Original Article

Trachoma Prevalence and Risk Factors in Eight Local Government Areas of Zamfara State

Nasiru Muhammad, Marthe Damina[1], Murtala M. Umar[2], Sunday Isiyaku[1]

Department of Surgery, Ophthalmology Unit, Usmanu Danfodiyo University, Sokoto, [1]Sight Savers Nigeria Country Office, No 1, Golf Course Road, Kaduna, [2]Department of Ophthalmology, King Fahad Ibn Abdul-Azeez Women and Children Hospital, Gusau, Zamfara State, Nigeria

ABSTRACT

Introduction: Trachoma is the leading cause of infectious blindness worldwide and is targeted for elimination by the year 2020 by the World Health Organization (WHO). The aim of our study was to provide baseline data on trachoma for eight local government areas (LGAs) of Zamfara state, Nigeria to enable planning and control activities in affected communities. **Materials and Methods:** A population-based cross-sectional survey was conducted in the selected LGAs between October 2010 and July 2011 using a two-stage sampling with probability proportional to size. The WHO guidelines for trachoma control were used in planning the survey, while the risk factors assessment was based on a recommendation from another WHO publication. **Results:** Trachomatous inflammation – follicular prevalence in children 1–9 years was 0.04–18%; while trachomatous trichiasis (TT) prevalence in persons ≥ 15 years was 0–1.4% across the LGAs. Access to improved water sources was worst (>40%) in Bakura and Maradun LGAs. Latrine accessibility was the highest (64%) in Bakura and Bukkuyum LGAs. Awareness of trachoma as a disease was 7–92% across the LGAs, whereas knowledge of trachoma prevention is poor (1–8%). Chi-square analysis shows access to latrine, knowledge of trachoma as a disease, and its prevention was significantly protective for active disease (odds ratio [OR] <1, $P < 0.05$). A regression analysis, however, showed that only access to latrine and knowledge of trachoma prevention remained significantly protective (OR < 1, $P < 0.05$). **Conclusion:** The risk factors for trachoma are endemic in the study areas, and active control measures are needed. The burden of the disease is, however, clustered with most LGAs having a low burden of both the active and blinding disease.

Keywords: Conjunctivitis, Global Elimination of Trachoma by 2020, Nigeria, trachoma, ultimate intervention goals

INTRODUCTION

Trachoma is chronic conjunctivitis caused by *Chlamydia trachomatis* that is spread by flies, fomites, and fingers in parts of the world where poor environmental and personal hygiene exists. The chronic nature of the disease leads to scarring of the tarsal plate and inversion of the upper lid margin (entropion) resulting in eye lashes rubbing the eyeball (trichiasis) eventually leading to blindness from corneal opacification. The World Health Organization (WHO) launched in 1997, an ambitious plan of eliminating trachoma as a disease of public health significance by the year 2020 (Global Elimination of Trachoma by 2020 – GET 2020). Zamfara state government in collaboration with an NGDO has been implementing a trachoma control program since 2003 that was integrated into the Zamfara state eye care program in 2010. The program implements community-based lid surgery for trachomatous trichiasis (TT), environmental improvement, and mass antibiotic (Zithromax) distribution, which are part of the WHO-recommended SAFE strategy for trachoma control (S-surgery, A-Antibiotics, F-facial cleanliness, and E-Environmental improvement). Previous trachoma surveys in some local government areas (LGAs) of

Address for correspondence
Dr. Nasiru Muhammad, Department of Ophthalmology,
Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria.
E-mail: nasiru69@yahoo.com

Access this article online	
Quick Response Code	Website: www.nigerianjournalofophthalmology.com
	DOI: 10.4103/0189-9171.170989

How to cite this article: Muhammad N, Damina M, Umar MM, Isiyaku S. Trachoma prevalence and risk factors in eight local government areas of Zamfara State. Niger J Ophthalmol 2015;23:48-53.

Zamfara,[1] and neighboring states[2-4] have reported different pattern of the magnitude of the disease with trachomatous inflammation – follicular (TF) prevalence ranging between 0.2% and 49%; and TT prevalence ranging between 0.2% and 8.0% across the states.

