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Original Research Article

Coverage survey of mass drug administration for trachoma control in Taura district of Jigawa State Northern Nigeria

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ABSTRACT

Background: Trachoma is one of the neglected tropical diseases earmarked for elimination as a public health problem by 2030. Active trachoma-trachomatous inflammation-follicular (TF) is controlled through mass drug administration (MDA) with antibiotics where prevalence of TF exceeds 5% in children 1-9 years, with aim to achieve at least 80% as recommended by WHO. This study aimed to evaluate population-based MDA coverage for trachoma in Taura local government area, Jigawa state and compared it with administrative coverage to ascertain the effectiveness MDA programs.
Methods: A cross-sectional survey using '30×7' cluster random sampling (CRS) technique was carried out in 202 randomly selected households of 30 clusters of Taura local government area of Jigawa state. Administrative coverage was compared with the surveyed coverage rates.
Results: The 1,047 persons received treatment during the MDA, giving a crude surveyed coverage of 69.7% (95% CI 67.4-72.0%). Nine hundred and 34 (89.2%) of those who received the antibiotics reported actual consumption, hence effective coverage of 62.2% (95% CI 59.7-64.8%) and coverage-compliance gap of 7.5%. The administrative coverage was 76.3%. Coverage was significantly higher in adults >15 years (p=0.005), female gender (p=0.043), higher literacy (p≤0.0001), and households' participation in previous MDA (p≤0.0001).
Conclusions: The findings of this survey were lower than the WHO-recommended coverage rate, thereby posing a threat to the trachoma elimination target. If the MDA programme is to succeed, there is need to explore all factors that are likely to have a potential for increasing MDA coverage of antibiotics for trachoma control in the district.

Keywords: Trachoma, MDA, Coverage

INTRODUCTION

Trachoma is the leading infectious cause of blindness worldwide.[1] It is caused by recurrent infections with ocular strains of the bacterium-*Chlamydia trachomatis* (A, B, Ba and C).[2,3] Globally, trachoma accounts for 2.9% of avoidable blindness with an estimate of about 2.2 million people blind or severely visually impaired and more than 7 million at risk of blindness from the disease.[4] Trachoma is one of the neglected tropical diseases that is endemic in poor rural communities of the developing countries where there is generally lack of water, poor environmental sanitation, low socioeconomic status and overcrowding, especially within household.[5-7] Trachoma has been earmarked for elimination through the implementation of the SAFE strategy (Surgery,

antibiotics, face washing environmental sanitation) at district level.[8,9] The antibiotic component of SAFE strategy is aimed at breaking the transmission of the active disease through mass treatment with oral azithromycin and or 1% tetracycline eye ointment (TEO).[10] Where the prevalence of active trachoma (TF/TI) exceeds 5% in children 1-9 years old, the WHO has recommended annual MDA achieving a minimum coverage of 80% to entire population.[8,11] Longer period treatment may be required where baseline trachoma prevalence is high or where annual treatment coverage is low.[8] Low coverage may lead to re-infection and can render trachoma elimination programs ineffective.[13]

Nigeria is still among the countries with high burden of trachoma in the world.[14] Most of the endemic districts are confined to north and central part of Nigeria.[15-17] Baseline prevalence survey in Jigawa state indicates that active trachoma (TI/TF) in children 1-9 years was 20.5% with no gender difference and trichiasis (TT) of 5% in adults 15 years and older.[18] In 2010, trachoma rapid assessment (TRA) in Taura LGA reported TT/TF prevalence of 22.2% and TT of 5% respectively. There was no follow-up cross-sectional survey in the LGA.[19] Antibiotic mass treatment was commenced in Taura local government area in 2011, using the results of prevalence survey in state and TRA in LGA as baseline.[16] However, the reported coverages achieved from 2011 to 2014 were 56%, 64%, 68%, and 63% respectively.[16] These have been consistently below the ≥80% recommended WHO target which poses threat to trachoma elimination target by the year 2020.[9] This administrative/reported coverage may even be overestimated as it is usually determined from the number of drug dosage given out by the programme, distribution register and population data that may be incomplete or inaccurate. No population-based study has been conducted to assess and validate the reported coverage of MDA in Taura local government area since the MDA implementation in 2011. The aim of this study was to evaluate the antibiotics coverage rate using survey method immediately after 2016 round of MDA for trachoma control in Taura local government. Results of this study would provide essential data for stakeholders to better understand the coverage status at population level in order to plan and improve higher drug coverage.

