

Prevalence and factors associated with trachoma among children aged 1–9 years in Zala district, Gamo Gofa Zone, Southern Ethiopia

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Background: Trachoma is the leading cause of preventable blindness worldwide. It is common in areas where people are socioeconomically deprived. Globally, approximately 1.2 billion people live in trachoma-endemic areas, in which, 40.6 million individuals have active trachoma and 8.2 million have trichiasis. According to the World Health Organization's 2007 report, globally close to 1.3 million people are blind due to trachoma, while approximately 84 million suffer from active trachoma. The National Survey (2007) of Ethiopia showed a prevalence of 40.1% active trachoma among children aged 1–9 years. Trachoma is still endemic in most parts of Ethiopia.

Objective: To assess prevalence of trachoma and factors associated with it among children aged 1–9 years in Zala district, Gamo Gofa Zone, Southern Nations, Nationalities, and Peoples' Region.

Methods: A community-based cross-sectional study was conducted in Zala district from February 28 to March 26, 2014. A total of 611 children were examined for trachoma based on the simplified World Health Organization 1983 classification. A multistage stratified sampling technique with a systematic random sampling technique was used to select study participants. Data were collected by using a semistructured pretested questionnaire and clinical eye examination. The data were entered using EpiData version 3.1 and analyzed using SPSS version 16. Multivariable logistic regression analysis was used to identify independently associated factors.

Results: The overall prevalence of active trachoma cases was 224 (36.7%) consisting of 207 (92.4%) trachomatous follicles, eight (3.6%) trachomatous intense, and nine (4.0%) combination of trachomatous follicle and trachomatous intense. Inadequate knowledge of family head about trachoma (adjusted odds ratio [AOR]=2.8 [95% CI: 1.9, 4.2]); ≤ 10 m latrine distance (AOR=1.6 [95% confidence interval {CI}: 1.09, 2.4]); presence of above two preschool children (AOR=2.2 [95% CI: 1.3, 3.7]), flies on the face (AOR =6.3 [95% CI: 2.7, 14.7]), and unclean face (AOR =2.4 [95% CI: 1.5, 3.9]) were found to be independently associated with trachoma.

Conclusion: Trachoma among children in Zala district is a disease of public health importance. Factors like inadequate knowledge about trachoma by the head of the family, ≤ 10 m latrine distance, presence of above two preschool children, flies on the face, and an unclean face were independently associated with trachoma among children. So strengthening of antibiotic use, face washing, and environmental improvement strategy implementation is mandatory.

Keywords: trachoma, children, prevalence, associated factors, Ethiopia

Introduction

Infectious diseases have been the most important contributor to human morbidity and mortality until relatively recent times, and still accounts for a large proportion of death and disability worldwide. In certain regions infectious diseases remains the most important cause of ill health and have been responsible for 22% of all deaths and 27% of

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disability-adjusted life years worldwide.¹ They have imposed a burden on the young, notably on children under 5 years.

Eye problems are recognized as among one of the major public health challenges in many developing countries. An international initiative called VISION 2020: The Right to Sight was launched by the World Health Organization (WHO) and collaborating institutions in 1999 to eliminate the major causes of avoidable blindness by the year 2020.^{2,3} Ethiopia launched the initiative in September 2002.^{4,5}

Blindness is one of the major health problems of the world. In 2002, WHO estimated that there were 37 million blind people and an additional 124 million people with low vision globally. The burden of blindness in the sub-Saharan Africa region is some of the worst in the world. Seventy-five percent of all blindness in developing countries can be prevented or cured. The current (2012) National Survey Results have shown that the prevalence of blindness and low vision in Ethiopia is among the highest in the sub-Saharan Africa (1.6% and 3.7%, respectively).⁶ In Ethiopia, the prevalence of blindness is 1.6% and corneal blindness accounts for over 19% of the total blindness.⁶

Trachoma is the leading cause of blindness worldwide, especially in many developing countries.⁷ Trachoma is a chronic conjunctivitis caused by *Chlamydia trachomatis*.⁸ WHO has endorsed the Surgery, Antibiotic, Face Washing and Environmental Sanitation strategy to combat trachoma, which consists of surgery to correct trichiasis, antibiotics to reduce the pool of active disease, and methods to improve face washing and environmental hygiene practices in trachoma-endemic communities.⁹ This study aimed to assess prevalence of trachoma and factors associated with it among children aged 1–9 years in Zala district, Gamo Gofa Zone, Southern Nations, Nationalities, and Peoples' Region, Ethiopia.

