

Prevalence of Post-Operative Trichiasis in Southern Ethiopia, 2021: A Community Based Cross Sectional Study

Chuchu Churko¹, Alemayehu Bekele Kassahun¹, Tamiru Getachew², Belachew Bokicho³, Haileyesus Deboch Terefe³, Selamawit Dagne⁴, Tsegaye Yohanes¹

¹Collaborative Research and Training Center for Neglected Tropical Diseases, College of Medicine and Health Sciences, Arba Minch University, Arba Minch Town, Southern Nation Nationality Region, Ethiopia; ²Department of Medical Anatomy, Arba Minch University, Arba Minch Town, Southern Nation Nationality Region, Ethiopia; ³Disease Prevention and health Promotion Directorate, Hawassa Town, Southern Nation Nationality Region, Ethiopia; ⁴Orbis International Ethiopia, Arba Minch Branch Office, Arba Minch Town, Southern Nation Nationality Region, Ethiopia

Correspondence: Chuchu Churko, Tel +251920315157, Email churkochuchu2005@gmail.com

Background: Post-operative trichiasis (PTT) is a major challenge following corrective eyelid surgery for trachomatous trichiasis. There is a scarcity of research on post-operative trichiasis in Southern Ethiopia, particularly in the study area. This study aimed to assess the prevalence of post-operative trichiasis in patients who underwent corrective surgery.

Objective: To assess the prevalence of post-operative trichiasis in the Gamo Zone in Southern Ethiopia in 2021.

Methods: A descriptive community-based cross-sectional study was conducted in the Dita district, Southern Ethiopia. The data were collected between 2014 and 2020. Three Qualified trachoma trichiasis (TT) graders working on a trachoma impact survey were recruited for this study. Eye examinations were performed by graders on all study subjects using a loupe to identify post-operative trichiasis. All patients underwent upper eyelid surgery only. A systematic sampling technique was used to select 459 participants from the TT Surgery Logbook.

Results: Of the 459 study participants, more than three quarter 353 (76.9%) were female. The mean age of the study subjects was 48.38 years with a standard deviation of +10.4. A total of 10 upper eyelids (7 bilateral and 3 left upper eyelids) underwent PTT. The prevalence of post-operative trichiasis in the study area was 2.2% (95% CI: 0.9–3.5%). Fourteen (4.7%) unoperated upper eyelids developed trichiasis infection. A few patients had left and right lower eyelid trichiasis (6/459 [1.3%] and 3/459 [0.7%], respectively).

Conclusion and Recommendation: The prevalence of post-operative trichiasis in the study area was similar to that recommended by the World Health Organization (WHO) recommendation range. Trachoma trichiasis was observed on the lower and upper unoperated eyelids of the study participants. Therefore, sustainable interventions should be considered in the study area for all the components of the SAFE strategy, particularly on S component.

Keywords: post-operative trichiasis, trachoma, Dita district

Introduction

Globally, trachoma is considered to be the principal preventable infectious cause of blindness. The etiologic agent, the intracellular bacterium *Chlamydia trachomatis*, spreads through infected discharge from the eye and nose, which is carried on 3F's (fomites, finger, and flies).¹ The disease causes active inflammation of the conjunctiva (active trachoma) typically in childhood, which leads to scarring of the eyelid if it persists or recurs. Scar contraction causes the eyelashes to turn inward and scratch the cornea. This stage is called trachoma trichiasis (TT) stage. It is mostly a problem of the upper eyelid, although it can also be found in the lower eyelids.²

Compared to other continents, Africa is a seriously affected continent with 18 million active trachoma cases (85% world burden) and 3.2 million are in the stage of trichiasis (advanced stage) and need operation to save them from blindness.^{3,4} Ethiopia and South Sudan accounted for the largest prevalence of active trachoma.⁵