METHODS

Study design

This was a cross-sectional survey.

Study period

Data was collected in the month of September 2016, 3 months after the 4th round of MDA for trachoma control in Taura LGA.

Study area

Study was conducted in 30 clusters across Taura local government area of Jigawa state, with an estimated total population of 131,861 and growth rate of 2.94% per year.[20] It comprises 118 villages, town/ communities. Male to female ratio almost 1:1, with average households of 7.0 members, almost all headed by male. Villages and settlements are sparse with a population density of 233/km^2. About 90% of the inhabitants were engaged in subsistence farming and animal husbandry.

Study population

All household members in the wards and villages who are present at the last round of MDA and live for more than 8 months in the household as at the time of the survey were included as participants.

Exclusion criteria

We excluded family members who were away from the household for more 8 months at the time of the survey and those that did not consent to participate in the study.

Sample size determination

The number of individuals included in the survey was determined by using the single proportion formula in a population >10,000.[21]

$n=Z^2\times P(1- P)/d^2$. Where: n=Sample size

With the assumption that;

P=Prevalence/coverage of antibiotics uptake=68% (as reported in 2014 AMT round).

Z=Z-score at 5% significance level, 95% confidence interval and power of 80%.

d=Absolute sampling error that can be tolerated=0.05%

Design effect=4.0.

Therefore;

$n=(1.96)^2\times 0.68(1-0.68)/ (0.05)^2=334.5$

To minimize design effect, sample size was multiplied by 4

$N=334.5\times 4=1,337.5$

With the assumption of 10% non-response rate, a total of 1,471 individuals were the minimum to be included in the survey.

Sampling

A two stage '30×7' CRS technique was used to determine the number of clusters and households included in the study. The method was adapted from WHO 30×7- CRS recommended for evaluation of immunization coverage and used in similar survey in trachoma control programme.[22] Clusters were defined using the updated 2006 census enumeration area (EA) registers in which borders were well-delineated and populations are approximately of the same size.[23] From the lists of 118 communities and villages arranged in order of geographic proximity, 30 were selected by simple random technique using computer generated random numbers. In each of the 30 clusters, 7 households were randomly selected. From the central point of the settlement/village shown by normal resident of the cluster, a bottle was spun. When the bottle stopped, the direction indicated by the head was selected. The number of households along the direction selected was counted and the first household to be interviewed was selected using random sampling by balloting. Random sampling at this level was done by listing household numbers on small pieces of paper, folding them, and selecting one as the first household. Subsequent households were selected following the nearest household from the last household to the right criteria until 7 households are completed. If all households in the selected direction had been enrolled and 7 households were not completed, the team returned to the center of the village to spin the bottle again until the required 7 households were reached.

Selection and training of survey interviewer

Twelve interviewers who could read and write in both English and Hausa languages were recruited during the first week of July, 2016 from the catchment villages and communities to help in the survey. They consisted of community members not directly involved with the MDA programme (so as to reduce bias), but who knew the local communities well. Each interviewer was assigned 3 clusters to interview in order of geographic proximity. The interviewers were trained over 4 days in groups of 3, at their closer locations. Training was on the study protocol, household selection, and the techniques of administering the questionnaire. After training, each interviewer was assigned 2 households to field test questionnaire and data reviewed, before embarking on data collection.

