Trachoma Mapping in Gombe State, Nigeria: Results of 11 Local Government Area Surveys

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ORIGINAL ARTICLE

Trachoma Mapping in Gombe State, Nigeria: Results of 11 Local Government Area Surveys

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ABSTRACT

Purpose: To determine the need or otherwise for establishment of a trachoma elimination program in Gombe State, Nigeria, by estimating the population-based prevalence of trachoma in each Local Government Area (LGA) of Gombe.

Methods: Using a multi-stage, systematic, random, and quasi-random sampling approach and Global Trachoma Mapping Project support, we selected 25 clusters in each LGA. In each cluster, we selected 25 households and all consenting residents aged 1 year and older were examined for trachomatous inflammation–follicular (TF) and trichiasis, using the World Health Organization simplified grading scheme.

Results: No LGA in Gombe State had a TF prevalence ≥5% in 1–9-year-olds. All LGAs had trichiasis prevalences above the elimination threshold and should be targeted for community-based delivery of trichiasis surgery. Only three LGAs had household-level improved wash water access of greater than 80%. Access to improved sanitation facilities was also poor as household access to improved sanitation facilities was above 80% in only one LGA.

Conclusion: A trachoma program focused on delivery of trichiasis surgery is required in Gombe. Improvements in water and sanitation, through engagement with other sectors, are necessary.

Introduction

Trachoma is responsible for 4% of overall blindness in Nigeria, with the north-eastern part of the country having the highest burden.[1] There are fewer than five years until the agreed target date for the global elimination of trachoma as a public health problem.[2] The World Health Organization (WHO) recommends the SAFE (Surgery for trichiasis; Antibiotics to clear infection; Facial cleanliness and Environmental improvement to reduce transmission) strategy for the elimination of trachoma.[2] Implementation of the SAFE strategy has led to considerable decline of trachoma in various countries.[3,4] It is therefore important that countries suspected of being trachoma-endemic document where trachoma is a problem, at district level, and determine what aspects of the SAFE strategy require implementation. To reach this decision, trachoma programs need to know the prevalence of trachomatous inflammation–follicular (TF) in children aged 1–9 years, and the prevalence of trachomatous trichiasis in adults aged 15 years and older, in each suspected-endemic district. Gombe State is located in the north-eastern part of Nigeria and borders Yobe, Kano and Jigawa States, where trachoma has been documented as requiring intervention.[5–7] However, there is no trachoma elimination program in Gombe State, in part because the district-level prevalences of trachoma, which might justify the establishment of such a program, have not been estimated.

We sought to determine the district (Local Government Area, LGA) level prevalence of TF and trichiasis in Gombe, so that the government and its partners can determine

whether a trachoma elimination program is required. This was undertaken as part of the Global Trachoma Mapping Project (GTMP).

Materials and methods

Sample size calculations, field team training and certification protocols, data collection procedures, data processing and analysis techniques all followed GTMP standards, which have been previously published.[8] In Gombe State, each LGA formed an evaluation unit, and we estimated an average of two children aged 1–9 years per household; 25 clusters each of 25 households therefore put >1222 children in the sampling frame per LGA. In each selected household, all residents aged 1 year and older were invited to be examined by GTMP-certified graders for TF, trachomatous inflammation—intense, and trichiasis. As elsewhere, we also collected data on household-level access to water and sanitation, using a combination of questioning of adult residents and direct observation.

Ethics

Examination protocols were explained by field teams to prospective participants in a language they understood, and verbal consent for enrolment and examination was obtained, as most survey subjects could neither read nor write. Each adult provided individual consent while heads of households gave consent on behalf of minors. Consent was documented in the LINKS application[9] by research teams. Persons with clinical evidence of active trachoma were given two tubes of 1% tetracycline eye ointment, and they or their carer were told how to apply it. Participants with trichiasis were referred to the nearest trained trichiasis surgeon for free lid surgery. In between examinations, graders used an alcohol-based hand sanitizer to clean their hands. Protocols were approved by the National Health Research Ethics Committee of Nigeria (NHREC/01/01/2007), and the Ethics Committee of the London School of Hygiene & Tropical Medicine (reference 6319). The Gombe State Ministry of Health gave administrative permission to conduct the surveys.

