ORIGINAL ARTICLES

PREVALENCE OF ACTIVE TRACHOMA TWO YEARS AFTER CONTROL ACTIVITIES

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SUMMARY

Background: Following an epidemiological assessment to map out the endemicity of trachoma in Ghana, Trachoma control interventions were put in place in two districts in Upper West and three in Northern Regions in the year 2001. The control activities were based on the WHO recommended strategy of SAFE. After two years of intervention, a study was undertaken to determine the impact of the control activities.

Methods: A simple random selection of compounds was done. Trained and standardized ophthalmic nurses examined children aged 1 to 10 years for dirty faces and signs of active trachoma. Community members were interviewed to ascertain availability of potable water and latrines.

Results: A total of 9,288 children aged 1-10 years were examined in 2003. Overall TF/TI prevalence for Upper West was 5.6% and for Northern Region was 3.5%. In 2000, 6,241 children aged 1-10 years were examined. The overall prevalence of TF/TI for baseline was 15.0% for Upper West and 9.1% for Northern Region. The prevalence of TF/TI showed significant reduction (p-value <0.001) in all five districts and overall in the two regions.

Conclusion: Trachoma control activities over a two-year period in two regions in Ghana had led to significant reduction in the prevalence of active disease. Integrated surveillance and active monitoring will help early detection of active disease.

Key words: Active Trachoma, Prevalence, SAFE Strategy, Intervention, Impact

INTRODUCTION

Trachoma is a recurrent infection of the upper eyelid conjunctiva with *Chlamydia trachomatis*.[1] Repeated infection over several years leads to scarring of the conjunctiva. This may cause the eyelid to turn in (entropion) and the eyelashes to rub on the eyeball (trichiasis) often resulting in visual loss due to corneal scarring. Active trachoma, manifested by trachoma follicles (TF) and intense inflammation (TI) is mainly found in children and the complications, entropion/trichiasis (TT), leading to visual loss usually found in adults. Trachoma trichiasis is more common in women than men. Environmental factors such as shortage of potable water, poor personal and environmental hygiene practices are the main risk factors that increase the incidence of the disease. Trachoma typically affects poor people living in remote communities which are dry, dirty and dusty. Eye discharges that contain the *Chlamydia* organisms cause transmission through agents like flies, the fingers, fomites among the family members and other contacts.[2]

Trachoma occurs in foci and is therefore very expensive to study epidemiologically. Analysis of data from the Eye Care Unit in 1995 indicated that trachoma was a health problem in Northern and Upper West Regions. In 1999, a Trachoma Rapid Assessment (TRA3) study was carried out in the Northern and Upper West Regions (NR & UWR) of Ghana in order to prioritize communities for intervention. Seventy percent of the 122 communities studied in the TRA3 had medium to high rankings that required some form of intervention.

In 2000, an epidemiological study was conducted in five out of the eighteen districts in the endemic regions. The overall range of prevalence of active trachoma (TF/TI) in children aged 1-10 years in the study districts was found to be between 4.7% and 16.5%. The lowest prevalence was found in Tamale Municipal in the Northern region, which happens to be the most urban of all the study districts, and the highest prevalence was found in Wa

District in the Upper West Region. At the community level active trachoma ranged from 0 to 64.4%.

This survey provided baseline data on prevalence of various stages of the disease among the population on district as well as village/community level.
In 2001 the Ghana Trachoma Control Programme started implementing control activities in two hundred and nineteen communities in five out of the eighteen districts in the two endemic regions. These activities were based on the WHO recommended SAFE strategy with the use of Pfizer donated Azithromycin (Zithromax®) as the antibiotic of choice. These communities have benefited from full SAFE strategy using Pfizer donated Zithromax® as the antibiotic of choice. Two rounds of yearly antibiotic treatment had been carried out at the time of this study.

