JIDC | THE JOURNAL OF INFECTION IN DEVELOPING COUNTRIES

The Ethiopian SORT IT Course

Towards the trachoma elimination target in the Southern region of Ethiopia: How well is the SAFE strategy being implemented?

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Abstract

Introduction: Trachoma is one of the 20 neglected tropical diseases and a serious public health problem in Ethiopia. To reach the WHO elimination target by 2020, SAFE (Surgery, Antibiotics, Facial cleanliness, Environmental improvement) strategy has been implemented in the Southern Nations, Nationalities, and Peoples' Region (SNNPRs), Ethiopia. Scarce evidence exists regarding recent progress in achieving elimination of active trachoma (< 5%) and how well the SAFE strategy implemented.

Methodology: A retrospective analysis of programmatic data in the period 2013-2018 was used. All trachoma endemic districts in SNNPR were included. Data collected from the Federal Ministry of Health on trachoma prevalence and SAFE strategy were analyzed.

Results: Out of 134 endemic districts, only 35 had their planned impact survey, of which only 11 districts achieved the elimination target. Six districts reverted backwards from eliminated status to low (1) or moderate (5) level. The median prevalence of active trachoma in these 35 districts was 10% in 2017/18. In 2017, the mean antibiotic treatment coverage was 90%, but only 56% and 68% of districts implemented and reported on "F" and "E" components, respectively. In the high prevalence districts, only 10% delivered their planned five rounds of Zithromax® mass distribution.

Conclusions: These data showed a lack in planned impact surveys with only a limited number of districts reached the WHO elimination threshold by 2018. Lack of attention on high prevalent districts, and recent reversal of trachoma eliminated districts to moderate or low prevalence levels argue for urgent and prioritized implementation of the SAFE strategy.

Key words: Trachoma; NTDs; GET2020; operational research; Ethiopia.

J Infect Dev Ctries 2020; 14(6.1):3S-9S. doi:10.3855/jidc.11703

(Received 31 May 2019 – Accepted 03 October 2019)

Introduction

Trachoma is the principal infectious cause of irreversible blindness worldwide and is caused by *Chlamydia trachomatis*. The infection is spread by both direct (hands) and indirect (flies, cloths) contact with an infected person's eyes or nasal discharge. With repeated infection over many years, the cumulative effect of many inflammatory episodes may cause the upper eyelid to turn inwards, so that the eyelashes rub on the eyeball, resulting in intense pain and scarring of the front of the eye, which permanently damages the cornea (referred to as trachomatous trichiasis, TT) [1-3]. Trachoma is endemic in many of the poorest and most rural areas of Africa, Central America, South America, Asia, Australia and the Middle East. It is a public health problem across 37 countries and affects over one billion of the world's poorest people. It is responsible for the blindness or visual impairment of about 1.9 million people and the causes of about 1.4% of all blindness worldwide. Global WHO 2017 data showed 165 million people living in districts in which the trachomatous inflammation- follicular (TF) or active trachoma prevalence in children aged 1–9 years was ≥ 5%. Africa remains the most affected continent. Out of the 165 million, 89% (146.3 million) lived in WHO's defined African region, and 42% (69.8 million) of those were

located in Ethiopia, which had the largest burden of active trachoma. In addition, in 2017 nearly 75% all TT surgeries globally were performed in Ethiopia [4,5].

Since 1993, the World Health Organization (WHO) endorsed a multi-faceted approach for the treatment, control, and elimination of trachoma as a public health problem using a package of interventions known as the SAFE strategy (Surgery, Antibiotics, Facial cleanliness, Environmental improvement) strategy [6] (Supplementary Table 1).

In 1996, the WHO along with its partners launched the WHO Global Alliance for the Elimination of Trachoma by 2020 (GET 2020), a partnership supporting the implementation of the SAFE strategy and the strengthening of national capacities of affected countries, through epidemiological surveys, monitoring and evaluation plans, and resource mobilization [7]. In 2013-14, the Global Trachoma Mapping Project (GTMP) conducted a country-wide survey in Ethiopia and showed that the pooled prevalence of active trachoma (TF) was 25.4% among children 1-9 years and blinding trachoma (TT) was 4% among adults aged ≥ 15 years [8], which were higher than the WHO recommended targets for intervention and elimination of trachoma as a public health problem (TF < 5% and TT < 1 per 1000 population) [9].