Sampling

A total of 25 villages (clusters) were selected from a sampling frame which consisted of a list of all the villages in each LGA, using a probability-proportional-to-size technique. Each selected village was further subdivided into existing subunits (wards), one of which was randomly selected; in the selected ward, 25 households

were selected using the random walk, despite its epidemiological drawbacks.[6,10] A household was defined as all individuals normally resident together and eating from the same pot.

Survey definitions

The WHO simplified grading scheme was used.[11] Data on household-level access to water and sanitation were collected using standard GTMP protocols.[8]

Data handling

Data were cleaned and analyzed following the standard GTMP techniques.[8] The GTMP data manager analyzed the data using pre-specified algorithms to control for age and sex of those recruited, and the number of individuals examined in each cluster. We calculated the trichiasis backlog in each LGA by multiplying the prevalence estimate in persons aged 15 years and older by 0.56 of the total population per LGA (as determined in the most recent census), because 56% of the Nigerian population is aged 15 years or older.[12] Further data analyses presented here were carried out in Epi Info version 7.0 (Centers for Disease Control and Prevention, Atlanta, GA, USA).

Results

Field teams examined 39,377 participants between November and December 2013. A further 5202 residents were absent, while 763 residents refused examination. The age range of study participants ranged from 1 to 100 years (Table 1).

Across the 11 LGAs, we examined 15,374 children aged 1–9 years (7488 females and 7886 males); 606 children were absent and 449 refused examination. The state-wide crude TF prevalence in 1–9-year-olds was 0.5% (95% confidence interval, CI, 0.4–0.7%); there was no statistically significance difference in the TF prevalence between females (0.7%, 95% CI 0.5–0.9%) and

Table 1. Age and sex distribution of participants, Global Trachoma Mapping Project, Gombe State, 2013.

| Age group (years)	Female		Male		Total	
	n	%	n	%	n	%
1–9	7488	48.7	7886	51.3	15,374	39.0
10–19	3386	52.1	3112	47.1	6498	16.5
20–29	3725	70.0	1596	30.0	5321	13.5
30–39	2760	66.8	1374	33.2	4134	10.5
40–49	1734	58.6	1227	41.4	2961	7.5
50–59	1247	57.6	919	42.4	2166	5.5
60–69	792	51.8	737	48.2	1529	3.9
70–79	436	44.4	547	55.6	983	2.5
80+	195	47.4	216	52.6	411	1.1
Total	21,763	55.3	17,614	44.7	39,377	100

