

Prevalence and factors associated with active trachoma among rural children aged 1–9 years in Chelia Woreda, Central Ethiopia

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Abstract

Background: Globally, trachoma remains the leading infectious cause of blindness and 40.6 millions of people had active trachoma found in 29 of the countries in Africa. Ethiopia is the country most affected by trachoma worldwide. So far no study was conducted in the study area and the prevalence of active trachoma among children aged 1-9 years is not known.

Objective: To assess prevalence of active trachoma and its associated factors among rural children aged 1–9 years in Chelia Woreda, West Shewa Zone, Oromia region, Ethiopia, 2020.

Method: A community-based cross-sectional study was conducted in Chelia Woreda from February 25 to March 30, 2020. Systematic random sampling technique was used to select 450 study participants. Data was collected using structured questionnaire through face to face interview and clinical examination. Data was coded and entered to Epi-info version 7 and exported to SPSS version 21 for cleaning and analysis. Multivariable logistic regression analysis was used to identify the independently associated factors.

Result: The overall prevalence of active trachoma cases was 77(17.8%) consisting of 62(14.3%) trachoma inflammation folliculitis and 15(3.5%) trachoma inflammation intense. Source of water for daily consumption, distance of water source from the house, absence of latrine utilization and presence of eye discharge on child face were independent predictors for children aged 1-9 years to have active trachoma.

Conclusion: This study revealed that the prevalence of active trachoma was high and children who had eye discharge and those from household with no latrine utilization and far away from water source were more likely to be affected by active trachoma. So, availing protected water source at the community surrounding, strengthening latrine utilization and face washing practice to reduce the burden of the disease is mandatory.

Keywords: Active trachoma, associated factors, Chelia Woreda, Children, Prevalence

Introduction

Trachoma is chronic conjunctivitis caused by *Chlamydia trachomatis* serovar A, B, Ba or C. The transmission occurs primarily through close personal contact, particularly among young children in rural communities with limited water supplies. Children are the most susceptible to *Chlamydia trachomatis* infection as they usually have close contact with others and often do not keep their faces free of secretions (WHO 2019).

In an endemic community, the primary reservoir of *Chlamydia trachomatis* are children, particularly those between 1-9 years due to the transmittable nature of trachoma. To eliminate trachoma as a public health problem, the World Health Organization (WHO) recommends use of the SAFE strategy (that is, surgery for advanced disease; mass drug administration of antibiotics to clear trachomatis infection, facial cleanliness and environmental improvement to reduce transmission (Gambhir et al. 2009; Francis and Turner 1995; Hu et al. 2010).

Ethiopia has one of the highest prevalence of active trachoma. It remains one of the major health problems, and a leading cause of blindness in the country.

According to 2010 WHO report on neglected tropical diseases, Ethiopia ranks first in the list of high burden Sub Saharan African countries (Daumerie et al. 2010; WHO 2016).

Trachoma is one of the 17 WHO-defined Neglected Tropical Diseases (NTDs) that affects 21.4 million people globally of whom about 2.2 million are visually impaired and 1.2 million are blind (WHO 2016; WHO 2010).

Ethiopia and South Sudan have the highest prevalence of active trachoma in Africa. In some areas of these countries, active trachoma is present in more than 50% of children aged 1–9 years and trichiasis affects more than 10% of adults. In Ethiopia, more than 75 million peoples, the largest number in the world live in trachoma-endemic areas; that is 44% of the global burden of active trachoma (Burton and Mabey 2009; Smith et al. 2013; Ejigu et al. 2013; Mondiale de la Santé and WHO 2016).

According to 2011 WHO report, Ethiopia is one of the five countries of the world where 49% of the global burden of active trachoma is concentrated. Ethiopia together with four other countries bears half of the global burden of active trachoma (WHO 2016).

Children less than 9 years are the major reservoir of the bacteria for the infective trachoma as children under this age cannot take care of themselves and are therefore affected more seriously because this group is characterized by unclean faces, nasal discharge, foods on faces and dust that attract eye-seeking flies, which are carriers the bacteria. In hyper-endemic areas, active disease is most common in pre-school children with prevalence rates as high as 60-90% (Mengistu 2014).