Since 2003, Ethiopia started implementing the SAFE strategy and made remarkable achievements [10]. However, many districts continue to have a high prevalence of active trachoma [11]. In the Southern Nations, Nationalities, and Peoples' Region (SNNPR) of Ethiopia, the overall regional prevalence of active trachoma was estimated to be 25.9% among children aged 1–9 years in 2013/14 [12].

The Federal Ministry of Health (FMOH) has prioritized operational research to look at the impact and implementation of the SAFE strategy and some research questions need to be answered. First, how is the SNNPR performing in terms of achieving WHO targets for trachoma elimination in recent years? Second, how well is the reporting and implementation of the SAFE strategy in all districts particularly in the high endemic districts in recent years? This is key to get a "handle" on the true level of implementation and to recommend upstream improvements. In particular, high prevalence districts should be evaluated as they can serve as drivers of trachoma transmission and thereby negating gains made in districts moving to elimination of trachoma.

Therefore, this study aimed to assess how well the SNNPRs districts progressed in terms of achieving trachoma elimination targets and how well the SAFE strategy was implemented.

Methodology

Study design and period

This study was a retrospective analysis of programmatic trachoma data at district level, available at FMOH for the period of 2013-2018.

General and specific settings

Ethiopia is a country located in the horn of Africa and divided into nine regional states and two city administrations, and with a projection from 2007 census it had a total population of 93.5 million for the year 2016. SNNPR is located in the southern part of the country and trachoma is endemic in most districts of the region. The SNNPR comprises 10% of the total area of Ethiopia and it is administratively divided in 14 zones, 157 woredas (districts) and 5 special woredas, with an estimated 105,887.18 Km^2, and with an estimated density of 141 people per square kilometre. The rural population of the region accounts for 90% of the total population and its capital city is Hawassa [13]. In the region, district-level data on distribution of trachoma as well as implementation of SAFE strategy were limited to data after 2013/14 [12].

Data collection and study variables

Surveys data for the period 2013-2018 and SAFE strategy implementation reports of the year 2017 were collected and extracted from the FMOH database. The study variables considered were: district names, active trachoma prevalence data, year of survey, reports on SAFE strategy components, number of rounds of azithromycin and year of mass drug administration (MDA) distribution.

Measurements

To evaluate the most recent progress per district, we analyzed the differences in prevalence between the two most recent surveys. The last survey was considered as 'impact survey' while the survey preceding the impact survey was taken as 'comparison' survey (for example it may have been the baseline survey for high or moderate districts or another impact survey for the intermediate and districts with eliminated status).

With regard to the prevalence of TF in children aged 1–9 years, areas were classified as low (5-9.9%), intermediate (10-29.9%) or high (≥ 30%) prevalence. Areas with a TF < 5% were considered as active trachoma eliminated. Implementation of the SAFE

strategy was assessed based on the reporting of the individual components of the SAFE strategy [5].

Statistical analysis

Data were reviewed, extracted, coded and entered into Epi data v3.1, then exported to SPSS v20 for cleaning and analysis. Descriptive analyses were performed for summary statistics. Figures and tables were constructed with SPSS or Excel (Microsoft). The progress of districts towards trachoma elimination was analyzed by comparing prevalence survey data in relation to the WHO classification criteria of "eliminated", "low", "moderate" and "high" [5]. In addition, the implementation of SAFE strategy for the year 2017 was evaluated and compared with the trachoma endemicity status of districts.