If people are not treated for trichomatous trichiasis, it will result in irreversible blindness; every 15 min, one person becomes blind and one person experiences severe vision loss every 4 min globally.^{6,7} In addition to the discomfort and pain of the disease and the infirmity caused by loss of sight, trachoma causes dependency and is an obstacle to growth. The cost of infirmity and likely loss of productivity alone has been projected to exceed USD2 billion per year.⁸

Surgery should be offered to any individual with TT thought likely to benefit from an operation; the S component of SAFE strategy is public health level intervention, recommended when the prevalence of trichiasis is “unknown to the health system” and is $\geq 0.2\%$ among individuals aged ≥ 15 years. The criteria for elimination of trachoma as a public health problem are as follows: 1) a prevalence of TT unknown to the health system of $< 0.2\%$ among people aged ≥ 15 years; 2) a prevalence of trichomatous follicular (TF) of $< 5\%$ among children aged 1–9 years in each previously endemic district; and 3) indications that the health system can continue to identify and manage incident cases of TT.⁹

Recurrent trichiasis has an undesirable influence on the delivery of good quality services and reduces the acceptance rate of trichiasis surgery, which may affect the progress of trachoma elimination in a country. If individuals with trichiasis are not treated well, other patients may be less likely to receive the surgery service.¹⁰ In addition, it is a major problem as repetitive operation has a higher risk of surgical failure than a primary operation and the eye may face the risk of blindness.¹¹ A survey that measured post-operative trachoma trichiasis (PTT) in Africa showed that the prevalence was ranged from 2.3% at 6 weeks to 65% at 7 years.¹²

The third global scientific meeting on trachoma assembled in 2010 suggested that nationwide trachoma programs should report the incidence of recurrent trichiasis and target a cumulative post-operative trichiasis incidence of $\leq 10\%$ at one year after-surgery.¹³ There is inadequate operational research on the incidence of recurrent trichomatous trichiasis published in areas where trachoma elimination programs are active.¹⁴

As countries exert efforts to eliminate their TT backlog, high rates of surgeries are required, and this is more likely to be attained if the surgical outcomes are good. Therefore, identifying means to ensure high-quality TT-surgery outcomes remains a vital public health issue. From our previous qualitative research, we found that most patients with trichiasis complained that they were repeatedly operated for trichiasis. Therefore, this study aimed to assess post-operative trichomatous trichiasis in patients who underwent surgery in the study area.

Methods and Materials

Study Setting

This study was conducted in the Gamo Zone of Dita district in Southern Ethiopia. Based on the 2007 Census conducted by the Central Statistics Agency (CSA), the district has 83,987 total populations, of whom 39,465 are men and 44,522 women; 2972 or 3.54% of its population are urban dwellers.¹⁵ The current data of the district has shown that there are 5 health centers including 1 satellite health centers and 4 clusters.

Study Design and Period

This community-based cross-sectional study was conducted between 1 and 30 January 2021.

Population

The source population included all patients who underwent surgery in the Dita district. The study population included patients who underwent surgery in the study area between the years 2014 and 2020.

Eligibility Criteria

All patients who underwent surgery for trichiasis between 2014 and 2020 in the study area were included. However, individuals who were recently operated on (within 6 months prior to data collection) were excluded from this study because recurrence is not common at this time. Patients who were severely ill or unable to respond to the questions were also excluded from the study.

Study Variables

Dependent Variable

Post-operative trichiasis (yes or no)

Independent Variables

- Age
- Gender
- Family size
- Eye lid operated
- Year of operation
- Type of surgical procedure
- Treatments given after surgery
- Frequency of operation

Operational Definitions

Post-Operative Trichiasis

One or more eyelashes touching the globe or a history of epilation after surgery.¹⁶

Integrated Eye Care Worker (IECW)

A paramedic trained for one month to perform posterior tarsal rotation for trachomatous trichiasis.¹⁶

Sample Size Calculation

Single population proportion formula was used to calculate sample size by taking the following assumption: prevalence of recurrence of trichiasis = 24.7%,¹⁷ margin of error = (0.05), $z_{\alpha/2}$ = significance level at 95% confidence interval = 1.96, the calculated sample size was 286 and considering design effect 1.5, $286 * 1.5 = 429$; and non-response rate 10%, $429 + 43 = 472$; the estimated final sample size was 472.