A study conducted in the North and South Wollo Zones of the Amhara Regional State indicated that the overall prevalence of trachomatis inflammation-follicular (TF) among children aged 1–9 were 52% and 13%, respectively (Tadesse et al. 2017).

Another study conducted in Leku town, Southern Ethiopia showed the prevalence of active trachoma among children aged 1–9 years were 11% (Abebo and Tesfaye 2017). A national survey carried out in 2005–2006 found an estimated national prevalence of active trachoma (trachomatous inflammation – follicular, TF, and/or trachomatous inflammation – intense, TI) of 40.1% in children aged 1–9 years, with an estimated TF prevalence of 24.5% in children 1-9 years age in Oromia (Abebo and Tesfaye 2017; Berhane et al. 2007).

Ethiopia launched the VISION 2020 Initiative in September 2002 and developed its own 20 years strategic plan to eliminate trachoma. However, surveys conducted by Global Trachoma Mapping Project in 2016 showed prevalence of active trachoma in Oromia region to be one of the highest (Pizzarello et al. 2004).

As far as our review touched, no study has been conducted on prevalence of active trachoma in Chelia Woreda of Oromia region. . . Therefore, this study helps in identifying the prevalence and associated factors of active trachoma among rural children of the study area, which would help program planners to have timely intervention by taking appropriate action on identified risk factors that facilitate the transmission of the disease.

Materials and Methods

Study setting: The study was conducted in Chelia Woreda, which is located in West Shewa Zone, Oromia Regional State, Western Ethiopia at 179km distance from the capital city, Addis Ababa. Chelia Woreda has one General Hospital, four Health Centers, 18 rural Health Posts, one NGO and seven Private Clinics. The Woreda was provided with three round mass Zithromax distributions for trachoma elimination prior to the study time.

Study design and period: A Community-based cross-sectional study design was conducted among 1-9 years

old rural children starting from February 25 to March 30, 2020.

Children aged 1-9 years, except those who were blind, living in rural household during data collection period were included in the study.

Sample size determination: The sample size was determined by using a single population proportion formula using P of 23.1%, prevalence rate taken from a study done on active trachoma on the same age group in Gonji Kellela District, West Gojjam Zone, North West Ethiopia ((Nigusie et al. 2015). The sample size was:

$$n = \frac{(Z\alpha/2)^2(P)(1-P)}{d^2}$$
$$= \frac{(1.96)^2 * 0.231 * 0.769}{(0.05)^2} = 273$$

By considering the design effect of 1.5, and 10% non-response rate, the final sample size became $(273 \times 1.5 = 409) + (409 \times 10\% = 41) = (409 + 41) = 450$

Sampling procedure: A multi-stage sampling technique was employed in order to select the study participants. At first stage, six out of 18 rural kebeles (the smallest administrative unit within a Woreda) were selected by lottery method. At second stage, households from each kebele where children 1-9 years old reside were identified from Community Health Information System (CHIS) folders through discussion with Health Extension Workers. The first household was selected using lottery method and from that systematically continued by visiting every 9th house. For two or more children living within a household, one of them was selected by lottery method. During the time of data collection, when respondent-child pairs were not available, the next household was considered.

Operational definition

Active trachoma: the presence of at least five or more follicles in the upper tarsal conjunctiva, each with at least 0.5 mm in size.

Data collection tool: Data was collected using structured questionnaire in face to face interview, observation (clinical eye examination techniques). Questionnaire was translated from English to Afan Oromo and then back to English to ensure consistency. Clinical eye examination for each child was done by careful inspection of eyelashes, cornea, limbus, eversion of the upper eyelids and inspection of the upper tarsal conjunctiva by the help of magnifying binocular examination loupe (x2.5) and day light or penlight torches. Both eyes were examined in the same

sequence and hygienic measures were carried out by using disposable latex gloves and results of the examination were registered. Data collection was conducted around mid-day time and at weekend to get those children attending school. The presence or absence of signs of active trachoma was determined based on the following WHO grading criteria (Solomon et al. 2006).

Trachomatous inflammation-follicular (TF): The presence of five or more follicles of >0.5 mm in the upper tarsal conjunctiva.