Zamfara state has a population of 3,278,873[5] located in 14 LGAs and living in 592,106 regular households.[6] Trachoma control measures were being implemented in 6 LGAs since 2003 in an emergency trachoma program that later integrated into a comprehensive eye care program. This study was conducted to provide population-based baseline data on trachoma in the remaining 8 LGAs of Zamfara state that have not been surveyed and no trachoma control activities implemented previously. The data are to be used for planning, monitoring, and evaluation of trachoma control at the LGA level as recommended by the WHO based on the ultimate intervention goals (UIGs), calculated from the disease burden and its risk factors. The specific objectives of the study were to: (i) Estimate the prevalence of active trachoma TF in children 1–9 years in each of the LGAs; (ii) estimate the prevalence of blinding trachoma TT in persons 15 years and older in each LGA; and (iii) assess the main risk factors for trachoma in the areas.

MATERIALS AND METHODS

This was a population-based cross-sectional survey conducted between October 2010 and July 2011. The WHO guidelines for trachoma control[7] were used in planning and conduct of the survey, and the risk factors assessment were also based on a recommendation from another WHO publication.[8]

Minimum sample size

A minimum sample size (n) was calculated using the formula $n = Z^2P\ (100 - P)/d^2$ for both active (TF) and blinding trachoma, where

P = anticipated population prevalence

1 − a = confidence level

d = absolute precision

The standard confidence level used is 95% with a = 0.05. The corresponding Z value is 1.96

Sample size for active trachoma (trachomatous inflammation – follicular

For each LGA, a minimum sample size of 2393 children aged 1–9 years was obtained using an anticipated population prevalence (P) of 15%, that was based on the prevalence in nearby LGAs (5–32%);[1] absolute precision (d) of 3%; confidence level of 95% (Z = 1.96); design effect of 4; and a nonresponse of 10% to cover expected attrition in study subjects.

Sample size for blinding trachoma (trachomatous trichiasis)

For each LGA, a minimum sample size of 3344 persons aged 15 years and above was obtained using an anticipated population prevalence (P) of 1.0%, which was based on prevalence in nearby LGAs (0.2–1.4%);[1] absolute precision (d) of 0.5%; confidence level of 95% (Z = 1.96); design effect of 2; and a nonresponse of 10%.

Sampling technique

In each of the LGAs, the study population was chosen by two-stage cluster random sampling technique. In the first sampling stage, all villages and settlements in each LGA formed the sampling frame from which 45 clusters were systematically selected using probability proportional to size sampling. In each selected community, a direction was randomly chosen by rotating a bottle at the center of the community to sample subjects for examination. In each cluster, 75 persons aged 15 years and above (75 × 45 = 3375) and 54 children aged 1–9 years (54 × 45 = 2430) were enumerated after they consented to participate. Parents or guardians of children granted consent for their wards' inclusion. Older children, however, granted assent. All households with eligible persons in the selected direction were included until the desired sample size was obtained. A separate roster was used for children and adults in the survey, where the sample size could not be obtained in a village; a nearby village was visited to complete the cluster size.

Survey teams

Six teams were used for the conduct of the survey. Two teams headed by an ophthalmologist along with 2 ophthalmic nurses (ONs) and 1 community health extension worker (CHEW) conducted the first phase of 4 LGAs; after which 4 teams headed by the ONs completed the second phase of 4 LGAs supported by two CHEWs and a local guide.

Training of survey teams

Two days were used for the training of the teams by the principal investigator to ensure standardization of survey procedures and to acquaint team members with their expected roles in the survey. The 1st day involved conducting a theoretical review of trachoma including the WHO trachoma grading system and the procedure for completing the survey tool. A kappa rating was conducted to ensure agreement between the principal investigator and graders using slides. Only graders that obtained a kappa rating of at least 0.7 were selected for the study. This was then followed by a pilot study in a nearby nonselected community where children were assessed for TF that improved agreement between the graders to at least 85%.

Data collection procedure

Consent was taken by the CHEW from the head of the household or his representative for inclusion of the household in the study that was followed by an enumeration of all eligible persons. Two separate rosters were used for adults and children, respectively. The household and demographic data of eligible persons were collected and recorded by the CHEW on each individual survey tool. As birth records are usually not available in these communities, the age of eligible individuals was estimated from local events and milestones. The enumeration was concluded in the roster for each age group after attaining the required sample in the separate rosters for children and adults.

The ONs cross-checked recorded demographic data of each individual and then assessed each individual for trachoma. Children 1–9 years were assessed for all stages of trachoma while persons 15 years and above were assessed for trichiasis (TT) and corneal opacity (CO).

