68.75	32	100
	Female	11	10.89	90	89.11	101	100
	Total	21	16.42	112	83.58	133	100
	$X^2 p = 0.01$						
Age group	<20	0	0.00	10	100	10	100
	21-40	4	16.67	20	83.33	24	100
	41-60	6	11.54	46	88.46	52	100
	61-80	11	25.58	32	74.42	43	100
	81-100	0	0.00	4	100	4	100
	Total	21	15.79	112	84.21	133	100
	Fisher's exact $p = 0.2$						
Place of surgery	Base hospital	11	15.94	58	84.06	70	100
	Community	10	15.63	54	84.38	64	100
	Total	21	15.79	112	84.21	133	100
	$X^2 p = 0.9$						
Visual acuity	$\geq 6/18$	8	18.60	35	81.40	43	100
	<6/18-6/60	7	18.92	30	81.08	37	100
	<6/60-3/60	1	16.67	5	83.33	6	100
	<3/60-LP	5	11.36	39	88.64	44	100
	NLP	0	0.00	3	100	3	100
	Total	21	15.79	112	84.21	133	100
	Fisher's exact $p = 0.8$						

the bilateral and unilateral surgeries; see Table 2. However there were no documented records of visual acuity or trichiasis grading/severity before surgery for all the eyes examined (Figure 3).

Duration of preoperative symptoms was more than one year in 113 eyes (84.96%), 17 eyes had symptoms lasting less than one year and trichiasis in three eyes were discovered on routine examination and operated immediately.

Eighty-six eyes were operated 6 months prior to data collection, these were more likely to have free surgery (90.7%, Fisher's exact $p = 0.00$) and to have been operated on at the community (67.44%,

Table 3. Distribution of eyes operated by duration post-op and payment modality

Duration post-op (months)	Payment				Total	
	Free		Paid		No	%
	No	%	No	%		
3	3	18.75	13	81.25	16	100
4	3	21.43	11	78.57	14	100
5	8	47.06	9	52.94	17	100
6	78	90.70	8	9.30	86	100
Total	92	69.17	41	30.83	133	100
Fisher's exact $p = 0.00$						

Table 4. Distribution of eyes operated by duration post-op and place of surgery

		Place of surgery				Total	
		base hosp		Community			
		No	%	No	%	No	%
Duration Post-op (months)	3	16	100	0	0	16	100
	4	14	100	0	0	14	100
	5	11	64.71	6	35.29	17	100
	6	28	32.56	58	67.44	86	100
	total	69	51.88	64	48.12	133	100
Fisher's exact $p = 0.00$							
Payment	Free	32	34.78	60	65.22	92	100
	Paid	37	90.24	4	9.76	41	100
	Total	69	51.88	64	48.12	133	100
	Fisher's exact $p = 0.00$						

Fisher's exact $p = 0.00$). Table 3 shows the distribution of post-op period by payment modality, while Table 4 shows post-op duration and payment by place of surgery.

All eyes operated had the BLTR procedure except those operated in zone 1 who all had the trabut procedure.

4. Outcome of surgery

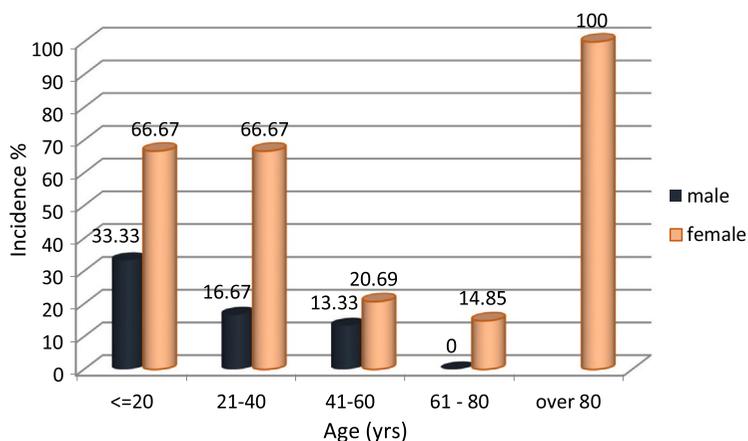
4.1. Incidence of recurrent trichiasis

Of the 133 eyes examined, 23 had recurrent TT with the overall incidence of 17.29% (95% CI 11.29%–24.80%). Incidence varied with zone (zone 1 highest); was more likely in females (OR 1.62; 95% CI 0.5–5.18), bilateral surgeries (OR 2.19; 95% CI 0.47–10.14); and paid surgery (OR 3.05; 95% CI 1.21–7.66). Figure 4 shows the incidence of recurrent trichiasis by age group.