Ethical considerations

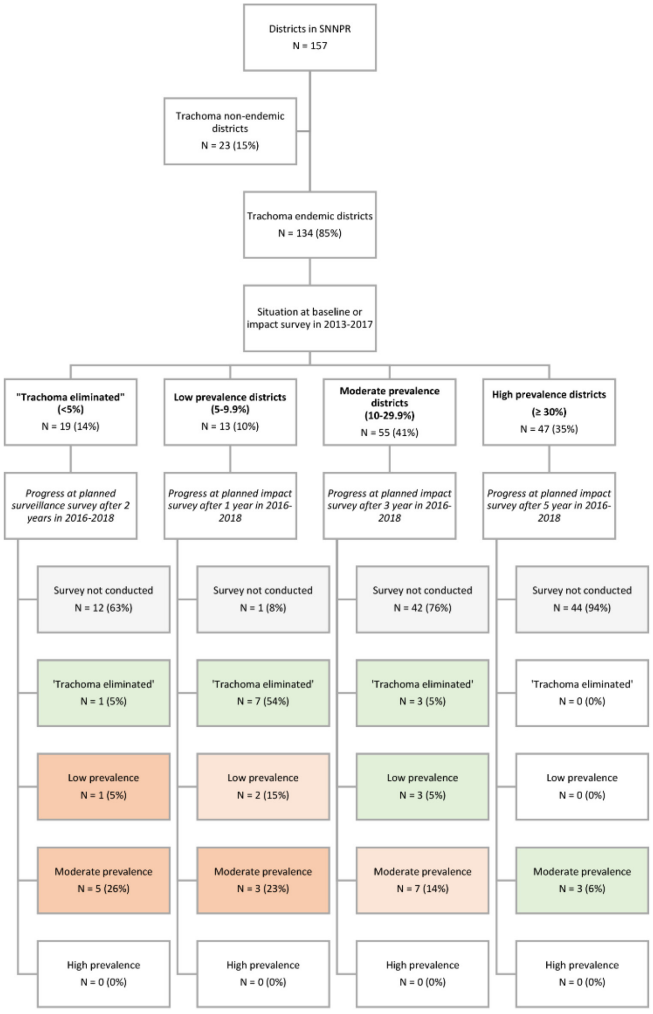
Permission to conduct the study was obtained from the FMOH, Ethiopia. Local ethics approval was received from the Ethics review board of Arba Minch University, College of Medicine and Health Sciences, Arba Minch, Ethiopia. The study was also approved by the Ethics Advisory Group of the International Union against Tuberculosis and Lung Disease, Paris, France. As this was a record review study without patient identifiers, the issue of informed patient consent did not apply.

Results

After exclusion of 23 trachoma non-endemic districts, the remaining 134 trachoma endemic districts of the SNNPR were included in the study. All the 134 districts had at least one prevalence survey between the years 2013-2017 and all were eligible for an impact or surveillance survey before the end of 2018, depending on their prevalence category (Figure 1 and Supplementary table 2). Based on the baseline or comparison surveys, a total of 19 districts (14%) were classified as < 5% active trachoma (TF eliminated), which required a surveillance survey after 2 years, while 13 (10%), 55 (41%) and 47 (35%) districts were classified as low (impact survey after 1 year), moderate (impact survey after 3 years) and high (impact survey after 5 years) endemic districts, respectively (Figure 1).

We could only measure the progress in trachoma prevalence in 35 out of the 134 districts, because only these 35 districts had their planned impact or surveillance survey. Hence, planned impact surveys were not conducted in 99 endemic districts (74%), especially among the high prevalence districts (94% missing) (Figure 1). Of the 35 districts in 2016-18, only 11 (31%) districts achieved the WHO trachoma elimination targets. A total of 12 districts (34%) were also reclassified to a lower active trachoma prevalence category, of which 7 reached the elimination threshold. On the other hand, six districts which had reached the elimination target (< 5%) in 2016 had a significant increase in trachoma prevalence in the subsequent 2 years' and were reclassified in the low (n = 1) and moderate (n = 5) trachoma prevalence categories in 2018. Likewise, 3 districts with low prevalence increased to moderate prevalence by 2018. Only 3 districts (6%) with high active trachoma prevalence had an impact survey of which all progressed to the moderate prevalence level, but none achieved the elimination criteria. From 13 districts with moderate

Figure 1. Representation of the 134 districts in the SNNPRs using the most recent survey between the years 2013 and 2017 and at their respective impact survey in 2016-2018, showing their progress towards elimination.



Red cells:- increase in prevalence; Green cells: decrease in prevalence.

Table 1. Number of districts (%) reporting on implementation of SAFE strategy components in 2017.