Structured questionnaire

An interviewer-administered questionnaire was developed based on the review of similar studies and the study objectives. It was designed in English language and translated in to Hausa language, the indigenous language of the study population and back translated to English language. It contained 43 items with section A consisting of items to obtain socio-demographic characteristics of the household head including assets ownership and monetary income to quantify wealth index, knowledge of trachoma and SAFE strategy, and previous household participation in MDA. Section B was designed to enumerate household members, their age, sex, and participation, consumption of drugs and reasons for not participation in MDA.

Data collection

Data was collected from each head of household on basic demographic data and knowledge of trachoma disease, the SAFE strategy and the number of times household participated in MDA and the level interaction with the CDDs using pre-corded interviewer administered questionnaire. After the head of household interview was completed, the members of the entire household (including those absent) were enumerated. Those available were was asked to report their age, type of antibiotic taken (if any), whether they actually took the drug or not and reason for not participating. In the event that a household member was absent, the head of household responded as a proxy. Survey participants were shown examples of azithromycin tablets and empty pediatric oral suspension bottles and TEO to enhance recall and avoid confusion with other non-trachoma treatment. Once the household interviews were completed, the interviewer reviewed the CDD register to verify the names and responses of the participants. For example, if a participant said that s/he did not receive treatment but the CDD register indicated that s/he had, the response would be recorded as ''not verified''. If the participant was not listed in the register or the register was not available to verify, then the response was coded as ''not recorded''.

Secondary data analysis of the 2016 MDA distribution registers for Taura LG to assess the administrative coverage was carried out. Records were analyzed on location, age, sex, and type of drugs they receive. Updated 2006 population census for the LGA was used as the denominator to determine the coverage and compare with the survey result.

After every round of quantitative data collection, the completed questionnaires were checked for completeness. Households were assigned identification number, the data was coded and double entered in to the password protected Microsoft excel (version 15.0) database for validation. All data entry was done by the PI.

Ethics approval

Ethical approval for the study was obtained from the research ethics committee of Aminu Kano teaching hospital (AKTH) with ref. number NHREC/21/08/2008/ AKTH/EC/1708 including clearance for verbal consent considering the peculiarities of the community was the study was carried out in which majority could not write in English and a large number of those participating were children. Permission to conduct the study was also

obtained from the Jigawa state ministry of health operational research ethics committee with ref. number MOH/SEC/3/5/577/I/43. In each household, verbal informed consent was obtained from household member aged 18 years and older and assent from guardian/parents of participating children before the interviews began.

Statistical analyses

Statistical analysis was conducted using STATA 14.0 I/C (Statacorp, college station, TX, USA). The primary outcomes were the proportion of total respondents who were present during the survey and reported taking the antibiotics during 2016 MDA. Principal Component analysis was used to classify the household wealth index to low, medium and high. Simple descriptive statistics was carried out for the outcome (took and did not take antibiotics) and explanatory variables (socio-demographic characteristics, awareness and perception of trachoma, information about MDA and personal factors). Discrete variables were summarized by frequencies, and percentages. Chi-square and multivariate logistic regression tests were conducted to determine associations between the dependent and independent variables. Secondary analysis of records of the administrative coverage for the study LGA was performed. Individual records were entered in to excel 15.0 to capture data on villages and communities covered, age, gender, whether they received tablets, syrup or ointment, and reasons for non-participation in the MDA. Summary statistics on MDA coverage was produced for the overall population, and by age, gender and the form of drug used. An updated 2006 population census (using population growth of 2.5%) was used as the denominator.

RESULTS

Survey response rate

A total of 1,578 eligible household members from 210 households in 30 clusters were enrolled in the survey. However, 76 (4.8%) responses from 8 households were excluded due to gross inconsistencies in the responses (contradictions between data on MDA participation, age, gender, and drug related statements). Therefore, 1,502 (95.6%) responses from 202 (96.2%) households were analyzed. Data was obtained by proxy in 623 (41.5%) eligible persons who were children or adult not available during the interview.