Minor recurrence was seen in 14 eyes (60.87%) and major in nine eyes (39.13%).

All major trichiasis in bilaterally operated eyes (Fisher's exact $p = 0.5$).

Figure 4. Trichiasis recurrence by age group and sex.



4.2. Incidence of eyelid contour abnormality (ECA)

The incidence of ECA was 18.93% (95% CI 12.64%–26.67%). The incidence was higher in females (21%) than in males (4%); it was higher in females of all age groups except in those aged ≤ 20 years where it was same (Fisher’s exact $p = 0.4$).

ECA risk was highest in zone 1 (35.9%; Fisher’s exact $p = 0.01$); eyes operated at the base hospitals (20.59%); those who were operated five months ago (41%), Fisher’s exact $p = 0.03$; longer duration of symptoms preoperatively (20% risk). ECA was less likely in free surgery (16.13%) than paid surgery (25.64%); The likelihood of ECA is greatest if only the left eye was operated (22.22%), followed by bilateral surgery (19.09%) and least likely if only the right eye was operated (15.38%); Fisher’s exact $p = 0.9$. There were no significantly associated risk factors for ECA occurrence.

ECA was mild in 68% (17), moderate in 28% (7) and severe in 4% (1). Severity more in females (Fisher’s exact $p = 1.0$); bilateral surgeries Fisher’s exact $p = 0.6$). There no variation with zone (Fisher’s exact $p = 1.0$).

4.3. Eyelid closure defects (ECD)

The incidence of ECD was 5.3% (95% CI 2.15%–10.62%). The incidence was higher in females (21%) than males (4%) Fisher’s exact $p = 0.3$. This was true for all age groups except age 21–40 years, where it was higher in males.

Risk of ECD was highest in zone 3 (11.11%), eyes operated at the base hospitals (7.35%). ECD was less likely in eyes operated free (6.45% risk) and eyes operated six months prior to the survey (4.60% risk). All ECD were found in eyes with preoperative symptoms more than one year (6.25% risk; Fisher’s exact $p = 1.0$). ECD was most likely if only the left eye was operated (22.22%) than if only the right eye was operated (15.38%) and least likely in bilateral surgery (2.73%) Fisher’s exact $p = 0.01$.

ECD was mild in 83% (5) and moderate in 16.67% (1) eyes. No severe ECD was recorded. Mild ECD was uniformly distributed across the zones and in both bilateral and unilateral surgeries, the only moderate ECD was in a unilateral eye in zone 1. Only two eyes in males had ECD, both were mild, no case of severe ECD were recorded (Table 5).

4.4. Other complications

The incidence of other complications was 2.26% (95% CI 0.47%–6.59%). The three eyes affected (2 in females and 1 in males) had conjunctival granuloma.

Table 5. Summary of outcome measures by zone and type of procedure

Zone	Type of operation	Number operated (N)	Incidence of TT (%)	Incidence of ECA (%)	Incidence of ECD (%)
1	PLTR (Trabut)	41	26.83	35.90	5.13
2	BLTR	32	15.63	12.50	0
3	BLTR	27	3.7	7.41	11
4	BLTR	33	18.18	14.71	5.88

5. Discussion

To our knowledge, this study is one of the earliest reports of the outcome of trichiasis surgery in Northern Nigeria where trachoma is highly prevalent, and the surgery component of the SAFE strategy has been implemented in many of the affected states with the support of government and non-governmental organizations. The study participants were drawn from across the state where different surgeons operate; the findings therefore represent a snapshot of activities of a variety of surgeons with varied experience and skills.

The response rate was good with a likely loss to follow up rate of about 21% assuming that the patients who were not traced shared the same characteristics with the group that turned up. Although there may be the possibility of selection bias, with likely underestimation of poor outcome measures if those who failed to turn up probably due to disillusionment have poorer outcome or an overestimation if only those with problems turned up with the hope of getting help. Only one person refused examination, and it is not known if he was eligible for inclusion in the study. The small number of eyes operated reflects the low level of surgical activity that goes on routinely in most centres across the state, as most patients wait for the annual surgical camps to present for surgery. This is evidenced by the fact that most patients in this study were operated six months prior to the survey during the last cycle of the free surgical campaigns for the year 2012. Also the fact that more eyes were operated free of charge including half of those operated at the base hospitals gives credence to this assertion.