Trachomatous inflammation-intense (TI): Pronounced inflammatory thickening of the upper tarsal conjunctiva that obscures more than half of the normal deep tarsal vessels.

Data quality assurance: Before the actual data collection was started, one day training was given for data collectors and supervisors by ophthalmic nurse who was certified by trachoma grading. Six Health Officers or Nurses (BSc) were trained to interview the study participants and trachoma grading. Health extension workers had supported data collectors as guidance on showing the selected households where children 1-9 years were residing. After training was conducted, pre-test was done on 23 rural children of 1-9 years old in one of the kebeles other than the selected kebeles with similar socio demographic characteristics. Findings of the pretests were discussed with data collectors and modification of the questions was done to give clear meaning and facilitate understanding to the questions.

Data processing and analysis: Data was coded and entered to Epi-info version 7 and was exported to SPSS version 21 for cleaning and analyses. For Descriptive statistics, the frequency and proportion was computed. Bivariate logistic regression analysis was done to determine the presence of statistical association between explanatory variables and the outcome variable. Variables with P-value less than 0.25 in bivariate analysis were considered as candidates to be entered into multivariable logistic regression model. Statistical significance was declared at $P < 0.05$. The strength of association between independent and the outcome variable was assessed using the odds ratio with 95% confidence interval and the results were presented by tables and graphs.

Ethical consideration: Ethical Clearance was obtained from Ethical Review Committee of College of Medicine and Health Sciences of Ambo University. Chelia Woreda Health Office and kebele administrative officials in the study area were informed about the study and then written consents were obtained. Parent or caregivers were entitled to

provide consent on the behalf of children 1-9 years old. Hence, verbal consent was obtained from parent or caregiver after the brief description was given on the benefits, objectives, procedure, and risk of the study. Confidentiality and privacy of every respondent's information was ensured by not using any identifiers of the study participants. Children diagnosed with the sign of active trachoma were immediately referred to the nearby health facility for treatments and farther investigation.

Results

Socio-demographic characteristics of the respondents: A total of 433 children aged 1-9 years were participated in the study making a response rate of 96.2%. The result showed that among 433 respondents participated in the study, about 345(79.7 %) were females. More than two third of child families, (68.4 %) had greater than five family members. Majority of the respondents (86.8%) were married. Of 433 respondents, 78.3 % had one child aged 1-9 year. More than half of child families, (57.0%) had no formal education.

About 65.1% of child families had monthly income of less than 1000 EB and majority of the respondents (87.3%) were farmers.

Environmental and housing condition of the respondents in Chelia Woreda: Of the respondents, 86.8 % were living in the house with two and above rooms. Majority of the households 87.1% used kitchen for cooking and the rest 12.9% were cooking in the living room. Majority of the cooking place, 94.5% were without windows while more than two third of child families, 70.4% had cattle. The respondents' main source of water was protected spring 51.5% and more than half, 63.3% of the respondents travel more than 30 minutes to fetch water for their daily consumption and 54.7% of them collected 20–40 liters of water/day.

The study also revealed that, majority of respondents, 391 (90.3%) had latrine of which 378(87.3%) were functional, and only 27 (6.2%) were traditional pit latrine. About 271(69.3%) of the latrines were located at the distance of 10 m away from home and majority of the respondents 405 (93.5%) had waste disposal site.

Child characteristics: Among the 433 children who took part in the study, 84.3% had no nasal discharge and 74.4% had no eye discharge; more than two thirds (78.5%) cleansed their face once a day; 71.4% had a clear face, while 54.5% had flies on their faces. Among the participants, 68.1% had previously received Zithromax prophylaxis (Table 1).