Sampling Procedure

Based on the location of each health center, four clusters were identified in the district. The number of individuals who underwent TT surgery was identified from each cluster and the sample size was allocated to each cluster in proportion to the number of patients operated for trichiasis. For each cluster, study participants were selected from the list using the lottery method. Repeated attempts were made to visit participants who were absent during the data-collection period (Figure 1).

Data Collection

A pretested interviewer-administered structured questionnaire was used to collect data from the study participants. The questionnaire template was created using Kobo toolbox software. The data collection tool included information on the sociodemographic and surgical history of the patients. An observational checklist was also prepared to see evidence of inward/inverted eyelashes and broken, newly growing, and absent eyelashes. The data collectors counted lashes in contact with the eyeball when there was clear evidence of epilation. Clinical evidence of epilation was defined as the existence of broken or recently emerging lashes, or evidence of areas with absent lashes.

Data Processing and Analysis

Data were downloaded to Microsoft Excel and imported into SPSS version 25 for cleaning, coding, and analysis. Descriptive statistics were used to characterize the study population. The results were presented as frequencies, proportions, narratives, tables, and figures.

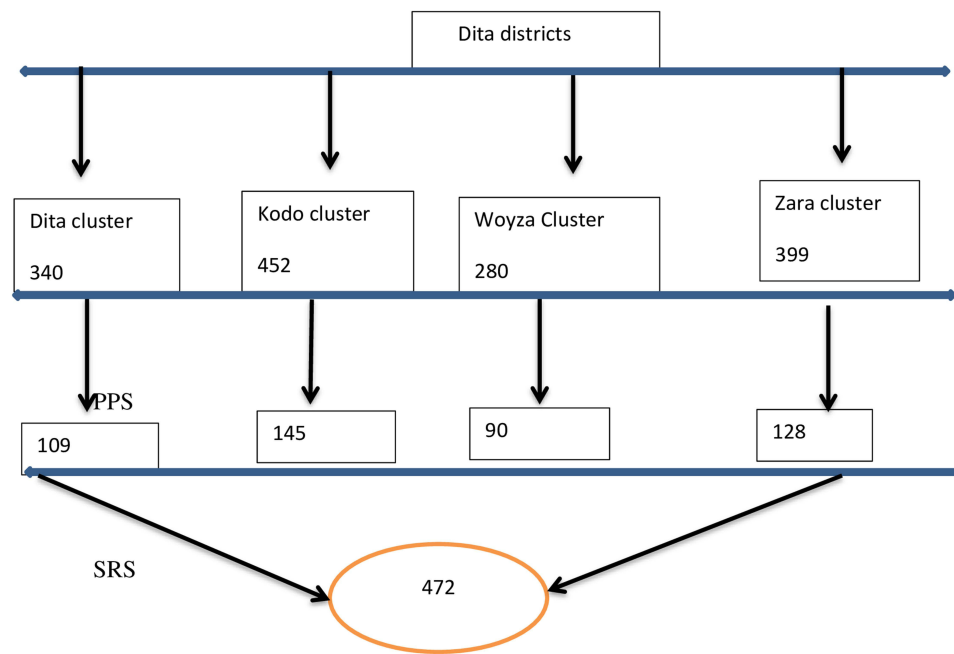


Figure 1 Schematic presentation of sampling procedure.

Ensure Data Quality

The data collection tool was prepared in English, translated into Amharic, and then back-translated into English by language experts to ensure consistency. The pre-test was conducted among 5% of individuals before one week of data collection outside the study area (Arba Minch Zuria District). Two-day training was provided to the data collectors and supervisors on the objective of the study, how to interview the study subjects, purpose, risks, and research ethics prior to data collection. Data were checked daily to ensure completeness and appropriate recording of the necessary information. Missing values and possible outliers were checked during the cleaning and sorting.