Methods

Study setting, design, and sampling

Community-based cross-sectional study was conducted among children aged 1–9 years in Gamo Gofa Zone of Southern Ethiopia from February 28 to March 26, 2014. Zala district is located 515 km south of Addis Ababa and 285 km south of regional city Hawassa. It is one of the 15 districts found in Gamo Gofa Zone. The district was administratively divided into 35 kebeles (lowest administrative units). There are 34 rural and one urban kebele. The district has 90,700 total population (51% female and 49% male).

Approximately 97% of the population lives in rural part of the district, where there is low infrastructure. The Gofa ethnic group is dominant in the area (~83%). As far as the climatic condition of the area is concerned, approximately

91.5% is lowland and 8.5% is mid-highland. The district had five health centers (one urban and four rural) during the study time. There were 35 (34 rural and one urban) health posts, and four private clinics with potential health service coverage of 95%. The district was provided with three round mass Zithromax distribution for trachoma elimination (Woreda, unpublished data, 2013).

The sample size was determined by using a single population proportion formula by considering 24.1% prevalence rate taken from a study done in Baso Liben district in East Gojjam Zone, in the northern part of Ethiopia.¹⁰ Ten percent nonresponse rates, 95% confidence level with 5% margin of error and design effect of two were considered. Based on this, a total of 618 children aged 1–9 years were selected for the study.

A multistage sampling technique was applied to select study subjects. After stratifying the district into urban and rural areas, one urban (only in the district) and nine rural kebeles were randomly selected using lottery method. The total sample was allocated proportionally to the selected ten kebeles according to their population size. A total of 6,337 households were present in the selected ten kebeles and 618 households were visited and one child per house was included in the study. Systematic random sampling method was used to select study units.

The following procedure was applied to get the households of the study subjects. First, a central point in each kebele; a place in the kebele where approximately an equal number of households were found in all of the four directions; was identified. Then, by spinning a pencil on a clipboard, a direction was identified and the first household out of the first ten households was selected as starting point. A direction was identified, and then the first household out of the first ten households was selected as starting point. Every tenth household was identified for inclusion into the study on an approximately straight line pattern in each kebele. Ten households on the selected direction were listed and a random start household number was identified by simple random sampling method. Then, every tenth household was selected and included into the study. This procedure was continued in all the selected kebeles until the required sample was gained for each of the kebeles. When there are no children aged 1–9 years in a sampled household, a substitute is taken from the nearest household. If there were two or more children in a household, one of them was selected by lottery method.

A total of 611 households were included and heads of households were interviewed for sociodemographic and economic information, housing and environmental condition, knowledge and practice about prevention of trachoma and

child factors. A total of 611 children were examined for the trachoma status from the ten selected kebeles accordingly.

Data collection and measurement

Face-to-face interview, observation with checklist, and clinical eye examination method of data collection were used. Data were collected using a pretested interviewer-administered semistructured questionnaire by trained and integrated eye care workers (nurses) as recorders, and ophthalmic nurses who were licensed and who participated in global mapping trachoma grading for eye examination. The questionnaire was adapted into local settings by reviewing related literature.

The clinical eye examination of each study subject was done by ophthalmic nurse trachoma graders. Careful inspection of eyelashes, cornea, limbus, eversion of the upper lid, and inspection of the tarsal conjunctiva with the help of magnifying binocular lenses ($\times 2.5$) and penlight torches were carried out. The guide used for diagnosis and reporting of eye examination results was the simplified trachoma grading scheme, which was developed by WHO for field work.¹¹ The interrater variability of eye examination was solved by certified trachoma graders who participated in the national program.

The questionnaires were pretested before the actual data collection. Five integrated eye care workers were recruited and trained to interview head of the households and observe the children after getting written consents from the heads of households. Then, two ophthalmic nurses who are trachoma graders also took part in eye examination.

Statistical analysis

Data were entered using EpiData version 3.1 (The EpiData Association, Odense, Denmark). It was then edited and cleaned for inconsistencies, missing values, outliers and then exported for analysis to SPSS version 16 (SPSS Inc., Chicago, IL, USA). Bivariate logistic regression analysis was done to determine the presence of statistical association between independent variables and the outcome variable and its strength with direction. Variables with $P < 0.25$ in bivariate analysis were considered as candidates to be entered into multivariable logistic regression model. The final model was fitted using stepwise selection methods (backward logistic regression). $P \leq 0.05$ in multivariable logistic regressions was considered as statistically significant. Goodness of fitness of the model was checked by Hosmer–Lemeshow test.