Table 2. Local Government Area-level prevalences of trachomatous inflammation–follicular (TF) and trichiasis, Global Trachoma Mapping Project, Gombe State, 2013.
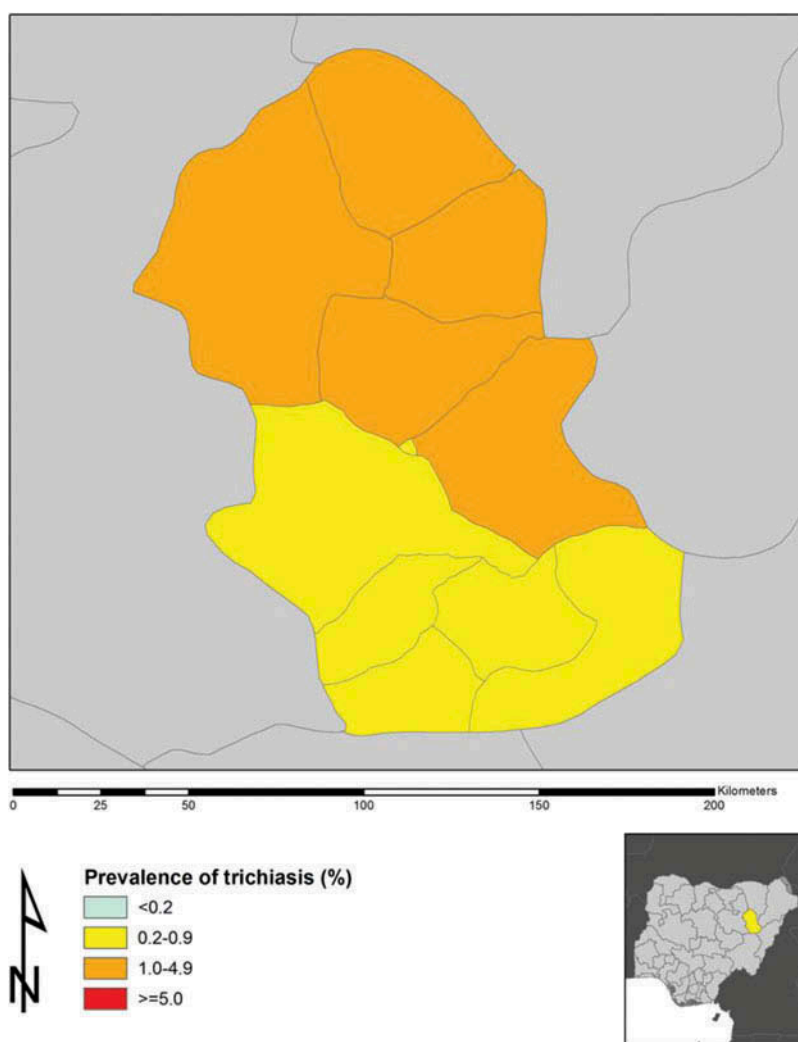
Local Government Area	Age-adjusted TF prevalence in 1–9-year-olds, % (95% confidence interval)		Age- and sex-adjusted trichiasis prevalence in those aged ≥15 years, % (95% confidence interval)	
Akko	0.1	(0.0–0.2)	1.0	(0.6–1.4)
Balanga	0.3	(0.0–0.7)	0.5	(0.2–0.8)
Billiri	0.3	(0.0–0.5)	0.7	(0.4–1.0)
Dukku	0.0	(0.0–0.0)	2.4	(1.5–3.5)
Funakaye	1.1	(0.4–1.8)	2.5	(1.6–3.6)
Gombe	0.2	(0.0–0.5)	0.8	(0.5–1.1)
Kaltungo	0.8	(0.2–1.6)	0.6	(0.3–1.0)
Kwami	0.2	(0.0–0.3)	2.2	(1.2–3.5)
Nafada	1.7	(0.8–2.8)	3.9	(2.9–5.2)
Shongom	1.1	(0.5–1.6)	0.6	(0.3–0.9)
Yamaltu/Deba	0.1	(0.0–0.3)	1.8	(1.2–2.5)

males (0.4%, 95% CI 0.3–0.6%), with an odds ratio (females:males) of 1.5 (95% CI 1.0–2.4; $\chi^2 = 3.4$, $p = 0.06$).

