



Barriers and facilitators to implementation fidelity of trichiasis surgery program, and its favorable postoperative trichiasis surgery outcomes in Northern and Eastern Uganda; A case study of Northern and Eastern Uganda.

Innocent Ssemanda^{1¶}, Brenda Kalembe², Mirriam Zulu³, Karenito Mwenge⁴, Tukie⁵, Choolwe Jacobs^{1¶}.

¹Department of Epidemiology and Biostatistics, School of Public Health, University of Zambia

²Indian institute of Health science, department of Nursing and midwifery

³department of health promotion, school of public health, University of Zambia,

⁴department of Family medicine, school of public health, University of Zambia,

⁵Uganda Technology and Management University,

Keywords: *barriers and facilitators, Trichiasis surgery program outcomes, and Implementation fidelity of trichiasis surgery.*

Abstract

Introduction

Trichiasis surgery is done to correct trachomatous trichiasis and prevent blindness, and to achieve this successfully, the entire trichiasis surgery program must be delivered with a high implementation fidelity level. Implementation fidelity is the degree to which an intervention is delivered as intended. Trichiasis surgery-postoperative patients experience unfavorable outcomes.

Objective: To explore the barriers and facilitators to the quality postoperative trichiasis surgery outcomes and the high level of implementation fidelity of trichiasis surgery program in Northern and Eastern Uganda

Setting and participants: From December 2019 to March 2020; we purposively selected 19 key trichiasis surgery program experts in northern and eastern Uganda; and interviewed them about the barriers and facilitators to the quality of postoperative trichiasis surgery outcomes and the level of implementation fidelity of trichiasis surgery in Northern and Eastern Uganda.

Results: We identified individual, interpersonal, organizational, community and structural barriers include; (1) surgical related factors; (2) trichiasis surgery patient-related factors; (3) environmental and geographical related factors; (4) health resources and financing challenges; and (5) the characteristics of trichiasis surgeon. The facilitators were; (1) Integration of trichiasis surgery program components into the PHC package; (2) prioritization of health resources; (3) training and retraining of trichiasis surgeons; (4) facilitation and sustainability strategies; and (5) partnership with implementing partners.

Conclusion: Our finding suggests potential approaches to increase the level of implementation fidelity and quality of postoperative trichiasis surgery program outcomes include; training; TT more nurses, ophthalmology clinical officers (OCOs), and ophthalmologists in the country, increasing health financing, health promotion, and community engagement, increase program coverage, motivation of health workers, and increase on the availability of medical products and technologies in the country.

Introduction

The setting and the results of this study are an extract from the mixed methods study which was conducted in 2021, and it shares the same study background as the quantitative strand published in 2021[1]. According to Ssemanda & friends; Implementation fidelity is the degree to which an intervention is delivered as intended[1]. The reduced level of implementation fidelity of the trichiasis surgery program may be why the program produces unfavorable postoperative trichiasis surgery outcomes[2]. Trachomatous trichiasis (TT) is a sign of trachoma which comes as a result of multiple rounds of *Chlamydial trachomatis* infection which causes recurrent chronic inflammation in the tarsal conjunctiva[3]. Long stay without treatment, the condition progress to fatal complications like; conjunctival scarring, entropion, trichiasis, and corneal opacification to blindness[4]. The World Health Organization through public health agencies and implementing partners has made numerous efforts to eliminate *Chlamydial trachomatis* infection and prevention of trachoma-related blindness globally[5]. This effort has taken many forms which include; mass drug administration of antibiotics, facial cleanness, environmental control, and surgery for trichiasis [6]. However, unfavorable postoperative trichiasis surgery outcomes are unexpectedly higher than expected and undermine the global trachoma elimination effort[7]. According to Geopogui et al, the increase in rates of unfavorable postoperative trichiasis surgery outcomes from 28% to 41.6% is unacceptable high [8], and this increase was associated with implementation-related issues like low fidelity to the implementation of trichiasis surgery programs [9-12]. For example, a current study indicated that when patients undergo trichiasis surgery majority suffer from bad postoperative trichiasis surgery outcomes, for example; TT recurrence, development of granuloma, entropion, trichiasis, and corneal opacification [13, 14]. If these issues are not addressed, the trichiasis surgery refusal rate among trachoma endemic social community shall go higher in the near future. Gupta, 2018. Indicated that people refuse trichiasis surgery because of recurrence and severe pain after surgery[14]. Therefore, to achieve the global effort of trachoma elimination and to prevent its related blindness, documenting the factors influence the implementation fidelity of trichiasis surgery, and its outcomes is crucial.

For example, WHO recommends Trichiasis surgery to be incorporated into routine clinical practice in trachoma endemic countries to improve visual acuity [15]. Unfortunately, the coherence and relevance of the trichiasis surgery program are still substantially deprived. Literature shows that TT-related blindness is still a public health problem[16]. Globally it is estimated that about 158 million people live in trachoma endemic areas and are at risk of trachoma blindness [17]. Furthermore, studies suggest that *Chlamydia trachomatis* infection is responsible for the blindness and visual impairment of about 1.9 million people, and it has caused about 1.4% of all blindness worldwide[17]. Overall, Africa remains the most affected region with a high prevalence of trachoma, and it is estimated that; 137 million people are infected with *Chlamydial*

trachomatis infection [17, 18]., and it is estimated that in Africa, over 1.6 million people are irreversibly blind and more than 83.5 million people are already infected with the infection that causes trachoma [17].