Table 1: Characteristics of respondents on their daily living in Chelia Woreda, West Shewa Zone, Oromia region, Ethiopia, February 2020

Variables	Alternatives	Frequency	%
Sex of the child	Male	193	44.6
	Female	240	55.4
Age(years) of the child	1-5 years	259	59.8
	6-9years	174	39.3
Frequency of face washing	Once a day	340	78.5
	More than once a day	93	21.5
Nasal discharge	Yes	68	15.7
	No	365	84.3
Discharge on eye	Yes	111	25.6
	No	322	74.4
Soap usage for face	Yes	52	12
	No	381	88
Presence of fly on child face	Yes	236	54.5
	No	197	45.5
Facial cleanness	Clean	309	71.4
	Not clean	124	28.6
Has child ever taken Zithromax	Yes	295	68.1
	No	138	31.9

Prevalence of active trachoma among children age 1–9 years in Chelia Woreda: Out of the screened children, 77 (17.8 %) had sign of active trachoma. Among these cases, 62(14.3%) had TF while the rest 15(3.5%) had TI. The prevalence of active trachoma within age category of 1–5 years and 6-9 years was 59(22.8%) and 18(10.3%) respectively

Associated factors for active trachoma: After adjusting for socio-demographic factors, environmental related factors and child condition the multivariable logistic regression analysis identified Source of water for daily consumption, Distance of water source from the house, absence of utilization of latrine and presence of eye discharge on child face as

independent predictors for children aged 1-9 years to have active trachoma. Accordingly, the odds of having active trachoma were 2.68 (AOR=2.68, 95%CI: 1.10-7.88) times higher among children whose families fetched water from more than 30 minutes walking distance away from their homes. Likewise, the odds of having active trachoma were 5.80 (AOR=5.80, 95% CI: 1.07- 31.28) times higher among children from households who were not utilizing latrine. The odds of having active trachoma were 0.06(AOR=0.06, 95% CI: 0.01- 0.27) times lowered among children whose households were get water from protected spring. The odds of having active trachoma were also 3.4(AOR=3.44, 95% CI: 1.39-8.56) times higher among children with eye discharge (Table 2).

Table 2: Multivariable logistic regression on factors independently associated with active trachoma among children of age 1–9 years in Chelia Woreda, West Shewa, Oromia region, Ethiopia, February 2020

Factors		Trachoma status		COR(95%CI)	AOR(95%CI)	P-value
		Yes	No			
Presence of eye discharge	Yes	52(67.5)	59(16.6)	10.47(6.02-	3.44(1.39-8.56)	.008**
	No	25(32.5)	297(83.4)	18.20)	1	
Source of water for consumption	River	8(10.4)	14(3.9)	1	1	
	Unprotected spring	44(57.1)	144(40.4)	0.53(0.21- 1.36)	0.40(0.10-1.44)	.151
	Protected spring	25(32.5)	198(55.6)	0.22(0.08-0.58)	0.06(0.012-0.27)	.001**
Distance of water source from the house	≤30minutes	30(39.0)	129(36.2)	1	1	
	>30minutes	47(61.0)	227(63.8)	0.89(0.14-0.99)	2.68(1.10-7.88)	.033**
Latrine utilization	Yes	59(76.6)	319(89.6)	1	1	
	No	18(23.4)	37(10.4)	2.63(1.40-4.93)	5.80(1.07-31.28)	.041**

Discussion

The overall prevalence of active trachoma among children aged 1–9 years in the study area was 17.8% of these cases 62(14.3%) had TF while the rest 15(3.5%) had TI, which is higher than the WHO recommendation (10%). However, the prevalence was lower than that of a study conducted in Gazegibela district of Wagehemera Zone, Gamo Gofa Zone, Kersa District of Jimma Zone and Gonji Kolella district of West Gojjam zone which reported 52%, 36%, 25% and 23.1% respectively (Anteneh and Getu 2016; Mengistu 2014; Ejigu et al. 2013; Nigusie et al. 2015). This difference might be due to low percentage of latrine Utilization and period of study. But, the current finding is comparable with 18% prevalence in Dembia district Northwest Ethiopia (Ferede et al. 2017). On the other hand, the prevalence of trachoma in the current study was higher than a study conducted in North Gonder and Dera district North West Ethiopia which reported prevalence of 12% and 15% of active trachoma respectively (Alemayehu et al. 2015; Asres et al. 2016). The higher prevalence in the current study might be due to endemicity of the disease, poor sanitation and water supply conditions in the district and the differences also might be due to study population(included rural/ urban) and high coverage of latrine utilization in Dera district.