Result

Socio-Demographic Characteristics

Of the 472 respondents, 459 (97.2%) of the study participants were interviewed. The remaining 13 (2.8%) were excluded from the survey because of their absence after repeated visits. All study participants were aged ≥ 25 years. The female participants accounted for the highest number of participation, 353 (76.9%) (Table 1).

Clinical Characteristics of the Study Subjects

One hundred and sixty nine (36.8%) study subjects were provided with both upper eyelid surgery services, whereas 162 (35.3%) of the total interviewed patients had a right upper eyelid operation. The highest number of operations was observed in 2015, 140 (30.5%), followed by 2016 E.C, 95 (20.7%). More than three-quarters 345 (75.2%) of the study subjects underwent bilamellar tarsal rotation (BLTR) surgical procedure for their last surgery. Majority 354 (77.1%) of the participants had given tetracycline eye ointment (TEO) treatment after surgical correction of their eyes (Table 2).

Prevalence of Post-Operative and New Trichiasis Among Study Subjects

The prevalence of post-operative trachoma trichiasis (PTT) was 2.2%, with a 95% confidence interval of 0.9–3.5%. Of the 162 patients who underwent both upper eyelid surgery, 7 (4.3%) presented with post-operative trichiasis. However, none of the patients who underwent right upper eyelid surgery experienced recurrent trichiasis. Almost all 9 out of 10 PTT were identified among female participants. There were no PTT among the patients who underwent surgery twice or more times (Table 3).

Trichiasis was present in 14 (4.7%) of the unoperated upper lids of the study subjects. Six (1.3%) and three (0.7%) study participants had left- and right-lower lid trichiasis, respectively (Table 3).

Table 1 Socio-Demographic Characteristics of the Study Population in Dita District, Southern Ethiopia, 2021

Variables	Category	Frequency	Percent %
Age in years	25–34	37	8.1
	35–44	137	29.8
	45–54	135	29.4
	55 and above	150	32.7
Gender	Female	353	76.9
	Male	106	23.1
Family size	5 or below	248	54
	Above 5	211	46
Clusters	Dita cluster	176	38.3
	Kodo cluster	24	5.2
	Woyza cluster	89	19.4
	Zara cluster	170	37.1

Table 2 Clinical Characteristics of the Study Participants, Dita District, Southern Ethiopia

Variables	Category	Frequency	Percent
Eye lid operated	Both upper eyelids	162	35.3
	Right upper eyelid only	169	36.8
	Left upper eyelid only	128	27.9
Year of Operation (G.C.)	2014	47	10.2
	2015	140	30.5
	2016	95	20.7
	2017	57	12.4
	2018	68	14.8
	2019	37	8.1
	2020	15	3.3
Type of last surgery procedure	BLTR	345	75.2
	Posterior lamellar tarsal rotation (PLTR)	114	24.8
Treatments given after surgery	Azithromycin	71	15.5
	TEO	354	77.1
	Both treatments	33	7.2
	Unknown	1	0.2

(Continued)

Table 2 (Continued).

Variables	Category	Frequency	Percent
Frequency of operation	Once	429	93.5
	Twice	29	6.3
	More than twice	1	0.2

Table 3 Prevalence of Post-Operative Trachoma Trichiasis Among Operated Patients in Dita District, Gamo Zone, Southern Ethiopia, 2022

Variables		Total	Post-Operative Trichiasis	
			Present	Absent
	Total	459	10(2.2%)	449(97.8%)
Eyelids operated	Right upper eyelid only	169	0	169 (100%)
	Left upper eyelid only	128	3(2.3%)	125(97.7%)
	Both Upper lids	162	7(4.3%)	155(95.7%)
Gender	Female	353	9	344
	Male	106	1	105
Family size	<=5	248	4	244
	>5	211	6	205
Frequency of operation	Once	429	10	419
	Twice	29	0	29
	More than twice	1	0	1
Presence of trichiasis in un-operated upper lids				
		Total	Present	Absent
	Left upper lid (Un-operated) ⁺	169	11(6.5%)	158(93.5%)
	Right upper lid (Un-operated) ⁺⁺	128	3(2.3%)	125(97.7%)
	Total*	297	14(4.7%)	283(95.3%)
Trichiasis in lower lids of study subjects**				
		Total	Present	Absent
	Right lower lid	459	3(0.7%)	456(99.3%)
	Left lower lid	459	6(1.3%)	453(98.7%)