Six months after the first community-wide antibiotic distribution in 2001, repeat prevalence surveys were carried out in eight and six hyperendemic communities in Northern and Upper West regions respectively. Data from this survey suggested that the overall prevalence of active disease had reduced from 38% to 21% in surveyed communities in UWR, and from 31% to 16% in those in NR. This survey was limited in scope as it involved a small number of communities and it had been done only six months after the first treatment with antibiotics. It was decided to do an impact assessment study after two years of intervention in many more communities.

Trachoma intervention was recommended if the active disease prevalence at the district level was 10% or more or the prevalence at the community level was greater than 5%. In the former case a district-wide treat with antibiotic was recommended; while in the later case treatment was recommended at the community level.

The Ghana Trachoma Control Programme used the recommended WHO **SAFE** strategy. **S**urgery was performed to correct the deformed eyelid and **A**ntibiotic was given to treat active disease and reduce the pool of infectious people. **F**acial cleanliness and personal hygiene and **E**nvironmental improvement through advocacy and education for the provision of potable water, provision and use of latrines so as to reduce the population of eye-seeking flies which act as mechanical carriers transferring the chlamydia from an infected eye to an uninfected one.

People with TT were identified through passive case detection or active search. Surgery was conducted free of charge at community outreach points or at health facilities. Azithromycin (Zithromax®) was distributed house-to-house at the community level to all people aged one year and above by health workers assisted by community volunteers. Directly observed treatment strategy was used. Children under one year and pregnant women were given Tetracycline 1% to apply to the eye twice a day for six weeks. Health education on Face washing / cleanliness was carried out by Health workers, Environmental Health Officers, School Teachers and Community Volunteers. Advocacy for the provision of safe water and for construction and use of sanitary facilities has been on-going since the start of control activities.

The specific objectives of the impact assessment study were: To determine the prevalence of active trachoma (TF & TF/TI) in children 1-10 years in the programme communities after two years of intervention; To determine the prevalence of the risk factor of dirty faces (ocular or nasal discharge) among children aged between 1 to 10 years; To determine availability of potable water in communities; and to determine the availability of household (HH) latrines in communities.

METHODS

The two trachoma endemic regions of Northern and Upper West Regions of Ghana lie between Latitude 8^o and 11^o North and Longitude 30^o East and 3^o West. The Northern Region shares common political boundaries with the South East of the Upper West Region.

The landscape is generally flat and 300m above sea level with a central plateau ranging between 1,000 and 1,150 ft. The rivers draining the area include the tributaries of the Volta (Black Volta, White Volta), Kulpawn and Sissili. Many communities in these regions rely on underground water, especially during the dry season, to meet their needs

The vegetation is generally semi-savanna with light undergrowth and scattered shrubs. The climate is tropical with an average minimum temperature of 22.6^oC and maximum of 40.0^oC. There is one rainy season from May-October with an intensity of 100-115 cm/annum with humidity ranging between 70-90% but falling to 20% in the dry season.

During the dry season, from November to March, the cold dry and dusty wind (the harmattan), blows from the Northeast across the region.

The predominant activity is farming and many people have very little to do during the long dry season. There is a lot of seasonal migration to the south especially to the Brong Ahafo, Ashanti and Eastern regions. This mobility has implication for communicable disease spread and control.

The ethnic groups of the regions are diverse and distinct, each having their own beliefs and traditional practices. However the predominant ethnic groups in the study areas are Sissala and Dagaaba in the Upper West and Dagomba and Gonja in the Northern region.

In two districts (Wa and Tolon/Kumbungu) out of the five, a simple random technique (lottery method) was used to select the communities from among those that had received two rounds of antibiotic. Due to the small number of communities implementing SAFE in the Tamale Municipal and Sissala Districts, all communities were surveyed. In the fifth district (Savelugu/Nanton) no sampling was done as most of the communities had received a third round of antibiotics but all those communities that had not yet received the third round of treatment at the time of the study were surveyed.

The number of children examined in each district was determined using the population of the communities that received two rounds of treatment and the estimated prevalence assuming a 20% reduction from the baseline. Calculations for the number of children to be included were based on a power of 80% and confidence interval of 95%. All calculations were done with the EPInfo v6.02a software.