Components SAFE strategy	Total districts n = 134 (%)	Eliminated n = 19 (14%)	Low prevalence n = 13 (10%)	Moderate prevalence n = 55 (41%)	High prevalence n = 47 (35%)
Surgery	93 (69)	16 (84)	13 (100)	35 (64)	29 (62)
Zithromax®	82 (61)	**NA**	11 (85)	29 (53)	47 (100)
Facial cleanliness	59 (44)	10 (53)	10 (77)	28 (51)	11 (23)
Environmental improvement	32 (24)	1 (5)	2 (15)	18 (33)	11 (23)

NA: not applicable.

active trachoma prevalence, only 3 (31%) eliminated active trachoma (Figure 1).

Districts' reporting and implementation status of SAFE strategy in 2017

In 2017, the mean antibiotics treatment coverage was 90 % (standard deviation, 6.85). Table 1 shows that in 2017 complete data reports were only available for the high prevalence districts regarding Zithromax® distribution and for the low prevalence districts regarding surgery. In contrast, only 53% of moderate trachoma prevalence districts reported on *Zithromax*® distribution. The highest reporting rate was observed for the surgery component with an overall of 69%. Facial cleanliness practice and environment improvement interventions were only reported and implemented in 44% and 24% of the districts, respectively.

Zithromax® (MDA) implementation in high active trachoma prevalent districts

With complete data reports in 2017 on mass *Zithromax*® distribution (Table1) in the high prevalence districts, Table 2 shows that more than half of these districts (51%), which had a baseline survey in 2013 and where 5 rounds of MDA were expected, had only one round of MDA in the year 2017, and only 5 (11%) districts delivered the required rounds.

Discussion

This study showed how far the SNNPRs progressed in terms of achieving trachoma elimination and how well is the SAFE strategy was reported and implemented at the district level.

Only 35 districts had their planned impact or surveillance surveys. Within these districts, our study showed a median prevalence of active trachoma of 10% in 207/18. The prevalence in this study is lower than the prevalence of the country-wide and SNNPR surveys conducted in 2013 and 2014 which had a prevalence of 25.4% and 25.9%, respectively [8,12]. The prevalence of 10% is based on the 35 districts which had their planned impact survey, which probably introduced a bias towards the districts with a good follow-up. This together with the 3-4 years of SAFE implementation could explain the reduced prevalence of active trachoma in these 35 districts. Despite an expected reduction in prevalence after 3-4 years of SAFE strategy implementation, the low number of included districts (n = 35/134) could have created a sampling bias rendering an injustified comparison.

However, only less than half of the districts were reclassified to a lower active trachoma prevalence category and only a few achieved the WHO elimination target. In addition, post elimination surveillance surveys indicated some trachoma eliminated districts reverted backwards to low or even moderate prevalence status. This might be due to inadequate implementation of F and E component of the SAFE strategy and maybe

Table 2. Number of mass drug administration rounds in high active trachoma prevalence districts which reported on the "A" component (n = 47), 2013-2018.

Number of districts (%)	Year of baseline survey	Number of expected MDA rounds by 2018	Number of rounds of MDA performed MDA in 2018	Interval years of MDA distribution
24 (51)	2013	5	1	2017
1 (2)	2014	5	2	2016-2018
5 (11)	2013	5	3	2016-2018
12 (26)	2013	5	4	2014-2018
2 (4)	2014	5	5	2014-2018
3 (6)	2013	5	6	2013-2018

relate to transmission of trachoma from high endemic districts.

Although Ethiopia has the largest burden of trachoma, these data suggest that SNPPRs and maybe Ethiopia in general are lagging behind in achieving the GET2020 targets compared to 13 countries that have reported to have achieved the elimination goals as of April 4, 2019 [4].

Three quarters of the districts had a TF prevalence above 10%, requiring yearly mass drug administration rounds with a Zithromax® for at least 3 (if TF 10-29.9%) or 5 years (if above 30%) plus a robust implementation of the F and E components of the SAFE strategy, after which impact surveys should be conducted. However, only a quarter of the districts performed their impact survey at due time. The best follow-up was shown in the low prevalence districts, with almost all being surveyed in time. In the high prevalence districts, on the other hand, only 3 districts (6%) were surveyed as planned.