A total of 20,165 persons aged 15 years and older were examined (12,390 females and 7775 males). In this age group, 3325 people were absent on the day of examination, and 292 refused examination. The state-wide crude trichiasis prevalence was 3.2% (95% CI 2.9–3.4%). The prevalence in females (3.4%, 95% CI 3.1–3.8%) was higher than in males (3.2%, 95% CI 2.9–3.4%), but there was no statistically significant difference between these prevalences; the female:male odds ratio was 0.9 (95% CI 0.8–1.0; $\chi^2 = 1.7$, $p = 0.2$).
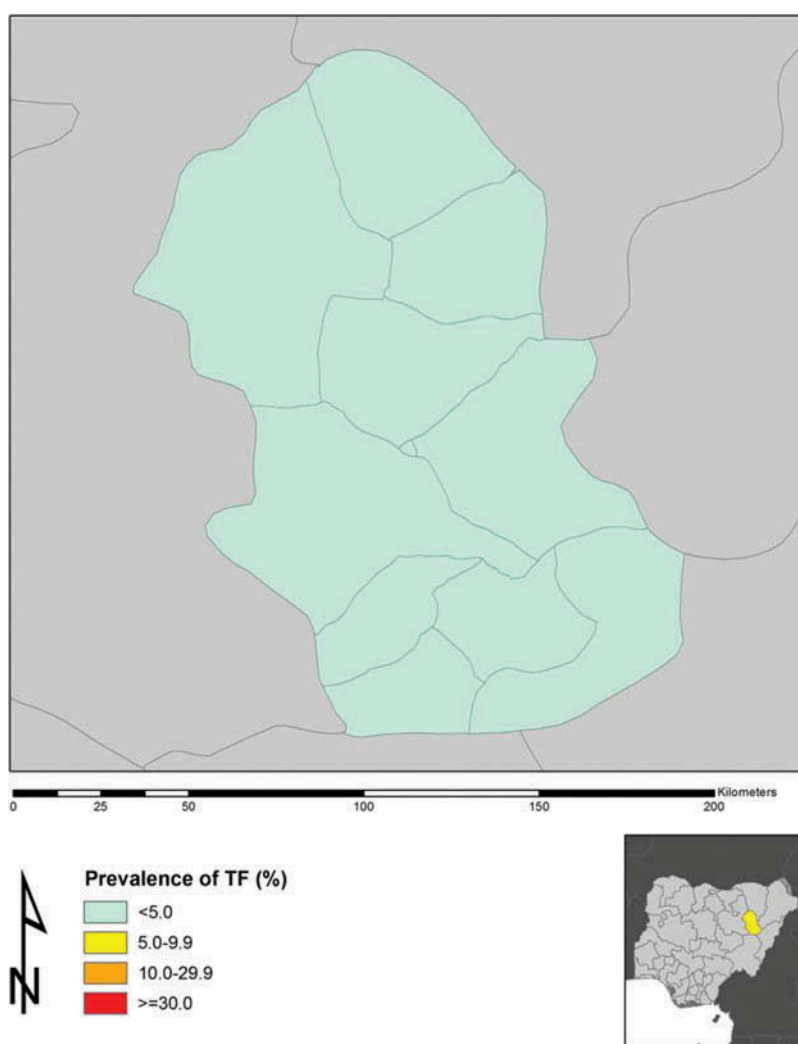
Figure 1. Prevalence of trachomatous inflammation–follicular (TF) in 1–9-year-old children, by Local Government Area, Global Trachoma Mapping Project, Gombe State, 2013.

Figure 2. Prevalence of trichiasis in adults ≥15 years, by Local Government Area, Global Trachoma Mapping Project, Gombe State, 2013.

LGA-level age-adjusted prevalences of TF in children aged 1–9 years are shown in Table 2 and Figure 1, and age- and sex-adjusted trichiasis prevalences in persons aged 15 years and older are shown in Table 2 and Figure 2.

None of the LGAs had a TF prevalence >5%, but each LGA had a trichiasis prevalence above 0.2% in adults (equivalent to >1:1000 total population[13]), which requires intervention.

The estimated population of Gombe State is 2,365,040, and the trichiasis backlog is a little less than 20,000 individuals. Setting aside incident trichiasis, over 17,000 persons require trichiasis surgery to attain the elimination prevalence target for trichiasis in the state (Table 3). The LGAs with the greater trichiasis problem are located across the northern part of Gombe (Figure 2).

Access of households to water and sanitation facilities ranged widely across the state. Access to improved water for hygiene purposes ranged from 14% in Kwami to 72% in Gombe LGA, while access to improved latrine facilities ranged from 8% in Balanga to 80% in Dukku (Table 4).