In each selected community a list of all compounds was made. A simple cluster random sampling technique was used to select compounds. In compounds with more than one household a random sampling technique was used to select one. The average number of households per community was 100 with an average household size of 5-6 people. The list of households and compounds was available from the register compiled prior to the 2002 antibiotic treatment.

Ophthalmic nurses specifically trained for this purpose did the data collection. One-day training was conducted for the ophthalmic nurses on how to use the WHO grading of trachoma. This training which also included how to record their findings on data collection forms was immediately followed by a standardization study. The standardization study provided an opportunity for the nurses to be pre-tested on how to fill the data collection forms. All ophthalmic nurses used in the data collection obtained an agreement score (kappa) of 80% and above.

A volunteer was recruited from each village to guide the ophthalmic nurses as they moved round the village from compound to compound. In each compound the purpose of the exercise and the methodology being used were explained to the people.

The face of each selected child aged 1–10 years was examined for nasal and ocular discharge. Any child with nasal or ocular discharge was recorded as having dirty face (DF). This was followed by examination of the eyes for signs of trachoma, starting with the right eye, followed by the left eye. Trachomatous Follicles (TF) was recorded if a child had two or more follicles only on the everted tarsal conjunctiva. Trachomatous Intense Inflammation (TI) was recorded if a child had intense inflammation obscuring more than 50% of the main blood vessels of the tarsal conjunctiva. If the child had both TF and/or TI in the everted tarsal conjunctiva, it was recorded as TF/TI. Active trachoma was recorded as TF or TF/TI. The prevalence of TF, TF/TI or DF per district was calculated as the number of children seen with active trachomatous lesion or dirty face out of the total examined in each district.

One adult in each selected household was interviewed to determine the availability of a household latrine. Three key informants, including at least one woman, were interviewed in each community to determine the number of potable water sources (hand dug wells, boreholes) and communal latrines. Each informant was asked to indicate the approximate location of each facility and these were compared when there was disagreement.

At the end of each day the Principal Researcher/Supervisor checked the data collected by the ophthalmic nurses for completeness. Permission was sought from parents, mainly mothers, to examine the children.

The two-year post-intervention study was carried out in the months of March and April 2003, the dry season when most communities were accessible by road.

This was also the period when community members were less busy with their farm work. The baseline study had been carried out in 2000, also during the dry season.

Data analysis

Data were entered and analysed using EPInfo v6.02a software package. The prevalence of TF, TF/TI or DF per district was calculated as the number of children seen with active trachomatous lesion or dirty face out of the total examined in each district. A comparison of trachoma prevalence two years after the intervention was made with the baseline prevalence and significant differences reported at an alpha level of 5%.

RESULTS

A total of 9,288 children aged 1-10 years were examined in 26 sub-districts of the five districts receiving intervention for trachoma control. The children were selected from 1,730 households in 89 communities. Table 1 shows the prevalence of active trachoma (TF & TF/TI) and the proportion of children aged 1 to 10 years with dirty faces (DF) at the district level. Tolon Kumbungu District had the highest prevalence of active trachoma (TF 7.0% & TF/TI 7.3%) followed by Wa District (TF 6.0% & TF/TI 6.6%). The lowest prevalence of active disease (TF & TF/TI 1.8%) and the lowest proportion of children with dirty faces were recorded in Tamale Municipal.

Table 2 compares the prevalence in each district for baseline and two-year post-intervention. It shows that the prevalence of active trachoma has markedly reduced (p-value < 0.001) in all the five districts two years after the start of trachoma control activities.