Similar to the conduct of impact surveys, the reporting to the FMOH on SAFE strategy implementation was partial. A similar trend in better implementation of the strategy for the low prevalence districts compared to the high or moderate ones was noticed. This indicated that high prevalence districts were particularly neglected, with half of them delivering only one round of mass azithromycin distribution by the year 2018 instead of 5-6 rounds. The latter could be a possible reason for districts not being surveyed in due time, because an impact survey is maybe only planned after a certain number of performed MDA rounds. In general there was an inadequate reporting of the components of the SAFE strategy, suggesting a poor implementation.

Our data also confirmed lack of implementation in the F and E component. Limitation in adoption of the F & E compenent can be due to resource intensiveness, lack of indicators and weak collaboration of water, sanitation and hygiene (WASH) sector and NTD programme.

Previous studies showed that the implementation of antibiotic (A), face washing (F) and environmental (E) components of the SAFE strategy were associated with a significant reduction in TF prevalence. Mass antibiotic distribution was also showed to be strongly associated with the reduction of active trachoma [14-18]. In addition, increased numbers of annual MDAs as well as consecutive yearly distributions are significant predictors of reduced TF prevalence. However, the probability of achieving the < 5% target in some districts has been shown to be less than 50% for areas with high prevalence at baseline, even with 7 or more continuous annual rounds [19]. The high prevalence districts in our study could act as drivers of trachoma, fuelling transmission and negating gains made in the districts moving to a better level of prevalence or even to an elimination status. Hence, bordering a high prevalence district could be part of the explanation behind those 6 eliminated or low prevalence districts that reverted back to low or moderate prevalence.

In 2017, the mean treatment coverage was 90% among the surveyed districts of the SNNPRs, but recommended treatment was lacking in 94% of these alarming high endemic districts and in 74% of the districts in general. Yet, the mean treatment coverage was higher than the minimum recommended coverage target (80%) set by WHO [20]. In addition, the treatment coverage in this study was higher than the global antibiotic coverage in 2017, 57% [5]. However, the current study treatment coverage was lower than the report of a study conducted in the south of Tigray which reported on 93% [21].

The main strength of our study is the inclusion of recent region-wide trachoma elimination data allowing to assess recent progression of the districts towards elimination targets, which addresses an important national operational research priority.

Lack of complete reported data on the SAFE strategy and the difficulty in finding reliable sources of information and indicators for the facial cleanliness and the environmental sanitation components of the program were the major limitations of this study. This data incompleteness made it impossible to compare the high and low performing districts with regard to SAFE strategy implementation.

The major implications of this study are that districts with a high and moderate prevalence of trachoma should get the required attention to receive the expected rounds of *Zithromax*® and to be timely surveyed. Moreover, all districts should fully implement and report all components of the SAFE strategy to properly evaluate and improve the strategy. Furthermore, facial cleanliness and environmental improvement should be assessed at individual and household level by means of operational research. In addition, the reasons for districts reverted backwards should be investigated by by other studies.

Conclusion

With three months left to 2020 we have achieved trachoma elimination in only 11 of 35 districts. In recent years, six districts even reverted backwards to low or moderate status after attaining of the elimination

threshold, and three districts reverted backwards to moderate status from low level. 90% districts with high trachoma prevalence did not receive the required Zithromax rounds of distribution. All components of the SAFE strategy should be scaled up to achieve trachoma elimination in the region. Therefore, monitoring of Zithromax® distribution rounds in high prevalence districts is recommended along with the reinforcement of water and sanitation access and improvement of socioeconomic conditions.

Acknowledgements

This research was conducted through the Structured Operational Research and Training Initiative (SORT IT), a global partnership coordinated by TDR, The Special Programme for Research and Training in Tropical Diseases hosted at the World Health Organization. The training model is based on a course developed jointly by the International Union Against Tuberculosis and Lung Disease and Médecins Sans Frontières- Luxembourg (LuxOR). The specific SORT IT program that led to these publications included a joint implementing partnership between TDR the Institute of Tropical Medicine Antwerp, Belgium, the University of Gondar, Ethiopia, The WHO country office in Ethiopia, Médecins Sans Frontières, Luxembourg (LuxOR) and The International Union Against Tuberculosis and Lung Disease, Paris France. We are grateful to the FMOH, SNNPR Health Bureau and Orbis International for the viability collection of the data and giving us the permission to use the program data for this publication as well as their unreserved support.