In Uganda particularly Northeastern Region, over 22,465 children aged 1-9 years have trichomatous trichiasis, and 24,652 cases are in the age group above 9 years [19]. Studies show that Uganda is one of the African countries that have a high prevalence of trichomatous trichiasis [19]. There are five trichiasis surgery approaches recommended to reduce the risk of visual impairment from trichomatous trichiasis. For example; (I) Bilamellar tarsal rotation(BLTR), (ii) posterior lamellar tarsal rotation (PLTR), (iii) trichiasis Clamp (TC), (iv) Anterior tarsal flap rotation (ATFR) (v) Anterior lamellar reposition(ALTR), (vi) Anterior lamellar resection and lid margin split of the upper eyelid [20, 21]. The surgery involves an incision through the eyelid parallel to and a few millimeters above the lid margin [20]. In trachoma endemic countries like Uganda, trichiasis surgery is usually performed by trained trichiasis nurse/paramedics health workers [9], to support the global effort to scale up surgical services to clear the current trichiasis backlog by 2020[7]. Currently, the World Health Organization epidemiology report 2019, shows that over 146 112 people receive surgical treatment for trichomatous trichiasis each year worldwide. In Uganda, according to Sightsavers (2019), more than 6400 Trichiasis surgery cases were conducted to save sight[22]. However, unfavorable outcomes after trichiasis surgery are considerably high compared with the 5% rate recommended by WHO [3, 10, 23-27]. Furthermore, evidence from existing literature reports that; trachomatis infection and trachoma-related blindness are surprisingly high due to recurrence of the disease [28-31]. Current existing evidence from the literature also shows that trichiasis surgery yields unexpected unfavorable outcomes when translated into practices in the social communities [10, 20, 32-35], and the rate is unacceptably high [36]. Further, it is reported that poor outcomes of TT surgery were associated with; surgical related, deficient knowledge, skills and experience of TT surgeons, capacity of Health facility related factors and availability of facilitation and sustainability strategies [11, 34, 37-39]. Many studies done around trichiasis surgery outcomes and an excellent work are done to demonstrate the quality of trichiasis surgery outcomes and documenting the associated factors. Unfortunately, In Uganda, studies that have explored the barriers and facilitators to implementation fidelity of trichiasis surgery, and its postoperative outcomes are scanty. Therefore, we explored the barriers and facilitators to the quality of postoperative trichiasis surgery outcomes and the level of implementation fidelity of trichiasis surgery achieved among the population of Northern and Eastern Uganda. We believe that; findings from this study will inform policymakers, program implementers, and other concerned bodies on the need for improvement and restructuring the available strategies to successfully eliminate trachoma and prevent future trachoma.

Methods

Study site.

The study was conducted in Eastern and Northern Uganda between December 2019 and March 2020. The study regions had an estimated total population of; 8606300 from northern Uganda, and 10836500 million people from the Eastern region. Geographically, these regions are divided into 28 wards (administrative districts). In many districts, rains do not often exceed 800 millimeters per year, sometimes hovering around a mere 500 millimeters. The socioeconomic status of these regions is agro-pastoralist, their main economy

is based on cattle herding, Northeastern Uganda is considered by many as “hard to reach” and “hard to live in”, because of cattle rustling, insecurity from armed nomadic tribes, semi-arid hot climate, and its high prevalence of trachoma in the region[40]. The selected wards within regions had 99 health facilities with “trichiasis surgery centers” where the study was conducted.

Study population

Participants in this study consisted of trachoma control program experts, neglected tropical diseases NTDs/vector control program coordinators, consultant ophthalmologists working at the district health facilities, and at Non-Government Organizations; implementing trachoma control programs in the selected districts in Uganda. To establish the barriers and facilitators of implementation fidelity of the Trichiasis surgery program in Northern and Eastern Uganda. We gathered information from; trachomatis Trichiasis nurses (TT nurses), trained Trichiasis case finders, Ophthalmologist clinical officers (OCOs), and Trained Trichiasis surgeons (TT surgeons) who were working in hospitals, ophthalmology clinics, health centres, eye care clinics, and in trachoma-community outreach posts sported in the study region.

Inclusion Criteria

The considered consultant Ophthalmologist, trachoma program manager, district trachoma focal persons, and national trachoma control program coordinators to be interviewed. The criterion depends on the individual’s role played during the intervention process of trichiasis surgery (i.e., trainer and a team leader), or the agency (program director, clinical supervisor, clinician, and Trachomatous Trichiasis surgeons, in this case, a series of studies based on the National Implementing Evidence-Based Practices Project.

Exclusion Criteria

Trichiasis program managers who were less than one year in the system, and other health departmental program managers working at the district health facilities, and at Non-Governmental organizations but did not participate in trachoma control programs were excluded from the study.