As expected, there were more females than males in the study, this reflects the fact that trichiasis affects more females than males (Mansur, Muhammad, & Liman, 2007; Mpyet et al., 2008, 2012). The mean age of 54.9 years reflects the fact that trichiasis is a disease of adulthood. However in this study two persons were children aged 13 and 8 years respectively. This is consistent with findings of others and may reflect the severity of the disease with early onset of scarring in young age in endemic areas (Ngondi et al., 2009; Rabi, Muhammed, & Isiyaku, 2011). This early onset of trichiasis in young children could pose a challenge to trichiasis surgery service as children would often require operation in centers well-equipped with facility for general anaesthesia as compared to adults whose surgery can be performed in the community under local anaesthesia as recommended by WHO (Ngondi et al., 2009; West, Bedri, Thanh Ton, West, & Mariotti, 2005). The children in this study were however operated under local anaesthesia and sedation. There was a significant difference in the mean age in both sexes with females being relatively older, this could also be a reflection of the gender disparity in access to healthcare with females more likely to present later with more advanced disease such as bilateral involvement as was the case in this study (Doyal, 2001; Hazarika, 2000; Iyer, Sen, & George, 2007; Shaw, 2006).

5.1. Outcome of lid surgery

The incidence of recurrent trichiasis was high over the six month period. This is similar to that reported elsewhere (el Toukhy, Lewallen, & Courtright, 2006), but higher than the one year incidence recorded in another study (West et al., 2006). The later however was a controlled trial unlike the case in our study and in others with similarly high incidence. This may signify the need for close monitoring and supervision in programme settings as in controlled trials to improve results.

It has been shown that early recurrence correlates well with surgery related factors such as incision length, suture type, probably surgical technique and wound healing which result in poor lid rotation with consequent recurrence (Gower et al., 2011; Rajak, Collin, & Burton, 2012). Other factors include surgeon's ability, infection and severity of the trichiasis before operation (Gower et al., 2011; West et al., 2006). A variation in recurrence across the zones which is significantly different between the zone with the highest and that with the lowest rate may suggest a difference in surgical skill as also reported by others (Merbs, West, & West, 2005; West et al., 2005). There is more than one surgeon working in each zone which makes it difficult to differentiate good from poor surgeons. This however may reflect the need for re-training and close supervision across board. Also the variation between the zones may be an indirect reflection of the difference in surgical technique as all the

eyes operated in zone 1 had the PLTR (Trabut) operation, while those in the other zones had the BLTR. The BLTR has been found to have the lowest risk of recurrence in controlled trials, though the results of PLTR are comparable (Adamu & Alemayehu, 2002) and hence the WHO's recommendation of either procedure in programme settings (Solomon, 2006).

Severe disease preoperatively is associated with higher recurrence due to excessive scarring resulting in technical difficulty in rotating the lid at surgery (Alemayehu et al., 2004; Burton et al., 2005; Rajak et al., 2013). Pre-operative grading of trichiasis was not documented; therefore we could not relate it to the recurrence. This underlies the need for proper documentation and record keeping to aid surgical audit.

Those eyes that had free surgery incidentally had significantly lower rates of recurrence. This may probably be because these eyes were mostly operated during the free surgical campaigns when patients were usually given free postoperative oral and topical antibiotics which have been shown to reduce recurrence due to persistent infection with both trachoma and other organisms (Burton et al., 2005; West et al., 2006). The paying patients however are required to purchase their postoperative medications in addition to the surgery fee which most patients may not afford due to poverty. The incidence of trichiasis did not vary significantly with duration of postoperative period. Similar finding has been reported in another study, although the length of post-op period was at least 18 months in that study (West et al., 2005).

The incidence of ECA over the six month period was high, although the majority recorded were mild. This is not uncommon as many studies have documented the occurrence of lid notching which though not graded were frequently observed; these studies however reported lower rates ranging from 1.2 to 6.3% (Adamu & Alemayehu, 2002; Alemayehu et al., 2004; Bog, Yorston, & Foster, 1993; Bowman et al., 2002; Gower et al., 2011). Our study is one of the first to put to test the new grading system for eyelid contour abnormalities as developed by Gower et al. (2012) and we found it to be quite easy to use in the field. As they noted, a standard grading system would enhance assessment and comparability of results in different studies.