Verification of respondents in AMT registration records

Twenty-four MDA registers of the 30 clusters studied with records of 168 surveyed households were available and reviewed to verify respondents and quantify recall bias. 1,168 (74.0%) of survey respondents were recorded in the registers and 410 (26.0%) were not recorded (either no register available to verify or not listed in the register). Of the 1,168-recorded persons, 1058 (90.6%) respondents were verified (names and responses matched in registers) whereas, 110 (9.4%) of respondents were not verified (name presence in record but denied receiving drugs).

Table 1: Socio-demographic characteristics of the participants (n=1502).

Variables	N*	Percent (%)*
Gender		
Male	789	52.5
Female	713	47.5
Age group (in years)		
≤5	313	20.8
6-15	365	24.3
16-25	194	12.9
26-35	239	15.9
36-45	198	13.3
46-55	63	4.2
56-65	62	4.1
66 and older	68	4.5
Occupation		
Students	665	44.3
Farmers	275	18.3
Merchants	116	7.7
Government employees	217	14.4
House wife	193	12.8
None	36	2.4
Educational attainment		
Unable to read and write	205	13.6
Able to read and write, but non-formal	341	22.7
Primary school only	399	26.6
Secondary school only	434	28.9
Higher level (diploma/ degree and above)	123	8.2
Marital status		
Single	739	49.2
Married	452	30.1
Divorced	91	6.1
Widow	220	14.6
Household's wealth index, (n=202)		
Low	125	61.9
Medium	41	20.3
High	36	17.8

*All frequencies (N) and percentages are weighted by cluster.

Socio-demographic characteristics

Of the 1,502 respondents, 789 (52.5%) were males and 713 (47.5%) were females. The mean age of respondents was 21.6 years±6.3 SD. Age range was 0.6 to 97 years, while the mean age of household heads was 46.2 years (±8.1SD). The average size of household was 7 with a range of 4 to 18, mostly headed by males (96.0%). Up to 44% of the respondents were students at various level of education, 275 (18.3%) were farmers, while only 36 (2.4%) respondents were unemployed. The 205 (13.6%) respondents were unable to read and write at all, while only 123 (8.2%) attended higher education. About half 739 (49.2%) of the respondents were single. More than

half (61.9%) household' wealth index was low (Table 1).

Survey coverage

The 1,502 eligible persons, 859 (57.2%) were treated with azithromycin (either oral suspension or tablets), whereas, 188 (12.5%) were treated with TEO only due to clinical contraindication to azithromycin (children less than 6 months of age and pregnant women). Therefore, coverage rate of antibiotics (both azithromycin and TEOs) was 69.7% (95% CI 67.4-72.03%) 934 (89.2%) participants reported actual consumption and 188 (100%) used TEO. While 113 (10.8%) didn't consume drugs. Coverage-compliance gap 10.8%. Effective coverage of antibiotics (both azithromycin and TEO) therefore 62.2% (95% CI 59.7-64.8%) for 2016 round of MDA (Figure 1).

Univariate analysis

After adjusting for cluster effect, coverage was found to be significantly higher among older age group >15 years, 52.1% (p=0.005), female gender 50.3% (p=0.043), having formal education 50.8% (p=0.001), and households' participation in more than 3 previous round of treatment 83.2% (p≤0.0001). No significance difference in the uptake trend was observed by occupation (p=0.83), place of residence (p=0.49) and wealth index (p=0.901).

LGA-level administrative coverage of antibiotics in the 2016 MDA round

Secondary data analysis of the LGA level coverage reported to ministry of health (MOH) was 76.3% in Taura during the 2016 round of MDA, being: 125,560 persons treated (out of 164,546 total populations). High treatment uptake was reported in women (52%) and those >15 years of age (67.2%) (Table 2).

Survey compared with administrative and WHO recommended MDA coverage

The above reported coverage is comparably higher than the 69.7% crude coverage obtained from the surveyed population, and lower than the WHO recommended coverage rate of >80% (Figure 2).