Note: ⁺Left upper lid (Un-operated) were all patients who underwent right upper lid surgery only. ⁺⁺Right upper lid (Un-operated) meant all patients who underwent left upper lid surgery only. *Both upper lids operated patients not included; **All patients did not receive lower lid surgery.

Discussion

This study aimed to assess post-operative trichiasis among patients who underwent trichiasis operations in Dita district, Gamo Zone, Southern Ethiopia, to drive possible recommendations for partners working on related programs and necessary interventions to reduce recurrence.

The present study revealed that the prevalence of post-operative trichiasis in patients who underwent surgery was 2.2%. This finding is consistent with the WHO PTT recommended range of <10%.¹⁸ However, it is significantly lower

than that in studies conducted in the Hadiya Zone, Southern Ethiopia (71.6%)¹⁹ and many other studies.^{20–23} The possible reason might be difference in study design; we had randomly selected our study participants whereas in Hadya¹⁹ used case finders or IECWs who identified study subjects.

We found that some study participants developed trichiasis in their unoperated upper and lower lids. Of the 169 patients who underwent right upper eyelid surgery, 11 (6.5%) developed trichiasis on their unoperated left upper eyelid. In contrast, 3 (2.3%) patients with right upper eyelids developed trichiasis. In addition, 6/459 (1.3%) and 3/459 (0.7%) participants had trichiasis in their lower left and right lids, respectively. A possible explanation is that patients might be given less attention to the S component of the trachoma SAFE strategies. Although the association was not identified, both PTT and trichiasis on unoperated eye lids were more common in the left eye than in the right eye. We suggest others in future research for possible reasons for the above findings.

The strength of this study was that we used well-trained data collectors to identify PTT and trichiasis. The descriptive cross-sectional study design employed in this study was too weak to undertake an association, and limited explanatory variables were collected.

Conclusion and Recommendation

In conclusion, the prevalence of post-operative trichiasis was below the WHO recommended range. Despite this, the development of trichiasis in the unoperated eyelids was observed in the study patients. Therefore, an intervention on S component of SAFE strategy is crucial for elimination and control of trachoma trichiasis.

Abbreviations

BLTR, bilamellar tarsal rotation; CSA, Central Statistics Agency; E.C, Ethiopian Calendar; IECWs, Integrated Eye Care Workers; IRB, Institutional Research Review Board; PLTR, Posterior Lamellar Tarsal rotation; PTT, Post-Operative Trachoma trichiasis; PPS, proportional to size; SAFE, Surgery, Antibiotic, Facial Cleanliness, Environmental hygiene; SPSS, Statistical Package for Social Sciences; TEO, Tetracycline Eye Ointment; TF, Trachomatous Follicular; TT, Trachomatous Trichiasis; WHO, World Health Organization.

Data Sharing Statement

The datasets during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethical Approval

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was secured from the Arba Minch University Institutional Research Ethics Review Board (IRB) with reference number (IRB/1149/2021). A support letter was written to the district health office after permission was obtained. Voluntary informed oral consent was obtained from each participant because the survey did not include invasive procedures that harmed the study subjects. This study was approved by the Institutional Research Ethics Review Board. The purpose of the study and the right to stop responding at any time were explained to all the participants. All personal information was kept confidential. All participants diagnosed with post-operative trachoma trichiasis were linked to nearby health facilities.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas, took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; agreed on the journal to which the article has been submitted; and agreed to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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