Table 1 Prevalence of Active Trachoma (TF, TF/TI) & Dirty Face in Children aged 1-10 years by district

Study area	No. of children examined	TF		TF/TI		Dirty Face (DF)	
		No.	%	No.	%	No.	%
Wa District	1,353	81	6.0	89	6.6	361	26.7
Sissala District	1,259	55	4.4	56	4.4	497	39.5
Upper West Region (Total)	,2612	136	5.2	145	5.6	858	32.8
Savelugu/Nanton District	1,878	35	1.9	37	2.0	210	11.2
Tamale Municipal District	2,825	50	1.8	50	1.8	215	7.6
Tolon/Kumbungu District	1,973	138	7.0	144	7.3	446	22.6
Northern Region (Total)	6,676	223	3.3	231	3.5	871	13

Source: Ghana Trachoma Control Programme

Table 2 Pre- and Post-intervention Prevalence of Active Trachoma (TF/TI) in Children 1-10 years old

Study area	Baseline (2000)			Post-intervention(2003)			% reduction in prevalence (p-value)
	No. examined	TF/TI	Prevalence	No examined	TF/TI	Prevalence	
		No.	%		No	%	
Wa District	1,900	306	16.1	1,353	89	6.6	59.0 (<0.001)
Sissala District	592	68	11.5	1,259	55	4.4	61.7 (<0.001)
Total Upper West Region	2,492	374	15.0	2,612	145	5.6	62.6 (<0.001)
Savelugu/Nanton District	1,314	127	9.7	1,878	37	2.0	79.3 (<0.001)
Tamale Municipal District	1,135	53	4.7	2,825	50	1.8	61.7 (<0.001)
Tolon/Kumbungu District	1,300	161	12.4	1,973	144	7.3	41.1 (<0.001)
Total Northern Region	3,749	341	9.1	6,676	231	3.5	61.5 (<0.001)

Source: Ghana Trachoma Control Programme

While the strategies and activities used were similar in all five districts there was a wide variation in the level of reduction, from a low of 41% to a high o f 79%. Antibiotic coverage among children aged 1-10 years was over 90% in all communities (Table 3).

Table 3 Antibiotic coverage among children aged 1-10 years by District

Study area	No. of children examined	Antibiotic coverage	
		No. treated	%
Wa District	1,353	1,239	91.6
Sissala District	1,259	1,224	97.2
Upper West Region	2,612	2,463	94.3
Savelugu/Nanton District	1,878	1,864	99.3
Tamale Municipal District	2,825	2,687	95.1
Tolon/Kumbungu District	1,973	1,832	92.9
Northern Region	6,676	6,383	95.6
Upper West & Northern Regions	9,288	8,846	95.2

Ghana Trachoma Control Programme

In the Upper West Region, out of a total of 503 households studied only 26 had household latrines and in the Northern Region, out of the 1227 households studied only one had a household latrine.

DISCUSSION

Active trachoma is basically a disease of childhood with peak infection rates being seen among children aged two to seven years. The prevalence begins to decline by adolescence though some adults, especially women who are the care-givers of young children, continue to have repeated episodes of active disease.

Trachoma is known to have a high association with economic underdevelopment and poverty. In some countries, the reduction in the prevalence of active disease preceded the development of effective antibiotics for treatment. The greatest contributor to this was the improvement in people's personal hygiene and environmental sanitation. Studies by Dolin and colleagues in The Gambia observed that between 1986 and 1996 the prevalence of clinically active trachoma decreased by 54% and attributed the findings to improved environmental sanitation.[3]

This study sought to determine if there has been any decline in the prevalence of active disease in those programme communities and districts that had benefited from two years of control activities. The prevalence of active trachoma in a particular community is affected by a number of factors including the environmental sanitation, personal hygiene of the individuals and access to health care. Efforts to reduce the prevalence of active disease focus on the use of **AFE** components of SAFE.

The advent of azalide antibiotics such as azithromycin that are effective when taken as a single oral dose has made the **A** component relatively easy to implement. The administration is easy and compliance is high compared with the use of tetracycline eye ointment two times a day over a six-week period.

The antibiotic coverage among children 1 to10 years was over 90% in the study districts. This high coverage could be attributed to a number of factors. After the first round of treatment with azithromycin (Zithromax®, Pfizer Inc. USA) many community members said that they had noticed a reduction in the attacks of colds and catarrhs they used to have before the yearly drug treatment and that their appetite had increased. The house-to-house strategy used for the distribution of antibiotics also helped to improve coverage. This high antibiotic coverage has contributed to the reduction in active disease.