The risk of eyelid contour abnormality was higher in females, eyes with symptoms lasting more than one year and bilateral cases. This may also reflect the effect of severity of disease preoperatively which may cause difficulty in eversion of the lid at operation with distortion of the lid contour due to scarring, usually worse in long-standing and severe disease. The risk of ECA was least in those operated six months prior to the survey, those whose surgeries were free, and those operated at the community. The incidence and severity of ECA is highest in zone one, the reason for this difference is related to that of recurrent trichiasis. ECA usually occur as a result of too tight sutures. Tight sutures can be released if detected early or repeat surgery may be required. The BLTR procedure has been reported to have relatively lower rate of ECA (0–14%) compared to the PLTR (6–30%) as we also found in this study where zone 1 which is the only zone doing PLTR had the highest rate (Alemayehu et al., 2004; Bog et al., 1993; Bowman et al., 2000; Gower et al., 2011).

The incidence of ECD was similar to rates reported by others (Reacher et al., 1992). The majority of those we found were mild with no case severe enough to cause exposure keratopathy. Lagophthalmos (ECD) is not uncommon post trichiasis surgery (Bowman et al., 2000; Gower et al., 2011; Reacher et al., 1990, 1992). Although there is no standard grading system for this defect following trichiasis surgery, most reported have been described as mild with minimal risk of corneal exposure. Many factors have been documented to be responsible for lid closure defects including the presence of lagophthalmos preoperatively, long standing disease with severe scarring and lid shortening, presence of other complications such as granuloma around the wound edge and other eyelid lesions such as tumours (Gower et al., 2012). We did not have records of preoperative lagophthalmos documented, therefore we are unable to relate this to the incidence, but the higher rate of ECDs in those presenting more than one year after onset of symptoms may suggest longstanding and more severe disease. Bilateral cases in our study were incidentally less likely to have eyelid closure defects. Eyes

operated in zone one had the highest incidence where the only eye with moderate ECD was found. This as with the other outcome measures reflects a variation in skill and possibly technique. ECD may result from overcorrection, therefore patients need to be followed-up for early detection and correction in the form of suture release or repeat surgery in severe cases.

The fact that both ECAs and ECDs were more common in the left eye, may suggest a technical difficulty in operating the left eye as reported by another study that found higher recurrence rate of trichiasis on the left eye and the left side of the right eye, though in our study there was no difference in trichiasis recurrence in both eyes (Merbs et al., 2005).

The incidence of other post operative complications was low in this study. Conjunctival granuloma formation is one of the commonest complications recorded following trichiasis surgery (Gower et al., 2011; Reacher et al., 1992) and may result from inflammatory reaction to lid sutures that have been left insitu, or due to infection. Small granulomas may resolve spontaneously, but persistent large ones causing lid closure defects may need to be excised. As such close monitoring with regular follow up especially in the early weeks to months postoperatively is essential for early detection, treatment and to allay the patient's anxiety in mild cases.

The study is limited by the non-availability of preoperative examination records and documentation of disease severity which limits the extent of assessment of the risk factors for poor outcome. Inadequate and improper documentation and record keeping was encountered in all the zones evaluated.

6. Conclusion

There is a high incidence of all the poor outcome measures assessed in all the zones evaluated. The risk factors associated with poorer outcome include long standing disease with late presentation, female sex, bilateral disease and paid surgery. The lack of preoperative data however limits the extent of risk factor assessment in this study.

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Competing Interests

The authors declare no competing interest.

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References

- Adamu, Y., & Alemayehu, W. (2002). A randomized clinical trial of the success rates of bilamellar tarsal rotation and tarsotomy for upper eyelid trichomatous trichiasis. *Ethiopian Medical Journal*, 40, 107–114.
- Alemayehu, W., Melese, M., Bejiga, A., Worku, A., Kebede, W., & Fantaye, D. (2004). Surgery for trichiasis by ophthalmologists versus integrated eye care workers a randomized trial. *Ophthalmology*, 111, 578–584. <http://dx.doi.org/10.1016/j.ophtha.2003.06.030>
- Bog, H., Yorston, D., & Foster, A. (1993). Results of community-based eyelid surgery for trichiasis due to trachoma. *British Journal of Ophthalmology*, 77, 81–83. <http://dx.doi.org/10.1136/bjo.77.2.81>
- Bowman, R. J., Jatta, B., Faal, H., Bailey, R., Foster, A., & Johnson, G. J. (2000). Long-term follow-up of lid surgery for trichiasis in the Gambia: Surgical success and patient perceptions. *Eye (London, England)*, 14, 864–868. <http://dx.doi.org/10.1038/eye.2000.238>
- Bowman, R. J., Faal, H., Jatta, B., Myatt, M., Foster, A., Johnson, G. J., & Bailey, R. L. (2002). Longitudinal study of trichomatous trichiasis in the Gambia: Barriers to acceptance of surgery. *Investigative Ophthalmology & Visual Science*, 43, 936–940.
- Buchan, J. C., Limburg, H., & Burton, M. J. (2011). Quality assurance in trichiasis surgery: A methodology. *British Journal of Ophthalmology*, 95, 331–334. <http://dx.doi.org/10.1136/bjo.2010.186197>