Sampling and sample size

The study used the purposive sampling method to collect qualitative data. The qualitative phase aimed to explore barriers and facilitators of implementation fidelity of the trichiasis surgery program in Uganda, and further document the implementers’ opinion on the factors that they felt may have strongly influenced the quality of Trichiasis surgery program outcomes ‘termed as the barriers and facilitators’. To gather enough information related to the implementation fidelity of trichiasis surgery outcomes, a sample size of (N=19) participants was considered, which include: key informant interviews (KIIs) which involved; 5 (five) Consultant ophthalmologists, 8 (eight) Trachoma control program coordinators, neglected tropical diseases (NTDs) managers at the Ministry of health, district trachoma focal persons, and district NTDs managers, and 6 (six) trichiasis surgery program experts in Karamoja region ‘Northeastern region as illustrated in the [Table 1](#) below, were interviewed. Snowball sampling strategy was also incorporated by asking recruited program managers to identify clinicians, administrative support staff, and consumers to obtain enriched program information.

Table 1: Key informant interviews

Participants	Number of Interviews
Consultant ophthalmologists	5 (five)
National trachoma control coordinators (NGOs)	3 (three)
Director for Trachoma at MoH Headquarters	3 (three)
Trichiasis surgery program experts	6 (six)
District focal person for Vectors control	1(one)
WHO/NTD manager at MoH	1(one)
Total number of interviews	19 (nineteen)

Data collection

The selected participants were invited for a semi-structured questionnaire interview moderated by the principal investigator (PI). Each interview lasted between 20-45 minutes and was audio-recorded. Face-to-face interviews were moderated by experienced qualitative researchers (NM), and (PK), each with a senior ophthalmology clinical officer. A topic guide on the key program intervention areas with specific questions and probes related to implementation fidelity of trichiasis surgery and the moderating factors (determinants) as described in supplementary file 2 attached” was employed. All the interviews were audio-recorded and transcribed verbatim in English. Trachomatous Trichiasis surgeons, clinicians providing usual care, and other health workers supporting the team were interviewed also to compare and contrast the information gathered.

Data analysis

Data collected on the barriers and facilitators of implementation fidelity and trichiasis surgery program outcomes was audio- recorded and transcribed verbatim in English and entered into a computer-based text file. After transcription, the data was transferred to the qualitative data analysis software “NVIVO 12 Pro-QSR International” for systematizing, organizing, and analyzing the data. The software aided in sorting material into groups, defining variables, and assigning codes to text segments; and it was also used for making comparisons across various pieces of qualitative data (interview transcripts, text segments). The interpretation and conclusion drawn on study findings were based on Nvivo 12 Pro- QSR International software results. Through the systematic coding and comparison of the text, for this study, transcripts were analyzed more than one time for emergent themes using principles of implementation fidelity conceptual framework; [supplementary file 1](#) attached [41] and the evaluation process described in [supplementary file 2](#) attached. Initially, transcripts were thoroughly examined to identify primary coding categories, as well as the range of themes present within each category. Identified coding categories and themes were organized into a formal codebook through collaboration and discussion; in the first and second analyses.

During the data analysis; transcripts were properly content coded and if there were new themes that did not appear to fit into the original codebook, it was discussed between three senior qualitative researchers (PK, JC, and SI) to make changes appropriately. The transcripts coding was concentrated on the text codes that

emerged and that reflect key analytical topics included in [supplementary file 2](#), which includes components of implementation fidelity, and factors that may affect the levels of implementation fidelity to trichiasis surgery, 'referred to as; the barrier and facilitators " like; (1) characteristics of service provider, (2) The type organization responsible for implementation, (3)Program participants, (4) The characteristics of community where the program is implemented, and (5) Program support system. Appendix A. [supplementary file 2](#), has detailed codes were examined in isolation and relation to other codes (axial coding)[42] e.g. 'Fidelity' in isolation and in tandem with other concepts such as 'barriers' and 'facilitators', to explore the limitations of fidelity described in Table 1.

Furthermore, deductive thematic analysis was used to analyze the interviews as it is a flexible method that works with a range of research questions, including understanding people's experiences of programs and healthcare interventions[43]. The study aimed to document the barriers and facilitators of implementation fidelity and trichiasis surgery program based on moderating factors surrounding the implementation process. The meaningful units of text were highlighted within each interview, then summarized and coded. Codes dealing with similar issues were grouped across all interviews and refined into themes. The reliability of themes was established by a second reviewer (JB), who independently analyzed a randomly selected sample of 50% of the transcript extracts using the coding framework. A percentage agreement was determined between the reviewers' respective coding of extracts. If the agreement was <50%, consensus on conflicting decisions was obtained through discussion[44]. Quality assurance was observed by providing two (2) days of training conducted by the ophthalmologists.

The follow-up evaluations are supported by an analysis of routine data from project monitoring documents. The objective of the semi-structured interview guide was to discuss the moderating factors affecting the implementation fidelity of the Trichiasis surgery program and to document the barriers and enablers to control trachoma-related blindness in Uganda. The qualitative data were double-checked for correctness, completeness, accuracy, clarity, and consistency throughout the data management period.