Funding

The program was funded by TDR, the Special Programme for Research and Training in Tropical Diseases and the Institute of Tropical Medicine Antwerp. Data extraction and entry was supported by Arba Minch University.

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Conflict of interests: No conflict of interests is declared.

Annex – Supplementary Items

Supplementary Table 1. WHO SAFE strategy and criteria for initiation of elimination programmes and elimination criteria.

SAFE strategy

S = **S**urgery to treat the blinding stage of the disease (trachomatous trichiasis);
A = **A**ntibiotics to clear infection, particularly mass drug administration of the antibiotic azithromycin;
F = **F**acial cleanliness; and
E = **E**nvironmental improvement, particularly improving access to water and sanitation.

WHO criteria for initiation of trachoma elimination programmes:

S	In areas with ≥ 0.2% trachomatous trichiasis (TT) cases among adults aged ≥ 15 years.
AFE	In areas with low (5-9.9%), intermediate (10-29.9%) or high (≥ 30%) prevalence of trachomatous inflammation (TF) - follicular in children aged 1–9 years. Areas with a TF < 5% are considered trachoma eliminated. However, interventions in the S, F and E component as well as follow-up are still recommended for the latter.

Elimination of trachoma as a public health problem is defined:
(i) a prevalence of trachomatous trichiasis "unknown to the health system" of < 0.2% in adults aged ≥ 15 years (approximately 1 case per 1000 total population), and (ii) a prevalence of trachomatous inflammation—follicular in children aged 1–9 years of < 5%, sustained for at least two years in the absence of ongoing antibiotic mass treatment, in each formerly endemic district; plus (iii) the existence of a system able to identify and manage incident trachomatous trichiasis cases, using defined strategies, with evidence of appropriate financial resources to implement those strategies.

Supplementary Table 2. List of 35 districts in SNNPR with impact survey, 2016-2018.

Name of district	Year of impact survey	Year of baseline or comparison survey	Years in between	Prevalence category at impact survey
Districts with low prevalence (5-9.9%)				
Cheha	2017	2016	1	Moderate
Mihuraklil	2017	2016	1	Eliminate
Derashe	2017	2016	1	Eliminate
Chencha	2018	2017	1	Eliminate
Deremalo	2018	2017	1	Eliminate
Dita	2018	2017	1	Moderate
Kemba	2018	2017	1	Eliminate
Mirababay	2018	2017	1	Eliminate
Kebena	2018	2017	1	Low
Alle	2018	2017	1	Low
NorthAri	2018	2017	1	Eliminate
Kindodidaye	2018	2017	1	Moderate
Districts with moderate prevalence (10-29.9%)				
Arbaminchzuria	2016	2013	3	Moderate
Bonke	2016	2013	3	Eliminate
Southari	2017	2013	4	Eliminate
Boreda	2017	2014	3	Eliminate
Endegagn	2018	2015	3	Low
Enemorener	2018	2015	3	Moderate
Bolosobombe	2018	2015	3	Low
Bolososore	2018	2015	3	Moderate
Damotgale	2018	2015	3	Moderate
Damotpullasa	2018	2015	3	Moderate
Damotsore	2018	2015	3	Moderate
Damotwoyde	2018	2015	3	Low
Dugunafango	2018	2015	3	Moderate
Districts with high prevalence (≥ 30%)				
Damboya	2018	2013	5	Moderate
Kididagamela	2018	2013	5	Moderate
Halabarulral	2018	2013	5	Moderate
Districts which had achieved elimination (< 5%)				
Ezha	2018	2014	4	Eliminate
Abeshge	2018	2016	2	Moderate
Angacha	2018	2016	2	Moderate
Doyogona	2018	2016	2	Moderate
Haderotutozur	2018	2016	2	Low
Kachabirra	2018	2016	2	Moderate
Tembaro	2018	2016	2	Moderate