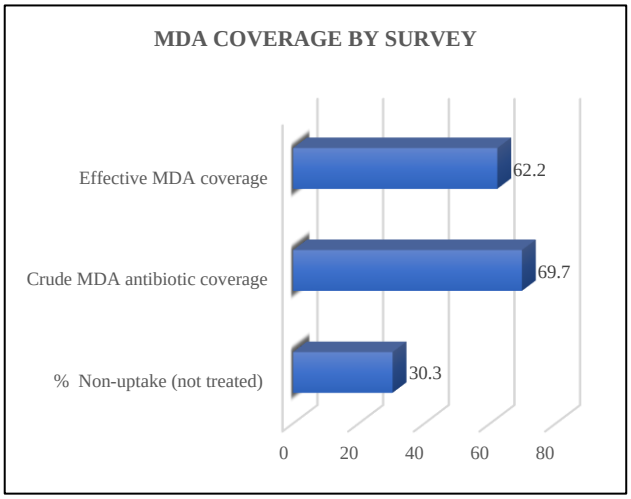

Figure 1: Surveyed coverage rate of antibiotics during 2016 MDA.

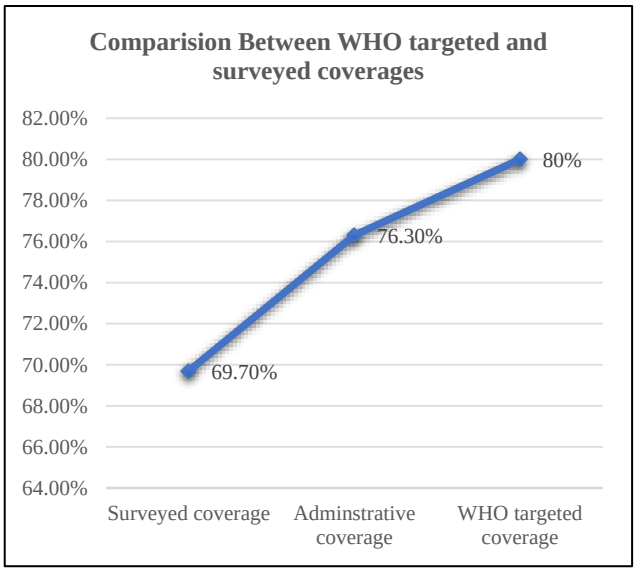

Figure 2: Comparison between survey, administrative coverages and WHO target.

Table 2: 2016 MDA administrative coverage of antibiotics by age and gender.

Variables	Type of treatment						Total treated (%)
Treatment by age group	**Tablet**	**%**	**Syrup**	**%**	**TEO**	**%**	
Less than 6 month	---		---		1881	74.9	1881 (1.5)
6 month-15 years	28,440	27.5	19,657	100			48,097 (38.3)
Age 5 years +	74,954	72.5	--------	0.00	628	25.2	75,582 (60.2)
Total	103,394	100	19,657	100	2509	100	125,560 (100)
Treatment by gender							
Male treated	31,279	49.6	27,989	46.3	1001	39.9	60,269 (48.0)
Female treated	31,340	50.4	32,443	53.7	1508	60.1	65,291 (52.0)
Total	62619	100	60435	100	2509	100	125,560 (100)
Total population of the LGA (2006 census updated)							164,546
Administrative coverage (total treated/total population)						76.3	

*Data source: Neglected tropical disease control unit, Jigawa state ministry of health.