Trachoma was assessed using the WHO simplified grading system and a ×2 magnifying loupe. Faces of children were assessed as either clean or dirty. The dirty face was defined as the presence of nasal and/or eye discharge or presence of fly on the face during the examination. All information were recorded into a predesigned data collection tool.

Household trachoma risk factors assessment was conducted using a structured questionnaire and spot observation. The factors assessed included hygiene; access to an improved water source and sanitation, knowledge on trachoma, and an enabling environment that can support trachoma preventive measures.[9] The team leader performed a daily review of collected data to ensure the accuracy of entries.

Ethical considerations

Approval for the conduct of the survey was obtained from Zamfara State Ministry of Health. Provisions of Helsinki declaration were observed during the survey. Consent was obtained from local authorities including the community leaders and then the individual participants during the survey. The parents or guardians granted minors' consent while assent was obtained in those 8 years or older. Hands were cleaned with local soap (ash) and water periodically and after examining every eye diagnosed with TF or an eye with purulent discharging. Persons found with TF were given tetracycline eye ointment, and those with eye discharge were given chloramphenicol eye drops. Those with TT or other eye ailments were referred for appropriate evaluation and treatment at the nearest service point.

Data management

Collected data were entered into a program designed in SPSS software version 16 (SPSS Inc., Chicago, IL. USA) by data entry staff, and then cleaned and analyzed by a statistician. Confidence intervals were calculated using Episheet software (Episheet, 2008. www.krothman.org).[10]

RESULTS

The response rate in children ranged from 69% in Bungudu LGA to 99% in Anka and Gummi LGAs; while in adults it ranged from 66% in Maradun to 98% in Bakura LGAs as shown in Table 1.

Trachoma risk factors analysis [Table 2] revealed that Bakura and Maradun population have the least access to water in which over 40% of the population has no access to improved water sources. Latrine accessibility is least in Gummi (39%) the LGA and the highest in Bakura and Bukkuyum LGAs (64%). Awareness of trachoma as a disease locally depended on the LGA but is worst in Anka LGA (7%); whereas knowledge of how to prevent trachoma is generally poor in all the LGAs.

Trachoma prevalence and risk factors in eight local government areas of Zamfara state

The burden of active trachoma (TF) in children is low in the surveyed LGAs with the exception of Bungudu and Maradun that had a hyper endemic disease (>10%) as shown in Table 1. The crude prevalence of TT in adults (15 + years) is hyper endemic in Bungudu and Maradun LGAs but hypo endemic in the other LGAs.

The burden of TT in the adult population as in Table 1 revealed that the majority of the LGAs have significant

Table 1: Study participants and crude prevalence of trachoma

LGA	Participants		TF (%)	TT (%)
	1-9 years	15+ years	1-9 years	15+ years
Anka	2392	3124	0.3 (0.1-0.5)	0.3 (0.2-0.6)
Bakura	2232	3307	0.3 (0.1-0.6)	0.8 (0.5-1.1)
Bukkuyum	1987	2447	0.4 (0.2-0.7)	0.08 (0.02-0.29)
Bungudu	1413	2333	18 (16-20)	1.4 (1.0-2.0)
Gummi	2375	3067	1.1 (0.7-1.6)	0.5 (0.3-0.8)
Gusau	2256	3096	0	0.03 (0.006-0.18)
Maradun	1903	2192	13 (11-15)	1.4 (0.9-1.9)
Maru	2183	2970	0.04 (0.008-0.26)	0

Figures in parenthesis are the 95% confidence limits. LGA: Local government area, TF: Trachomatous inflammation-follicular, TT: Trachomatous trichiasis

Table 2: Number of households surveyed and the risk factors for trachoma across the LGAs in Zamfara state

LGA	Household surveyed (*n*)	Trachoma risk factors (%)				
		Access to improved water source	Water distance >30 min	Access to latrines	Aware of trachoma as disease	Aware of trachoma prevention
Anka	998	61	1	48	7	3
Bakura	1001	57	6	64	31	8
Bukkuyum	833	70	3	64	26	1
Bungudu	710	64	5	54	78	4
Gummi	930	71	0.4	39	46	8
Gusau	473	84	0	63	63	8
Maradun	708	59	14	48	92	6
Maru	410	89	2	62	57	1

LGAs: Local government areas

TT burden except Bukkuyum, Gusau, and Maru LGAs. The results of Chi-square analysis to determine the relationship of active trachoma and its risk factors are presented [Table 3]. The analysis shows that access to latrine, knowledge of trachoma as a disease, and the knowledge of how to prevent it was protective of having active (TF) disease (odds ratio [OR] <1, $P < 0.05$). A regression analysis of these significant risk factors [Table 4] shows that only access to a latrine and the knowledge of how to prevent trachoma remained significantly protective (OR < 1, $P < 0.05$).