Results

Description of barriers and facilitators to implementation fidelity, and trichiasis surgery program outcomes; several approaches were used as described in [supplementary file 2](#). To examine the qualitative data to answer the study objective; regarding the relationships among the variables that could act as barriers and facilitators of implementation fidelity and trichiasis surgery program outcomes; logalismic analysi illustrated in [supplementary file 2](#), attached. . During the interview, trichiasis surgery program experts were asked several guided and probing questions related to potential moderating factors (determinants) that influence the implementation fidelity of the trichiasis surgery program and its outcomes. The relationship between the Implementation fidelity of the trichiasis surgery program and the moderating factors that are described in the conceptual framework (figure1 in the quantitative strand[1]) was investigated. To document the barriers and enablers (facilitators) to both implementation fidelity and trichiasis surgery program outcomes; thematic was done. During analysis multiple factors were identified; some were impeding (barriers) factors while others were identified as enablers (facilitators) of the implementation fidelity of the Trichiasis surgery program. The following themes emerged as barriers and enablers were; (I) characteristics of the program participants, (ii) the characteristics of the community where the program is

implemented (iii) facilitation and sustainability strategies (health financing), and (vi) the structural/ organizational system challenge, and preparedness of organization/ service providers to implement trichiasis surgery program components, as illustrated in [supplementary file 2](#).

The barriers to the favorable postoperative trichiasis surgery outcomes

Characteristics of the service providers

It is reported that; the knowledge and experience of service providers is one of the key factors that influence implementation fidelity and the quality of trichiasis surgery outcomes. For example, the characteristics of the trichiasis surgery program implementer were examined in terms of the service provider's years of experience in service, the highest level of education, the level of knowledge and skills required to implement the trichiasis surgery program and the level of training in trichiasis surgery. Respondents reported a knowledge gap and lack of enough experience among health service providers to optimally implement trichiasis surgery program components as intended. Of recent it is reported currently that; they have recruits, some with the minimum level of education while others are still under trichiasis surgery training. Furthermore, the study revealed some TT surgeons who are still lacking the necessary surgical skills to perform surgery. To deliver trichiasis surgery program components, as it is prescribed; implementation challenges related to service providers should be addressed at the primary stage of the implementation process and planning.

‘Trichiasis surgeons who're trained are very few in this region; the Government deployed only one surgeon to Regional referral hospital’ (Moroto regional referral hospital), so to find a well trained TT surgeon, with reasonable experience is still a challenge in this region. Or....even finding a TT case finder who can identify people with TT cases in the community is also a challenge (KII01).

Participant's responsiveness

The attitude and perception of trachoma patients towards trichiasis surgery are appalling. Respondent reported inconsistency and a low level of participant engagement in trichiasis surgery program activities. The study further highlighted the low level of interest in the service, and poor perception and negative attitude of trachoma patients have slowed down the interaction process into TT program activities. Participants reported refusal of trichiasis surgery in the community, and the refusal of surgery is imbedded to unpredictable trichiasis surgery outcomes good. Further, program experts reported participants' attendance low, mostly in rural areas, low level of interaction and willingness to respond to the program activities was low.

“We have a quarterly integrated community outreach program for trachoma and any other eye-care services which are supposed to run throughout the year, but our patients! Umm... I don't know how to put it... it's like; when they see or hear that we're coming, that's when they think of visiting their relatives to... a far distance to avoid attending or being called for the eye care services to the point set..... You know.... they nicknamed us all- ‘Government.....’ oohhh.....the Government” They have come. Some deliberately refuse; some community members reject health workers to visit their homes, and some welcome us. Those who have allowed us, they start narrating, the previous medical history happened to

either....a.... friend or a relative, but what they stick-on..is,...that.....this disease has been with us for so long, so it's normal, secondly we epilate 'meaning cutting off eyelash with razorblade"- This kind of situation is so much common in villages but not in town. Their concern is that the service is costly, sometimes the same condition comes back and I fear moving long distances to the facility (KII2). Me..... what I think the solution could be; to exclusively deliver community health information about trachoma and its treatment plan, secondly; to bring the service closer to the end-users and make it freer (KII3).

The characteristics of community

Geographical and environmental factors which include; dry and hot climate, sparsely populated population, and hilly and hard to reach community were identified as potential barriers to the implementation fidelity of trichiasis surgery program in the region. Participants reported environmental degradation in the community and a combination of harsh climatic conditions which has got a long drought of six to seven months each year, making the environmental improvement difficult. This type of climate cited as an environment provides good cites for flies to bleed to accelerate the spread of infection. Further, it hinders accessibility and lowers the coverage of the program in the community. These characteristics were further reported as a catalyst for the transmission of *chlamydia trachomatis* infection among community members.

"This is trachoma endemic region,...I think because of its environment and its hot climate... and I think is one of the reasons why health workers fear to serve in the hard-to-reach communities like this one...this area is scorch, sometimes it takes more than six months without rain, no access to safe water in this region..... So..... facial cleaning is difficult to achieve" Secondly, you know, in this region, we have a long dry session which lasts between five to six months, at that time that's when the flies that transmit eye infection bleeds, and.....uhmm... remember the region has no tap water, we depend on only streams, and wells, and all they can dry up during this session making Trichiasis post-operated patients not to clean their wound and keeping personal hygiene. I think that's where the problem is coming from to see Trachomatis Trichiasis recurrences" because patients don't do what is recommended (KIIs).