This study assessed the coverage of antibiotics during MDA for the control of trachoma after the 4th round in 2016 in Taura local government area Jigawa state of Nigeria. The survey found a coverage rate of 70%. However, when considering the WHO recommended minimum coverage of 80% in order to eliminate trachoma, the result of the survey is suboptimal.[6] The implications of such low coverage may include persistent and re-infection with *chlamydia trachomatis* in the communities and considerably prolonging the time needed to reach the elimination target of endemic trachoma as demonstrated in the Gambia.[13] Lower coverage rates were equally reported from similar studies in Plateau state Nigeria, and northern Tanzania.[23,24] Coverage were higher (40%) in adults aged 15 years and older (p=0.005) and women (38%) (p=0.432), which to some extent reflects the demographic characteristics of the study area where those aged 15 years and older constitutes 55% of the study population. However, it contradicted findings in a similar study in Tanzania where children had higher drug uptake than adults.[24] This may not be good for trachoma elimination target as the aim of MDA was to treat the pool of chlamydial infection in children of ≤9 years of age. The higher coverage in women may be related to the fact that women have primary responsibility for childcare. Higher coverage rate in women may also be attributed to the fact that women have more blinding complications of trachoma than men.[25] Similarly, an association was observed between higher treatment coverage and increasing educational level (p=0.001), household heads' knowledge of trachoma and SAFE strategy (p=0.002), and previous participation in MDA (p=0.001).

Assuming that lower educational level is associated with a poorer knowledge about trachoma and its control, then the findings in the present study suggests that lack of knowledge may be a major barrier for drug uptake. Findings were similarly reported in Tanzania and Plateau Nigeria.[23,24] However, in the present study there was no bearing between higher coverage and persons' occupation or place of residence. The discrepancy between reported administrative coverage and the survey results suggests that reliance on administrative data alone as a method of monitoring MDA performance is not sufficient as it is vulnerable to bias from missing forms or inaccurate reporting from the drug providers.[26] In other settings, the administrative records of coverage were found to be higher than that of cluster random surveys. Having yet another <80% coverage after the 4th round have pointed to the need for understanding the barriers to achieving high coverage that may require attention.

This survey has several limitations, including possibility of recall bias as the study was conducted 4 months after the round of the MDA. We attempted to overcome that through showing of sample antibiotics and register verifications of participants, almost 75% of the respondent were verified in the register.

CONCLUSION

This survey revealed low levels of coverage for both surveyed and reported coverages in Taura local government. As several rounds of MDA may be needed to achieve trachoma elimination target, developing a detailed micro-plan that include clear mapping of seasonal activities, should be considered, such that it targets a period when most of the people are at home to receive the services especially in communities with low uptake. The next round of MDA should consider directly observed treatment (DOT) strategy. This alone may bring down the coverage compliance gap considerably.

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REFERENCES

1. Flaxman SR, Resnikoff S, Bourne RRA, Peter A, Tasanee B, Maria VC, et al. Global causes of blindness and distance visual impairment 1990-2020: A systematic review and meta-analysis. Lancet Glob Health. 2017;5(12):e1221-34.
2. Hadfield J, Harris SR, Seth-Smith HMB, Surendra P, Patiyan A, Philip MG, et al. Comprehensive global genome dynamics of Chlamydia trachomatis show ancient diversification followed by contemporary mixing and recent lineage expansion. Genome Res. 2017;27(7):1220-9.
3. Harris SR, Clarke IN, Seth-Smith HM, Anthony WS, Lesley TC, Peter M, et al. Whole genome analysis of diverse Chlamydia trachomatis strains identifies phylogenetic relationships masked by current clinical typing. Nat Genet. 2012;44(4):413-9.
4. World Health Organization. WHO Alliance for the Global Elimination of Trachoma by 2020: progress report on elimination of trachoma, 2021. Wkly Epidemiol Rec. 2021;96(31):353-64. Available at: https://www.who.int/publications/i/item/who-wer9731-353-364. Accessed on 3 July 2024.
5. World Health Organization. Ending the Neglect to attain the sustainable development goals: a Road Map for Neglected Tropical Diseases 2021-2030. World Health Organization, 2020. Available at: https://www.who.int/publications/i/item/9789240010352 Accessed on 3 July 2024.
6. Habtamu, E. Wondie T, Aweke S, Zerihun T, Mulat Z, Zebideru Z, et al. Trachoma and relative poverty: a case-control study. PLoS Negl. Trop. Dis. 2015;9(11):e0004228.