This finding is further consolidated by the fact that the multivariate logistic regression analysis revealed that children from those household who were not utilizing latrine were 5.8 times more likely to develop active trachoma when compared with their counterpart (AOR=5.8, 95% CI: 1.07-31.28). This finding is in line with the study conducted in Dera district North West Ethiopia and Nigeria (Alemayehu et al. 2015; Mpyet et al. 2010).

The study result also showed that presence of eye discharge on child face was significantly associated with trachoma status. The odds of developing active trachoma were 3.4 times higher among children with eye discharge as compared to their counterparts (AOR=3.44, 95% CI: 1.39-8.56).This is in line with study conducted in Dera Woreda, Northwest Ethiopia (Alemayehu et al. 2015). This can be justified that, the increase in water source distance from the household possibly exposed the children not to wash their face frequently and having unclean face. This allows flies to be present on their face and frequent exposure of the children to the flies possibly made them develop active trachoma.

The current study showed that the odds of developing active trachoma were 2.68 times higher among children whose families fetched water from more than 30 minutes walking distance away from their homes as compared to their counterpart (AOR=2.68, 95%CI: 1.10- 7.88). This finding is contrary a study conducted

in Dembia district Northwest Ethiopia (Ferede et al. 2017). Children whose households got water from protected spring were 94% times less likely to develop active trachoma than their counterparts (AOR=0.06, 95% CI: 0.01- 0.27).This result is in agreement with the study conducted in Gazegibela district of Wagehemera Zone (Anteneh and Getu 2016).

Conclusion and Recommendation

The prevalence of active trachoma in children aged 1-9 years in Chelia Woreda was found to be much higher than the WHO recommendation; which states trachoma is a serious health problem when the active disease prevalence exceeds 10%. Besides, the study also revealed that children who had eye discharge and those from house hold who did not have latrine utilization and far away from water source were more likely to be affected by active trachoma.

Since trachoma is a serious problem and requires immediate attention; encouraging children and parents to practice regular face washing, work on proper utilization of latrine and maintain the timely mass drug administration (MDA) to reduce the burden of the disease is mandatory. The local administration should also work on availing protected water source at the community level to reduce water washed disease like trachoma. Furthermore, attention of the Zonal Health Department and Woreda Health office in harmony with different stakeholders for intervention is desirable so that the SAFE strategy will be implemented in combating the trachoma.

Funding

The authors declared no fund has been received to conduct this study

Competing interests: The authors declared that they have no competing interests.

Acknowledgements

We would like to thank Ambo University, College of Medicine and Health Sciences, Department of Public Health for their overall support to undertake this research. Our thanks also extend to all Chelia Woreda Health Office staffs for their unreserved support in giving information and necessary materials for data collection. We are also grateful to the study participants and data collectors for their openly participation and commitment.

Availability of data and materials: The data used to support the finding of this study are included within the article.

References

- Abebo TA & Tesfaye DJ (2017). Prevalence and distribution of active trachoma among children 1-9 years old at Leku town, Southern Ethiopia. *Current Pediatric Research*, 21(3):507-513