Inaccessibility to sanitation facilities

In many parts of the Karamoja region; access to sanitation facilities is defied. Participants discussed the cause of chronic trachomatous trichiasis infection in the community, and the potential causes of reinfection and trichiasis recurrence among trachoma endemic communities., and it was reported; that lack of access to safe water, no streams and boreholes, with poor fecal matter disposal in the region; were identified as the fundamental cause of poor facial cleaning, cause of reinfection and poor personal hygiene. So this condition attracts flies that transmit chlamydial infections.

"I think you have seen our people on the streets...true....aahhhh.....they are poorly dressed and very dirty, so they decide to use water for drinking and domestic use only.....no. water to waste for facial washing and bathing or washing clothes. Secondly; the majority in the community are challenged to access good sanitation facilities, and you know this condition attracts flies that transmit chlamydial infections."

High illiteracy level among trichiasis patients

Trichiasis surgeons reported low education levels among the community members, and this was observed as the most common cause of poor postoperative trichiasis surgical outcomes in the trachoma endemic regions. For example, it is stated that; these communities have a high illiteracy rate, and the majority of them lacks knowledge about trichiasis surgery program, have low experience, and others lack program information. This high illiteracy level in the community exacerbated; self-reinfection, nonadherence to the postoperative treatment prescribed, early self-removal of eye pads, and sutures before the recommended time, and poor personal hygiene. This affected the level of Implementation fidelity and quality of trichiasis surgery program outcome.

Respondent (A) called ...and....'Voiced out" the researchers' name..... ("name silenced"). let me tell you the big problem I have noticed with these patients; ...yeah....one; they don't want to come to hospitals before the eye condition worsened, they come for help when it's too late. We have the ambulance that is supposed to pick up trichiasis patients to the hospital, then to their homes, but they refuse to come again. However; to some patients, the delay could be a result of the long-distance facility. Another issue identified is..... all these regions you have visited are dry, with no water, and these people live in absolute poverty, so when the wells and streams get dry, it's difficult to access water for home use, and facial cleaning, or keeping good personal hygiene. Some after the operation, when they reach home, they get convinced by their relatives to remove the eye-pad, as it was likely to cause more problems, others, they share the medicine prescribed and given to the only postoperative patient, and end up not taking a full course "low dose". What I know many of them cut off the stitches before the recommended time, purposely to see what is done, or what was put inside (KII05).

Socio-cultural factors

Cultural norms and beliefs in the community. Trichiasis surgery program components are mostly implemented in rural areas where the prevalence of trachoma is high. Respondents reported self-medication practices and self-epilation; as cultural practice in the community is privately done to reduce trichiasis disease. It is also added that; poor health-seeking behavior is normal. It is also believed that; holistic healthcare and support are only got from relatives, so getting blind is normal and is a sign of aging. This kind of behavior and perception has compromised the performance of trichiasis surgery programs in these regions.

"Moreover, reported being blind is considered normal in the community. The community considers trichiasis surgery as a devious intervention that removes people's eyes. Some say that, even if they have operated their eyes, blindness recurs. So it is difficult to meet them and offer them eye care service" (KII14).

The facilitators to the high implementation fidelity of trichiasis surgery and its favorable postoperative trichiasis surgery outcomes

Training and assessment of trichiasis surgeons

Training and continuous assessment of trichiasis surgeons quarterly improve the quality of delivery of trichiasis surgery programs. Participants were asked about the quality of delivery to understand the implementing organization's preparedness to implement the trichiasis surgery program, and to understand whether an intervention was delivered in appropriate way to achieve the intended objectives. Participants reported training of staff, provision of program materials, routine assessment of TT surgeons, and availability of program support supervision to those delivering an intervention steered to the improved quality of delivery. Furthermore, participants reported consistent provision of quality improvement strategies; emphasizing ongoing monitoring and giving feedback to those delivering trichiasis surgery program activities to maintain good quality program outcomes.

"Quality of delivery is assured by making sure that all practitioners get trained and assessed before starting practicing surgery. Secondly, among those who have got knowledge gaps in surgery, refresher training is recommended. Staff interacts during training purposely to build up their level of confidence to implement effectively" (KII19).

The motivation of health workers

Respondent reported many health workers who're on fresher training of TT surgery and others still under assessment process. Providers' training and healthcare guidelines are essential for providing knowledge and skills to deliver TT surgery services. This training should be provided consistently to all health workers providing trachoma and other eye care services as a motivation. In addition, participants reported being well-motivated with incentives to serve in the hard-to-reach communities.

"We believe that some of our surgeons lack enough experience in some of trichiasis surgery program components, and others have failed to pick up and to practice good surgical skill.....because they are demoralized and.....So they end up having poor skin closing techniques, using the wrong suture, making poor knots, and many other surgical-related issues. That's why we always recommend, staff performance motivation by sending them to refresher pieces of training, especially on the key weak areas that are identified during operational reviews.....program support supervisions and surgical audits, and during assessments to avoid continuous registering of poor surgical related outcomes" (KII1s1).

Availability of health workforce

Participants discussed facilitation strategies available to facilitate the implementation fidelity of trichiasis surgery program activities. Participants reported strategies to optimize the level of implementation fidelity. Strategies included; Recruitment of new staff, provision of program manuals, guidelines, training, monitoring and feedback, capacity building, and giving incentives to trichiasis surgery program implementers. Secondly, trichiasis surgery service providers get assessed for competence and preparedness to implement trichiasis surgery activities. However, some providers felt well-trained and competent enough, however, they did not feel well prepared enough to implement all trichiasis surgery program components.