Ethical consideration

Ethical approval and clearance was obtained from Jimma University Ethical Review Board. Letter of cooperation was obtained from Zala district health office and Zala district

administration office. Written informed consent was taken from the head of the household. Children with trachoma were provided with two tubes of 1% tetracycline eye ointments immediately after examination and referred to a linked to primary eye care unit.

Results

Sociodemographic and economic characteristics

A total of 611 children were seen for an eye examination and this made the response rate 98.87%. The remaining households were not included due to refusal to participate in the study and incomplete data in the analysis.

The majority of household heads, 473 (77.4%), were females with the mean age of 31 ± 7 years; approximately half of them, 326 (53.4%), were illiterate; and 565 (92.5%) were married. They were predominantly rural residents, 551 (90.2%), with the average family size of six (Table 1).

Table 1 Sociodemographic characteristics of the head of the household in Zala district from February 28 to March 26, 2014

Variable	Frequency (n=611)	Percentage
Sex		
Male	138	22.6
Female	473	77.4
Educational status		
Illiterate	326	53.4
Read and write	9	1.5
First cycle 1–4 grades	103	16.9
Second cycle 5–8 grades	109	17.8
Grade 9 and above	64	10.5
Marital status		
Married	565	92.5
Divorced	19	3.1
Widowed	27	4.4
Occupation		
Governmental worker	41	6.7
Farmer	372	60.9
Merchant	26	4.3
Housewife	165	27.0
Others	7	1.1
Place of residence		
Urban	60	9.8
Rural	551	90.2
Family size		
2–5	254	41.6
6–10	348	57.0
>10	9	1.5
Average monthly income		
First quartile	144	23.6
Second quartile	155	25.4
Third quartile	134	21.9
Fourth quartile	178	29.1
Age of head of household (years)		
17–30	54.0	54.0
31–45	43.0	43.0
46–65	2.9	2.9

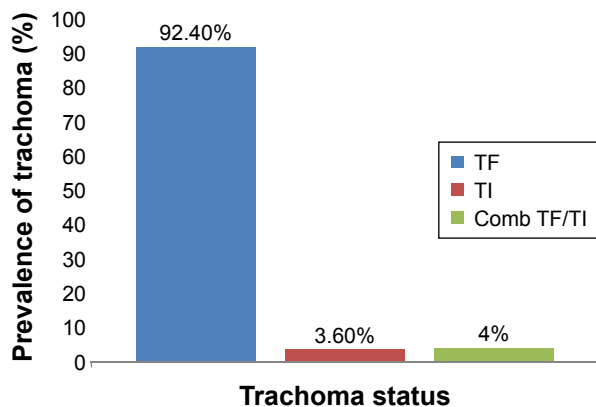


Figure 1 Prevalence of trachoma in children aged 1–9 years in Zala district, Gamo Gofa Zone, Southern Ethiopia from February 28 to March 26, 2014.

Abbreviations: Comb, combination; TF, trachomatous follicle; TI, trachomatous intense.

Prevalence of trachoma among children aged 1–9 years

Among all children examined for trachoma status, 224 (36.7%) children had clinical trachoma. Among these, 207 (92.4%), eight (3.57%), and nine (4.0%) were trachomatous follicle (TF), trachomatous intense (TI), and combination of TF/TI, respectively. Generally, overall prevalence of trachoma in the district was 36.7%. There were no trachomatous scare (TS), trachomatous trichiasis (TT), and corneal opacity (CO) stages observed during the study (Figure 1).

Knowledge of heads of households about trachoma

The majority of the heads of the households, 592 (92.6%), had heard about trachoma before the study time, but only 366 (59.9%) of them had adequate knowledge about trachoma (Figure 2).

Household environmental characteristics

Most households used pipeline water, 388 (63.5%), and more than half of them, 364 (59.6%), traveled <30 minutes to fetch water. Approximately 239 (39.1%) collected 20–40 L/day with the average consumption of 6 L/capita/day.

Majority of households, 585 (95.5%), had latrine, of which 582 (99.5%) were functional and 134 (33.2%) were covered with traditional pit latrine. Five hundred ninety-one (96.7%) households used latrine always and most of the latrines were located at the distance of ≤10 m.