There was a significant reduction in the prevalence of active disease in all districts (p-value < 0.001). At the community level reduction in the prevalence of active disease ranged from 10.4% to 100%. In three communities in the Northern region and one community in the Upper West region the prevalence of active disease was higher than the pre-intervention level. The reason for this is not clear. It may be necessary to explore the peculiar characteristics of these communities.

The **F** and **E** components require a change in the behaviours of all those at risk as well as the provision of potable water and latrines. This area has been particularly challenging as change in behaviour is slow and provision of water and latrines involves several other sectors. Those with no latrines said they buried their faeces to help reduce

the fly population. This has been taught them through health education.

The presence of ocular and nasal discharges (dirty face) attracts eye-seeking flies to the eyes, thus increasing the risk of transmission of trachoma from one person to another. Poor environmental sanitation and the lack of latrines both at the community and household levels promote the breeding of eye-seeking flies and maintain the cycle of transmission. Previous studies have shown that at the community level, awareness about the risk factors for trachoma infection is high although behaviour change is rather slow. While communities continue to have inadequate water, efforts are being made to wash children's faces and thus improve hygiene. The level of facial cleanliness has increased in all districts.

In some of the endemic communities water availability continues to be poor. Some had no source of potable water at all and had to rely on streams which dry up during the long dry season. In other communities people had to queue for many hours at the only borehole or well to draw a few litres of water for household use. West and colleagues conducted a risk factor analysis in Tanzania and established an association between trachoma prevalence and distance to water source[4]. They also established that children were more likely to have unclean faces if they lived more than 30 minutes from a water source. Women would rather use the little water available in the house for drinking and cooking.

Exposed faecal matter around the house has been considered to contribute to increased fly density and thereby contributing to the spread of trachoma. Zerihun found that in South-Western Ethiopia, where 24.5% of the population have clinically active trachoma, both active and cicatricial trachoma were significantly associated with communities not having a latrine.[5]

In this study household latrine coverage was found to be 0.0% in two of the districts of the three districts studied in Northern region and below 10.0% in the remaining three (two districts in Upper West and one in Northern Region). Availability of communal latrines was equally low and in any case they were not well patronized. The reason for most people not using communal latrines was the poor maintenance of these facilities leading to them giving off bad odour. Household latrines were preferred by majority of community members and the reason often given was the ease of maintenance ensuring privacy.

CONCLUSIONS AND RECOMMENDATIONS

This study has shown that the implementation of trachoma control activities, using SAFE strategy with Zithromax® as the antibiotic of choice over a two-year period in the endemic communities in two Regions in Ghana, has led to significant reduction in the prevalence of active disease. The reduction is more likely due to the high antibiotic coverage in all districts and the fact that children's faces were now cleaner and thus not attracting the eye-seeking flies that transmit the disease from the eyes.

The components of the SAFE strategy that contribute to decreasing the prevalence of active disease are the **A, F** and **E.** They are required to complement each other for maximum result. While there has been a significant reduction in active disease prevalence, the risk factors for disease transmission were still widespread. In order to sustain this gain and thereby reduce active disease in the endemic districts even lower still and so making the disease no longer a public health problem, it is important to continue with advocacy for the provision of potable water and sanitary facilities to endemic communities. The provision of these facilities will encourage behavioural change and also impact not just on trachoma control but on other diseases such as guinea worm, diarrhoea and soil transmitted helminths that are all endemic in the programme districts.

With two years of intervention the study identified that there were still some communities where TF levels were above 10% among children. Treatment should continue in all communities and assessment conducted after the third round of mass antibiotic treatment as recommended by the Trachoma Initiative Monitoring and Evaluation (TIME) Team in Ghana.[6,7]

Integrated surveillance should be put in place and actively monitored so that resurgence in active disease can be detected early and the necessary action taken to control it. For each district, two communities should be randomly selected as sentinel sites to be followed up for trends in active diseases.

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