"What I know is that the facility has qualified staff to deliver the services, but the challenge was, the staff is not enough, other challenges we face during implementation are; lack of medicines and supplies, which never been enough, we lack program materials, lack modern theater with technologies; and

underfunding of program activities, hence the implementation of all program components becomes difficult” (KIII8).

Further details of the integration of results are provided in [supplementary file 2.](#) where a meta-matrix was used to compare findings from both data sets which focused on (a) program service providers (b) adherence Quality of delivery (c) Resources, for the most part, convergence was found between the qualitative and quantitative data, though two qualitative themes relating to influencing factors had no corresponding quantitative data (silence). Two areas of discrepancy were found.

Discussion

The qualitative study identified; the knowledge and experience of service providers, the attitude and perception of trachoma patients towards trichiasis surgery, geographical and environmental factors, inaccessibility to sanitation facilities, inaccessibility to trichiasis surgery centers, poor health-seeking behavior, high illiteracy level among trachoma patients, agro-pastoralist farming, living in absolute poverty, cultural norms and believes, inaccessibility to medical products and technology, and supplies, inaccessibility to quality health services, and inaccessibility to education services were the barriers to implementation fidelity of trichiasis surgery and its outcomes. It also identified; that training and continuous assessment of trichiasis surgeons, availability of health workforce, staff motivation, quality improvement, and program support system; were reported as the facilitators to favorable postoperative trichiasis surgery outcomes, and to high level of implementation fidelity. These findings suggest potential approaches to increase the level of implementation fidelity of trichiasis surgery, and the quality of postoperative trichiasis surgery outcomes and further suggest the recommendations which include; training TT more nurses, ophthalmology clinical officers (OCOs), and ophthalmologists in the country, increasing health financing, encourage health promotion, and community engagement, increase program coverage, motivation of health workers, and increase on the availability of medical products and technologies in the country.

The relevance of these findings is to shape the implementation process of community health programs, where trichiasis surgery program is included. To successfully design and implement a trichiasis surgery program with high fidelity, and to achieve its intended results. Program designers and implementers should consider these studied barriers and facilitators. The strength of this study is that; previous studies have made tremendous contributions by demonstrating the predictors of Trachomatous trichiasis surgery outcomes[45]. unfortunately, not much work was done to describe and document the implementation issues surrounding the whole process to outcomes. So in this study, we have outlined the factors (as barriers and facilitators) that have the potential to influence the implementation fidelity of trichiasis surgery, and its outcomes and further these results will facilitate a community-based interventions ‘like trichiasis surgery’, which has shown to be efficacious to yield population benefits once translated to the community. We believe the study didn’t exhaustively fetch information in the population; this is because; the study populations were nomadism and hostile, and, the study site was hard to reach communities. Therefore, these characteristics stalled us from reaching-out to the key identified study subjects who were enriched with the information required to develop a comprehensive report. Therefore, understanding the nature and interplay of these multiple factors influencing the implementation process is fundamental. Therefore, there

is a great promise for more high-quality trichiasis surgery program outcomes. This understanding will form the basis for planning and implementing of trachoma program successfully. Therefore, we recommend that a further study to explore factors that influence implementation fidelity of mass drug administration, facial cleanness, and environmental control promotion towards trachoma control effort in Uganda. We explored the barriers and facilitators to implementation fidelity of trichiasis surgery, and its outcomes in Northern and Eastern Uganda, and the study suggested potential approaches to increase the level of implementation fidelity and quality of postoperative trichiasis surgery program outcomes to policymakers which include; training; TT more nurses, ophthalmology clinical officers (OCOs), and ophthalmologists in the country, increasing health financing, health promotion, and community engagement, increase program coverage, motivation of health workers, and increase on the availability of medical products and technologies in the country.

Conclusion

Our finding suggests potential approaches to increase the level of implementation fidelity and quality of postoperative trichiasis surgery program outcomes include; training; TT more nurses, ophthalmology clinical officers (OCOs), and ophthalmologists in the country, increasing health financing, health promotion, and community engagement, increase program coverage, motivation of health workers, and increase on the availability of medical products and technologies in the country. This understanding will form the basis for all planning, organization, and implementation of trachoma elimination strategies, where trichiasis surgery for trachoma is included, if we are to reach the elimination of Neglected Tropical Diseases National Masterplan 2019-2023. We, therefore, recommend that a further study on assessment and description of the levels of implementation fidelity on other trachoma elimination interventions know by the acronym “SAFE” which is not evaluated in this study to be considered, but more focus on the main implementation issues as identified by this study.

Authors’ contributions

The authors of this paper confirm contribution to the write-up as follows; Study conception and design; Dr. Innocent Ssemanda and Dr. Choolwe Jacobs. For data collection; Ms Mirriam Zulu, Brenda Kalembe, and Karenito Mwengwe, and for data analysis and interpretation of results; Dr Innocent Ssemanda, and Dr. Choolwe Jacobs and Brenda Kalembe. For the draft manuscript preparation; Dr Innocent Ssemanda and Choolwe Jacobs. For the manuscript reviewers of the results and approving the final version of the manuscript, Dr. Choolwe Jacobs, Dr. Okwadi Tukie, and Dr. Innocent Ssemanda

Acknowledgements

The authors would like to acknowledge and thank Prof. Joseph Mulamb Zulu, Prof Charles Michelo, Mr. Adam Silumbwe, Dr. Halwindi Hikabasa, and Ms. Patricia Maritim for guiding and instructing and reviewing the manuscript Further, in special consideration we thank Dr Wakaisuka Moses, and Dr. Benedicto for facilitation in data collection process in the region

Funding : This study was not funded

Competing interests

In this study, there was no potential conflict of interest.