- Alemayehu M, Koye DN, Tariku A & Yimam K (2015). Prevalence of active trachoma and its associated factors among rural and urban children in Dera Woreda, Northwest Ethiopia: a comparative cross-sectional study. *Biomedical Research International*, 2015:8.
- Anteneh ZA & Getu WY (2016). Prevalence of active trachoma and associated risk factors among children in Gazegibela district of Wagehemra Zone, Amhara region, Ethiopia: community-based cross-sectional study. *Tropical Diseases, Travel Medicine and Vaccines*, 2: 1-7.
- Asres M, Endeshaw M, Yeshambaw M & Muluken A (2016). Prevalence and risk factors of active Trachoma among children in Gondar Zuria District North Gondar, Ethiopia. *Preventive Medicine*, 1: 5.9
- Berhane Y, Worku A, Bejiga A, Adamu L, Alemayehu W, Bedria A, et al. (2007). National survey on blindness, low vision and trachoma in Ethiopia: methods and study clusters profile. *Ethiopian Journal of Health Development*, 21: 185-203.
- Burton MJ & Mabey DC (2009). The global burden of trachoma: a review. *PLoS Neglected Tropical Diseases*, 3: e460.
- Daumerie D, Peters P & Savioli L (2010). Working to overcome the global impact of neglected tropical diseases: first WHO report on neglected tropical diseases, World Health Organization. Pp 55.
- Ejigu M, ariuki MM, Ilako DR & Gelaw Y (2013). Rapid trachoma assessment in kersa district, Southwest Ethiopia. *Ethiopian Journal of Health Sciences*, 23: 1-9.
- Ferede At, Dadi AF, Tariku A & Adane AA (2017). Prevalence and determinants of active trachoma among preschool-aged children in Dembia District, Northwest Ethiopia. *Infectious Diseases of Poverty*, 6: 1-7.
- FMoH Ethiopia (2015). Health sector transformation plan (2015/16–2019/20). Federal Ministry of Health Addis Ababa, Ethiopia. Pp 37-38.
- Francis V & Turner V (1995). Achieving community support for trachoma control. *Achieving community support for trachoma control*. Pp 40.
- Gambhir M, Basáñez MG, Burton MJ, Solomon AW, Bailey RL, Holland MJ, et al. (2009). The development of an age-structured model for trachoma transmission dynamics, pathogenesis and control. *PLoS Neglected Tropical Diseases*, 3: e462.
- Hu VH, Harding-Esch EM, Burton MJ, Bailery RL, Kadimpeul J & Mabey DC (2010). Epidemiology and control of trachoma: systematic review. *Tropical Medicine & International Health*, 15: 673-691.
- Mengistu K (2014). Prevalence and factors associated with trachoma among children 1-9 years of age in Zalla district, Gamo Gofa zone, Southern Ethiopia (Doctoral dissertation, Jimma University).
- Mondiale De La Sante O & WHO (2018). Weekly Epidemiological Record. *Relevé Épidémiologique Hebdomadaire*, 93(26): 369-380.
- Mpyet C, Goyol LM & Ogoshi C (2010). Personal and environmental risk factors for active trachoma in children in Yobe state, North-Eastern Nigeria. *Tropical Medicine and International Health*, 15: 168-172.
- Nigusie A, Berhe R & Gedefaw M (2015). Prevalence and associated factors of active trachoma among children aged 1–9 years in rural communities of Gonji Kolella district, West Gojjam zone, North West Ethiopia. *BMC Research Notes*, 8: 1-9.
- Pizzarello L, Abiose A, Ffytche T, Duerksen R, Thulasiraj R, Taylor H, et al. (2004). Vision 2020: The Right to Sight: a global initiative to eliminate avoidable blindness. *Archives of Ophthalmology*, 122: 615-620.
- Smith JL, Fluckiger RM, Hooper PJ, Polack S, Crowell EA, Palmer SL, et al. (2013). The geographical distribution and burden of trachoma in Africa. *PLoS Neglected Tropical Diseases*, 7: e2359.
- Solomon AW, WHO & International Trachoma Initiative (2006). Trachoma control: a guide for programme managers. World Health Organization. Pp 53.
- Tadesse B, Worku A, Kumie A & Yimer AS (2017). The burden of and risk factors for active trachoma in the North and South Wollo Zones of Amhara Region, Ethiopia: a cross-sectional study. *Infectious Diseases of Poverty*, 6: 1-12.
- WHO (2010). Elimination of blinding trachoma: only 10 years to go: report of the fourteenth meeting of the WHO alliance for the global elimination of blinding trachoma, 19–21 April 2010, Geneva, Switzerland. World Health Organization 76: 419-424.
- WHO (2019). WHO Alliance for the Global Elimination of Blinding Trachoma by the year 2020: Progress report on elimination of trachoma, 2013. *Weekly Epidemiological Record= Relevé épidémiologique hebdomadaire*. Pp 12.
- WHO (2016). World Health Organization Alliance for the Global Elimination of Trachoma by 2020: second global scientific meeting on *trachomatous trichiasis*: Cape Town, 4–6 November 2015 (No. WHO/HTM/NTD/2016.5). Pp 1-19.
- WHO (2016). Monitoring Health for the Sustainable Development Goals (SDGs) 2016(OP), World Health Organization. Pp 121.