The targets for elimination of the components of the SAFE strategy (UIG) are also summarized in Table 5. The population in all the LGAs needs to be improved water sources and latrine provision.

Table 3: Chi-square analyses for active trachoma risk factors

Risk factor	OR	95% CI	*P*
Water source	1.21	0.94-1.57	0.14
Water distance	1.53	0.72-3.28	0.27
Face washing frequency	0.9	0.33-2.45	0.84
Facial cleanliness	1.00	0.7-1.43	0.99
Access to latrine	0.27	0.19-0.37	<0.0005
Knowledge of trachoma	0.16	0.12-0.23	<0.0005
Knowledge of trachoma prevention	0.02	0.02-0.03	<0.0005

OR: Odds ratio, CI: Confidence interval

Table 4: Regression analyses for active trachoma risk factors among children

Risk factor	OR	95% CI	*P*
Access to latrine	0.31	0.17-0.55	<0.0005
Knowledge of trachoma	1.13	0.63-2.0	0.69
Knowledge of trachoma prevention	0.02	0.01-0.03	<0.0005

OR: Odds ratio, CI: Confidence interval

DISCUSSION

The poor response rate in some LGAs was partly a result of refusals and the difficult terrain as mop up visits could not be conducted. The findings of this study reveal the clustering nature of trachoma as reported in the literature.[11] Trachoma risk factors are endemic in these communities as all the LGAs require environmental control measures to provide access to improved water sources and sanitation through the provision of boreholes/wells and latrines. Bungudu LGA had the highest need for improved water sources while Gusau LGA (the state capital) had the highest need for latrine provision. These findings are comparable to the reports from districts in neighboring states.[12] The only significant protective risk factors on regression analysis were access to latrines and a knowledge of how to prevent trachoma which contrasts the findings in nearby LGAs of Sokoto and Kebbi states[12] where clean face was also protective. The result of regression analysis and TF prevalence, however, did not agree with the preponderance of the significant risk factors in Bungudu and Maradun over the other LGAs. The reason for the hyper endemicity, therefore, in these LGAs cannot simply be explained by the risk factors alone. The population largely share similar sociocultural characteristics across the LGAs. A study in Malawi has reported different risk factors across the districts.[13]

Based on the burden of active trachoma (TF), only Bungudu and Maradun LGAs require a mass distribution of antibiotics because of the high endemicity (>10%), while the other LGAs should integrate trachoma screening and treatment in routine health services. This prevalence pattern contrasts the findings in the nearby LGAs surveyed[1-3,14] in 2005, where most of the LGAs had a hyper endemic active trachoma. The interval between the periods of these studies may be responsible for this different TF prevalence pattern, as improvements could have occurred in the area of environmental risk factors and social development. Trachoma reduction in the absence of disease control has been reported in the literature.[15]

The prevalence of TT also indicates the need for an active TT screening and surgery in the surveyed LGAs but

Table 5: Ultimate intervention goals for elimination of trachoma in the LGAs

LGA	Anka	Bakura	Bukkuyum	Bungudu	Gummi	Gusau	Maradun	Maru
2006 population estimates[9]	143,637	187,141	216,348	258,644	206,721	383,712	207,563	293,141
2006 regular households estimates[10]	26,340	32,876	38,356	47,869	39,314	66,649	38,480	53,944
Surgery, UIG-surgery number of persons in need of surgery	215 (143-430)	748 (468-1029)	86 (22-313)	1810 (1293-2586)	233 (116-582)	57 (11-345)	1452 (934-1972)	0
Antibiotics, UIG-antibiotics distribution strategy at LGA level	Routine services	Routine services	Routine services	Mass treatment	Routine services	Routine services	Mass treatment	Routine services
Environmental change, UIG-latrine number of households in need of improved latrine	13,697	11,835	13,808	22,019	23,981	24,660	20,009	20,498
Environmental change, UIG-water source number of households in need of improved adequate water source	10,272	14,136	11,506	17,232	11,401	10,663	15,777	5933

Figures in parenthesis are the 95% confidence limits. LGAs: Local government areas, UIG: Ultimate intervention goals

especially in Bungudu and Maradun LGAs with a high TT burden. The low TT prevalence (<1%) contrast the findings in the previous surveyed LGAs/districts,[1-3,11,14] where most of the LGAs had a high TT prevalence (>1%). To achieve the TT elimination target, 6 of the 8 LGAs will require the provision TT surgeries with priorities in the LGAs with a higher burden. The pattern is comparable to the finding in neighboring states where some LGAs are hyper endemic, and some are hypo endemic for both TF and TT. This may be explained by the fact that the states share a similar Sahel –savannah vegetation and cultural practices.