Reference

1. Ssemanda, I., et al., *Implementation fidelity of trichiasis surgery program in Northern and Eastern Uganda*. 2021. **Volume-6**: p. 48.
2. Carroll, C., et al., *A conceptual framework for implementation fidelity*. Implementation science, 2007. **2**(1): p. 1-9.
3. Rajak, S.N., J.R.O. Collin, and M.J. Burton, *Trachomatous trichiasis and its management in endemic countries*. Survey of ophthalmology, 2012. **57**(2): p. 105-135.
4. Diab, M.M., et al., *Trachoma elimination, approaching 2020*. Current opinion in ophthalmology, 2018. **29**(5): p. 451-457.
5. Organization, W.H., *Report of the 21st meeting of the WHO alliance for the global elimination of trachoma by 2020, Geneva, Switzerland, 20-22 April 2017*. 2019, World Health Organization.
6. ASSEMBLY, F.-S.W.H., *The Resolution of the World Health Assembly on the Elimination of Avoidable Blindness*. Community eye health, 2003. **16**(46): p. 17.
7. WHO, *World Health Organization Alliance for the Global Elimination of Trachoma by 2020: progress report on elimination of trachoma, 2017–Alliance OMS pour l'élimination mondiale du trachome d'ici 2020: Rapport de situation sur l'élimination du trachoma, 2017*. Weekly Epidemiological Record= Relevé épidémiologique hebdomadaire, 2018. **93**(26): p. 371-380.
8. Geopogui, A., et al., *Baseline trachoma prevalence in Guinea: Results of national trachoma mapping in 31 health districts*. PLoS Negl Trop Dis, 2018. **12**(6): p. e0006585.
9. Habtamu, E., et al., *Predictors of Trachomatous Trichiasis Surgery Outcome*. Ophthalmology, 2017. **124**(8): p. 1143-1155.
10. Rajak, S.N., et al., *The outcome of trachomatous trichiasis surgery in Ethiopia: risk factors for recurrence*. PLoS Negl Trop Dis, 2013. **7**(8): p. e2392.
11. Rajak, S.N., et al., *Trichiasis surgery in The Gambia: a 4-year prospective study*. Invest Ophthalmol Vis Sci, 2010. **51**(10): p. 4996-5001.
12. West, E.S., et al., *Risk factors for postsurgical trichiasis recurrence in a trachoma-endemic area*. Invest Ophthalmol Vis Sci, 2005. **46**(2): p. 447-53.
13. Habtamu, E., et al., *Predictors of trachomatous trichiasis surgery outcome*. Ophthalmology, 2017. **124**(8): p. 1143-1155.
14. Gupta, K.M., et al., *Why do patients refuse trichiasis surgery? Lessons and an education initiative from Mtwara Region, Tanzania*. PLoS neglected tropical diseases, 2018. **12**(6): p. e0006464.
15. mondiale de la Santé, O. and W.H. Organization, *WHO Alliance for the Global Elimination of Trachoma by 2020: progress report on elimination of trachoma, 2017–Alliance OMS pour*

- l'élimination mondiale du trachome d'ici 2020: Rapport de situation sur l'élimination du trachoma, 2017.* Weekly Epidemiological Record= Relevé épidémiologique hebdomadaire, 2018. **93**(26): p. 371-380.
16. WoldeKidan, E., et al., *Prevalence of active trachoma and associated factors among children aged 1 to 9 years in rural communities of Lemo district, southern Ethiopia: community based cross sectional study.* BMC infectious diseases, 2019. **19**(1): p. 1-8.
 17. WHO, *Trachoma*, in World Health Organization. 2019.
 18. mondiale de la Santé, O. and W.H. Organization, *WHO Alliance for the Global Elimination of Trachoma by 2020: progress report, 2019 360 COVID-19 update–Alliance de l'OMS pour l'élimination mondiale du trachome d'ici 2020: Rapport de situation, 2019 360 Le point sur la maladie à coronavirus 2019 (COVID-19).* Weekly Epidemiological Record= Relevé épidémiologique hebdomadaire, 2020. **95**(30): p. 349-360.
 19. Baayenda, G., et al., *Completing Baseline Mapping of Trachoma in Uganda: Results of 14 Population-Based Prevalence Surveys Conducted in 2014 and 2018.* Ophthalmic Epidemiology, 2018. **25**(sup1): p. 162-170.
 20. Merbs, S., *Trichiasis surgery for trachoma.* 2013: World Health Organization.
 21. Merbs, S.L., et al., *Relationship between immediate post-operative appearance and 6-week operative outcome in trichiasis surgery.* PLoS Negl Trop Dis, 2012. **6**(7): p. e1718.
 22. Sightsavers, *Sightsavers' focus in Uganda is to promote social inclusion and tackle neglected tropical diseases (NTDs).* , in Sightsavers. 2019.
 23. mondiale de la Santé, O. and O. World Health, *WHO Alliance for the Global Elimination of Trachoma by 2020: progress report on elimination of trachoma, 2017–Alliance OMS pour l'élimination mondiale du trachome d'ici 2020: Rapport de situation sur l'élimination du trachoma, 2017.* Weekly Epidemiological Record= Relevé épidémiologique hebdomadaire, 2018. **93**(26): p. 371-380.
 24. Al-Khatib, T.K., et al., *Rapid assessment of trachoma in 9 governorates and Socotra Island in Yemen.* East Mediterr Health J, 2006. **12**(5): p. 566-72.
 25. Warwar, R.E. and J.D. Bullock, *Single-dose Azithromycin Prevents Trichiasis Recurrence After Surgery: Randomized Trial in Ethiopia.* Evidence-Based Ophthalmology, 2006. **7**(4): p. 206-207.
 26. Rajak, S.N., et al., *Trichiasis surgery in The Gambia: a 4-year prospective study.* Investigative ophthalmology & visual science, 2010. **51**(10): p. 4996-5001.
 27. Burn, H., et al., *Podoconiosis, trichomatous trichiasis and cataract in northern Ethiopia: A comparative cross sectional study.* PLoS Negl Trop Dis, 2017. **11**(2): p. e0005388.