7. Barenfanger J. Studies on the role of the family unit in the transmission of trachoma. Am J Trop Med Hyg. 1975;24(3):509-15.
8. Solomon AW, Zondervan M, Kuper H, et al. Trachoma control: a guide for programme managers. Geneva: World Health Organization. 2006. Available at: https://www.who.int/publications/i/item/9241546905 Accessed on 3 July 2024.
9. World Health Organization. Global elimination of blinding trachoma. Resolution WHA 51.11. Adopted by the World Health Assembly. 1998. Available at: https://www.who.int/publications/i/item/wha51.1 Accessed on 3 July 2024.
10. Zithromax management guide. How to successfully apply for, administer and manage the Zithromax. 2019. Available at: https://www.trachoma.org/sites/default/files/2020-10/ITI_ZMG_ENG_102620_Online.pdf. Accessed on 12 September 2024.
11. Lietman TM, Porco TC, Dawson C, Blower S. Global elimination of trachoma: how frequently should we administer mass chemotherapy? Nature Med. 1999;5(5):572-6.
12. Sheila K, West SK, Munoz B, Mkocha H, Gaydos CA, Quinn TC. Number of Years of Annual Mass Treatment with Azithromycin Needed to Control Trachoma in Hyper-Endemic Communities in Tanzania. J Infect Dis. 2011;204(2):268-73.
13. Burton MJ, Holland MJ, Makalo P, Aryee EA, Alexander ND, Sillah A, et al. Re-emergence of Chlamydia trachomatis infection after mass antibiotic treatment of a trachoma-endemic Gambian community: a longitudinal study. Lancet. 2005;365(9467):1321-8.
14. World health organization. Status of elimination of trachoma as a public health problem, 2022. WHO. Available at: https://www.trachomaatlas.org. Accessed on 12 September 2024.
15. 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(4):348-53.
16. Mpyet C, Ogoshi C, Goyol M. Prevalence of trachoma in Yobe State, north-eastern Nigeria. Ophthalmic Epidemiol. 2008;15(5):303-7.
17. 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(5):294-302.
18. Alice R, Wade P, Ogoshi C, Goyol M, Adenuga O, Dami N, et al. Prevalence of Trachoma in Jigawa State, Northwestern Nigeria. Ophthalmic Epidemiol. 2015;22(3):184-9.
19. Report obtained from Ministry of Health, Jigawa state. 2015
20. Population census of the Federal Republic of Nigeria: Analytical report at the national level. Abuja: National Population Commission.
21. Kasiulevicius V, Sapoka V, Filipaviciute R. Sample size calculation in epidemiological studies. Gerontology. 2006;7:225-31.
22. WHO. Training for mid-level managers: the EPI coverage survey. Geneva: World Health Organization. 1991. Available at: https://www.who.int/publications/i/item/module-7-the-epi-coverage-survey Accessed on 3 July 2024.
23. Cromwell EA, King JD, McPherson S, Jip FN, Patterson AE, Mosher AW, et al. Monitoring of Mass Distribution Interventions for Trachoma in Plateau State, Nigeria. PLoS Negl Trop Dis. 2013;7(1):e1995.
24. Desmond N, Solomon AW, Massae PA, Lema N, Anemona A, Foster A, et al. Acceptability of azithromycin for the control of trachoma in Northern Tanzania. Trans R Socie Trop Mede Hyg. 2005;99(9):656-63.
25. Mabey DC, Solomon AW, Foster A. Trachoma. Lancet 2003;362(9376):223-9.
26. Thylefors B, Dawson CR, Jones BR, West SK, Taylor HR. A simple system for the assessment of trachoma and its complications. Bull World Health Organ. 1987;65(4):477-83.

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