Mass antibiotic distribution in Bungudu and Maradun LGA is recommended based on the WHO guidelines for trachoma control;[7] community-based TT surgery is recommended in all the LGAs except Gusau and Maru where the burden of TT is below the TT elimination target (<1TT/1000 population). There is a need for an effective advocacy to all tiers of government for water and latrine provision to the population, in addition to community targeted support for families to construct latrines. The eye care program needs to embark on an intense advocacy to the community leaders, well to do individuals and the NGDOs to facilitate attitudinal changes in latrine construction and usage.

CONCLUSION

The risk factors for trachoma are endemic in the study areas, but the clustering nature of the disease shows few hyper endemic districts. There is a need to implement a targeted SAFE strategy in most districts and full SAFE strategy in only two of the studied districts.

Financial support and sponsorship

This work was funded by Sightsavers.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Sightsavers International. Report of Trachoma Population Based Survey in 6 Local Government Areas of Zamfara State, SSI Kaduna; 2005.
2. Mansur R, Muhammad N, Liman IR. Prevalence and magnitude of trachoma in a local government area of Sokoto State, north western Nigeria. Niger J Med 2007;16:348-53.
3. Muhammad N, Rabiu MM. Prevalence of Trachoma in 6 Local Government Areas of Kebbi State. Annual Conference of the Ophthalmological Society of Nigeria; 2006.
4. Jip NF, King JD, Diallo MO, Miri ES, Hamza AT, Ngondi J, *et al.* Blinding trachoma in Katsina state, Nigeria: Population-based prevalence survey in ten local government areas. Ophthalmic Epidemiol 2008;15:294-302.
5. National Population Commission. 2006 Population Distribution by Sex, State, LGA, and Senatorial District – Priority Tables. Vol. III. Abuja: National Population Commission; 2010. p. 1-64.
6. National Population Commission, Abuja. Nigeria. 2006 National and State Population and Housing Tables – Priority Tables I. Abuja: National Population Commission; 2010. p. 1-347.
7. World Health Organization. Trachoma Control – A Guide for Programme Managers. Geneva: WHO Press; 2006. p. 1-53.
8. Montgomery M. Sustaining trachoma control and elimination – The basis for environmental indicators in the certification of the elimination of blinding trachoma. Geneva: World Health Organization; 2006.
9. World Health Organization, UNICEF. Core Questions on Drinking – Water and Sanitation for Household Surveys. Geneva: World Health Organization; 2006. p. 1-25.
10. Rothman K. Spreadsheets for the analysis of epidemiological data. Version of June 11, 2008. Episheet 2008. Available from: www.krothman.org/episheet.xls.[Last accessed on 2012 Feb 23].
11. Cromwell EA, Amza A, Kadri B, Beidou N, King JD, Sankara D, *et al.*

Trachoma prevalence in Niger: Results of 31 district-level surveys. Trans R Soc Trop Med Hyg 2014;108:42-8.

12. Muhammad N, Mohammed A, Isiyaku S, Adamu MD, Gwom A, Rabiu MM. Mapping trachoma in 25 local government areas of Sokoto and Kebbi states, northwestern Nigeria. Br J Ophthalmol 2014;98:432-7.
13. Kalua K, Chirwa T, Kalilani L, Abbenyi S, Mukaka M, Bailey R. Prevalence and risk factors for trachoma in central and southern Malawi. PLoS One 2010;5:e9067.
14. Sightsavers International. Report of the Trachoma Population Based Prevalence Survey in 6 Local Governments of Sokoto State, SSI Kaduna; 2006.
15. Dolin PJ, Faal H, Johnson GJ, Minassian D, Sowa S, Day S, *et al.* Reduction of trachoma in a sub-Saharan village in absence of a disease control programme. Lancet 1997;349:1511-2.