28. Alemayehu, M., et al., *Prevalence of Active Trachoma and Its Associated Factors among Rural and Urban Children in Dera Woreda, Northwest Ethiopia: A Comparative Cross-Sectional Study*. BioMed Research International, 2015. **2015**: p. 570898.
29. Ferede, A.T., et al., *Prevalence and determinants of active trachoma among preschool-aged children in Dembia District, Northwest Ethiopia*. Infectious Diseases of Poverty, 2017. **6**(1): p. 128.
30. Kassim, K., et al., *Prevalence of active trachoma and associated risk factors among children of the pastoralist population in Madda Walabu rural district, Southeast Ethiopia: a community-based cross-sectional study*. BMC Infectious Diseases, 2019. **19**(1): p. 353.
31. Anteneh, Z.A. and W.Y. Getu, *Prevalence of active trachoma and associated risk factors among children in Gazegibela district of Wagehemra Zone, Amhara region, Ethiopia: community-based cross-sectional study*. Tropical Diseases, Travel Medicine and Vaccines, 2016. **2**(1): p. 5.
32. Habtamu, E., et al., *Predictors of Trachomatous Trichiasis Surgery Outcome*. Ophthalmology, 2017. **124**(8): p. 1143-1155.
33. Habtamu, E., et al., *Posterior lamellar versus bilamellar tarsal rotation surgery for trachomatous trichiasis in Ethiopia: a randomised controlled trial*. Lancet Glob Health, 2016. **4**(3): p. e175-84.
34. Habtamu, E., et al., *Impact of Trichiasis Surgery on Quality of Life: A Longitudinal Study in Ethiopia*. PLoS Negl Trop Dis, 2016. **10**(4): p. e0004627.
35. Barr, K., et al., *Comparison of trichiasis recurrence after primary bilamellar tarsal rotation or anterior lamellar repositioning surgery performed for trachoma*. Clin Exp Ophthalmol, 2014. **42**(4): p. 311-6.
36. Gower, E.W., et al., *Trachomatous trichiasis clamp vs standard bilamellar tarsal rotation instrumentation for trichiasis surgery: results of a randomized clinical trial*. JAMA ophthalmology, 2013. **131**(3): p. 294-301.
37. Bouazza, M., et al., *[Anterior lamellar resection with lid margin split of the upper eyelid in the treatment of trachomatous entropion]*. J Fr Ophtalmol, 2017. **40**(6): p. 453-459.
38. Cruz, A.A., et al., *Upper lid crease approach for margin rotation in trachomatous cicatricial entropion without external sutures*. Arq Bras Oftalmol, 2015. **78**(6): p. 367-70.
39. Reacher, M., A. Foster, and J. Huber, *Trichiasis surgery for trachoma: the bilamellar tarsal rotation procedure*. Trichiasis surgery for trachoma: the bilamellar tarsal rotation procedure., 1993.
40. Bugeza, J., et al., *Participatory evaluation of delivery of animal health care services by community animal health workers in Karamoja region of Uganda*. PloS one, 2017. **12**(6): p. e0179110.

41. Carroll, C., et al., *A conceptual framework for implementation fidelity*. Implementation science, 2007. **2**(1): p. 40.
42. Creswell, J.W. and V.L.P. Clark, *Designing and conducting mixed methods research*. 2017: Sage publications.
43. Braun, V. and V. Clarke, *Using thematic analysis in psychology*. Qualitative research in psychology, 2006. **3**(2): p. 77-101.
44. Guerin, S. and E. Hennessy, *Pupils' definitions of bullying*. European Journal of Psychology of Education, 2002. **17**(3): p. 249-261.
45. Habtamu, E., et al., *Predictors of Trachomatous Trichiasis Surgery Outcome*. Ophthalmology. (no pagination), 2017, 2017. **Date of Publication: January 22.**