Discussion

Trachoma appears to be a disappearing disease in Gombe State, considering that none of the LGAs had TF prevalences in children at or above the 5% elimination threshold set by WHO. This is similar to the picture in neighboring Bauchi State, where only two LGAs qualify for one round of mass azithromycin administration, but contrast with the picture in the northern neighboring state of Yobe, which has an active trachoma problem.[5,10] However, inadequate access to improved water and sanitation facilities in some Gombe LGAs needs to be rectified, to help prevent possible recrudescence of active trachoma there.[14] To sustain the process of eliminating trachoma (and for other wide ranging

Table 3. Local Government Area-level estimates of trichiasis surgery backlog, Global Trachoma Mapping Project, Gombe State, 2013.

Local Government Area	Estimated total population, n	Trichiasis prevalence in persons aged ≥15 years, %	Estimated trichiasis backlog, n	People to be offered trichiasis surgery to achieve the trichiasis component of "elimination of trachoma as a public health problem"[a], n
Akko	337,435	1.0	1890	1552
Balanga	211,490	0.5	592	381
Billiri	202,680	0.7	795	592
Dukku	207,658	2.4	2791	2583
Funakaye	237,687	2.5	3328	3090
Gombe	266,844	0.8	1195	929
Kaltungo	160,392	0.6	539	379
Kwami	193,995	2.2	2390	2196
Nafada	140,185	3.9	3062	2921
Shongom	150,948	0.6	507	356
Yamaltu/Deba	255,726	1.8	2578	2322
Total	2,365,040		19,667	17,301

[a]A prevalence of trachomatous trichiasis unknown to the health system of <0.2% in adults aged ≥15 years.

Table 4. Household access to wash water and improved latrines by Local Government Area, Global Trachoma Mapping Project, Gombe State, 2013.

Local Government Area	Wash water access <1 km, %	Improved wash water access <1 km, %	Improved latrine access, %
Akko	69.6	28.2	32.6
Balanga	93.3	36.3	7.7
Billiri	53.0	36.9	24.7
Dukku	84.2	16.9	79.7
Funakaye	77.4	50.6	18.7
Gombe	79.9	72.6	91.1
Kaltungo	72.5	60.0	27.8
Kwami	49.0	14.1	29.1
Nafada	60.1	39.4	11.8
Shongom	70.2	50.9	10.6
Yamaltu/Deba	82.4	50.2	44.0

benefits to the local population)[14,15] there is a need for governments, water and sanitation agencies and other partners to prioritize provision of these facilities in Balanga, Nafada, Shongom and Kwami LGAs in particular, while improving on rather better circumstances noted in the other LGAs.

None of the LGAs qualified for mass drug administration of azithromycin for trachoma elimination purposes.[16] However, the prevalence of trichiasis is above the elimination threshold across Gombe, and there is a need to plan community-based eyelid surgery in order to clear the backlog of trichiasis cases. All LGAs require eyelid surgery interventions, but priority should be given to the five northern LGAs of Nafada, Funakaye, Dukku, Kwami, and Yamaltu/Deba, which border Yobe, a state in which trichiasis prevalence is high.[5] To attain elimination of trachoma from Gombe State, the emphasis should be on training and equipping eyelid surgeons, then deploying them to perform community-based surgery. Those with trichiasis normally reside in remote villages and do not have access to surgical services located in cities.[17] Surgical training should follow guidelines established by WHO.[18] If the trachoma program is to be successful in overcoming the trichiasis problem in Gombe, a system for finding patients with trichiasis through village promotion efforts will be required.[19] Emphasis must also be placed on supervision and support of trichiasis surgeons to ensure high productivity and delivery of a high quality service.[20]

Gombe State would benefit from a trachoma program that delivers trichiasis surgery to the nearly 20,000 residents who need it to save their vision. In addition, improvements in water and sanitation are required.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Appendix

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