- Burton, M. J., Kinteh, F., Jallow, O., Sillah, A., Bah, M., Faye, M., ... Faal, H. (2005). A randomised controlled trial of azithromycin following surgery for trachomatous trichiasis in the Gambia. *British Journal of Ophthalmology*, 89, 1282–1288.
<http://dx.doi.org/10.1136/bjo.2004.062489>
- Doyal, L. (2001). Sex, gender, and health: The need for a new approach. *British Medical Journal*, 323, 1061.
<http://dx.doi.org/10.1136/bmj.323.7320.1061>
- el Toukhy, E., Lewallen, S., & Courtright, P. (2006). Routine bilamellar tarsal rotation surgery for trachomatous trichiasis: Short-term outcome and factors associated with surgical failure. *Ophthalmic Plastic & Reconstructive Surgery*, 22, 109–112.
<http://dx.doi.org/10.1097/01.iop.0000203494.49446.60>
- Frick, K. D., Hanson, C. L., & Jacobson, G. A. (2003). Global burden of trachoma and economics of the disease. *The American Journal of Tropical Medicine and Hygiene*, 69(5 suppl 1), 1–10.
- Gower, E. W., Merbs, S. L., Munoz, B. E., Kello, A. B., Alemayehu, W., Imeru, A., & West, S. K. (2011). Rates and risk factors for unfavorable outcomes 6 weeks after trichiasis surgery. *Investigative Ophthalmology & Visual Science*, 52, 2704–2711. <http://dx.doi.org/10.1167/iovs.10-5161>
- Gower, E. W., West, S. K., Cassard, S. D., Munoz, B. E., Harding, J. C., & Merbs, S. L. (2012). Definitions and standardization of a new grading scheme for eyelid contour abnormalities after trichiasis surgery. *PLoS Neglected Tropical Diseases*, 6, e1713. <http://dx.doi.org/10.1371/journal.pntd.0001713>
- Hazarika, G. (2000). Gender differences in children's nutrition and access to health care in Pakistan. *The Journal of Development Studies*, 37, 73–92.
<http://dx.doi.org/10.1080/013716000059>
- Iyer, A., Sen, G., & George, A. (2007). The dynamics of gender and class in access to health care: Evidence from rural Karnataka, India. *International Journal of Health Services*, 37, 537–554.
<http://dx.doi.org/10.2190/1146-7828-5L5H-7757>
- Mansur, R., Muhammad, N., & Liman, I. R. (2007). Prevalence and magnitude of trachoma in a local government area of Sokoto state, North Western Nigeria. *Nigerian Journal of Medicine*, 16, 348–353.
- Mariotti, S. P., Pascolini, D., & Rose-Nussbaumer, J. (2009). Trachoma: Global magnitude of a preventable cause of blindness. *British Journal of Ophthalmology*, 93, 563–568.
<http://dx.doi.org/10.1136/bjo.2008.148494>
- Merbs, S. L., West, S. K., & West, E. S. (2005). Pattern of recurrence of trachomatous trichiasis after surgical technique as an explanation. *Ophthalmology*, 112, 705–709.
<http://dx.doi.org/10.1016/j.ophtha.2004.10.037>
- Mpyet, C., Lass, B. D., Yahaya, H. B., & Solomon, A. W. (2012). Prevalence of and risk factors for trachoma in Kano state, Nigeria. *PLoS ONE*, 7, e40421.
<http://dx.doi.org/10.1371/journal.pone.0040421>
- Mpyet, C., Ogoshi, C., & Goyol, M. (2008). Prevalence of trachoma in Yobe state, North-Eastern Nigeria. *Ophthalmic Epidemiology*, 15, 303–307.
<http://dx.doi.org/10.1080/09286580802237633>
- Ngondi, J., Reacher, M. H., Matthews, F. E., Brayne, C., Gatpan, G., Becknell, S., ... Emerson, P. M. (2009). Risk factors for trachomatous trichiasis in children: Cross-sectional household surveys in Southern Sudan. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 103, 305–314.
<http://dx.doi.org/10.1016/j.trstmh.2008.08.024>
- Pascolini, D., & Mariotti, S. P. (2012). Global estimates of visual impairment: 2010. *British Journal of Ophthalmology*, 96, 614–618.
<http://dx.doi.org/10.1136/bjophthalmol-2011-300539>
- Rabiu, M. M., Muhammed, N., & Isiyaku, S. (2011). Challenges of trachoma control: An assessment of the situation in Northern Nigeria. *Middle East African Journal of Ophthalmology*, 18, 115.
<http://dx.doi.org/10.4103/0974-9233.80699>
- Rajak, S. N., Collin, J. R., & Burton, M. J. (2012). Trachomatous trichiasis and its management in endemic countries. *Survey of Ophthalmology*, 57, 105–135.
<http://dx.doi.org/10.1016/j.survophthal.2011.08.002>
- Rajak, S. N., Habtamu, E., Weiss, H. A., Kello, A. B., Abera, B., Zerihun, M., ... Lietman, T. M. (2013). The outcome of trachomatous trichiasis surgery in Ethiopia: Risk factors for recurrence. *PLoS Neglected Tropical Diseases*, 7, e2392.
<http://dx.doi.org/10.1371/journal.pntd.0002392>
- Ramyil, A., Wade, P., Ogoshi, C., Goyol, M., Adenuga, O., Dami, N., & Mpyet, C. (2015). Prevalence of trachoma in Jigawa state, Northwestern Nigeria. *Ophthalmic Epidemiology*, 22, 184–189.
<http://dx.doi.org/10.3109/09286586.2015.1037399>
- Reacher, M. H., Huber, M. J., Canagaratnam, R., & Alghassany, A. (1990). A trial of surgery for trichiasis of the upper lid from trachoma. *British Journal of Ophthalmology*, 74, 109–113. <http://dx.doi.org/10.1136/bjo.74.2.109>
- Reacher, M. H., Munoz, B., Alghassany, A., Daar, A. S., Elbulay, M., & Taylor, H. R. (1992). A controlled trial of surgery for trachomatous trichiasis of the upper lid. *Archives of Ophthalmology*, 110, 667–674.
<http://dx.doi.org/10.1001/archophth.1992.01080170089030>
- Resnikoff, S., Pascolini, D., Etya'ale, D., Kocur, I., Pararajasegaram, R., Pokharel, G. P., & Mariotti, S. P. (2004). Global data on visual impairment in the year 2002. *Bulletin of the World Health Organization*, 82, 844–851.
- Shaw, D. (2006). Women's right to health and the Millennium development goals: Promoting partnerships to improve access. *International Journal of Gynecology & Obstetrics*, 94, 207–215.
<http://dx.doi.org/10.1016/j.ijgo.2006.04.029>
- Solomon, A. W. (2006). *Trachoma control: A guide for programme managers*. Geneva: WHO.
- West, S. K., Bedri, A., Thanh Ton, T., West, E. S., & Mariotti, S. P. (2005). *Final assessment of trichiasis surgeons*. Geneva: WHO.
- West, E. S., Mkocha, H., Munoz, B., Mabey, D., Foster, A., Bailey, R., West, & S. K. (2005). Risk factors for postsurgical trichiasis recurrence in a trachoma-endemic area. *Investigative Ophthalmology & Visual Science*, 46, 447–453.
<http://dx.doi.org/10.1167/iovs.04-0600>
- West, S. K., Munoz, B., Turner, V. M., Mmbaga, B. B., & Taylor, H. R. (1991). The epidemiology of trachoma in central Tanzania. *International Journal of Epidemiology*, 20, 1088–1092.
<http://dx.doi.org/10.1093/ije/20.4.1088>
- West, S. K., West, E. S., Alemayehu, W., Melese, M., Munoz, B., Imeru, A., ... Quinn, T. (2006). Single-dose azithromycin prevents trichiasis recurrence following surgery. *Archives of Ophthalmology*, 124, 309–314.
<http://dx.doi.org/10.1001/archophth.124.3.309>



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