Majority of the households, 551 (90.2%), had waste disposal system, among which 418 (76%) used farmland disposal system. As far as the distance is concerned, 422 (69.1%) of the households disposed the waste at a distance of >10 m from their houses.

Flies were observed in half (50.2%) of the households and the major (60.7%) breeding site for the flies was animal dung. Even though three out of five households did use separate place for cooking, almost all of them, 592 (96.9%), were without windows (Table 2).

Child characteristics

Child factor of trachoma among children in the study area is indicated in Table 3. Most of the children, 325 (53.2%), were females with the mean age of 3±1 years and there were an average of two preschool children per household. Preschool children were 517 (91.2%), those who were attending school during the study time 27 (4.4%), and those who were not attending even if eligible for primary education were also 27 (4.4%).

Children who washed their face more than once a day were 523 (85.6%). Five hundred nine (83.3%) of the children had no ocular discharge, and 502 (82.2%) had no nasal discharge (Table 3).

Independent determinants of trachoma in children aged 1–9 years

Knowledge about trachoma, latrine distance from household, number of preschool children, flies on the face of child, and facial cleanliness of the child were independently associated factors with trachoma among children.

Knowledge about trachoma was significantly associated with trachoma. Those children from household head having

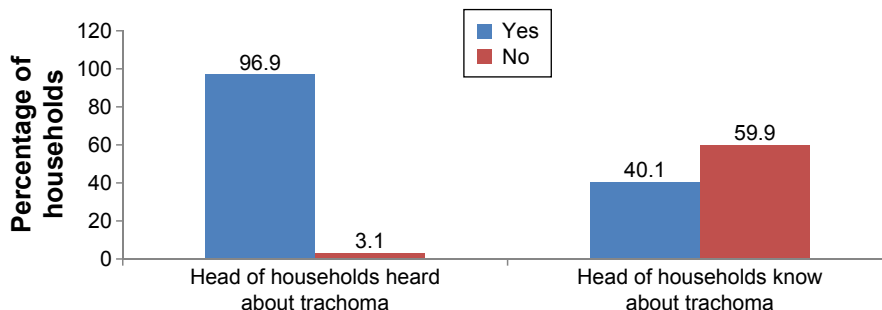


Figure 2 Knowledge of heads of households (HHs) about trachoma in Zala district from February 28 to March 26, 2014.

Table 2 Household environmental factors of trachoma among children in Zala district from February 28 to March 26, 2014

Variable	Frequency (n=611)	%
Main source of water		
Pipeline water	388	63.5
Protected well or spring	77	12.6
Unprotected well or spring	146	23.9
Time to fetch water (minutes)		
≤30	364	59.6
>30	247	40.4
Amount of water collected by family (L)		
<20	11	1.8
20–40	239	39.1
40–60	161	26.4
60–80	105	17.2
>80	95	15.5
Liter water/capita/head (L)		
Below 4	217	35.5
4–8	243	39.8
>8	151	24.7
Latrine availability		
Yes	585	95.7
No	26	4.3
Functional latrine		
Yes	582	99.5
No	3	0.5
Type of latrine		
Covered traditional pit latrine	194	33.2
Uncovered traditional pit latrine	391	66.8
Latrine to household distance (m)		
≤10	330	54.0
>10	281	46.0
Frequency of latrine usage		
Always	591	96.7
Sometimes or occasionally	20	3.3
Latrine usage		
Only adult	100	16.4
Both adult and children	511	83.6
Presence of waste disposal		
Yes	60	9.8
No	551	90.2
Type of waste disposal		
Uncovered pit	37	60.7
Covered pit	15	24.6
Burn on pit	9	14.8
Distance of waste disposal (m)		
≤10	189	30.9
>10	422	69.1
Flies observed		
Yes	307	50.2
No	304	49.8
Flies breed		
Yes	354	57.9
No	257	42.1
Fly breeding site		
Animal dung	215	60.7
Open pit latrine	49	13.8
Decayed and rotted foods	90	25.4

(Continued)

Table 2 (Continued)

Variable	Frequency (n=611)	%
Cooking place		
In living room	180	29.5
On the field	69	11.3
Outside living room, its own place	362	59.2
Availability of windows in cooking room		
Yes	19	3.1
No	592	96.9
Presence of animals		
Yes	562	92.0
No	49	8.0
Animals sleeping location		
Same room where the family lives	133	23.7
Living in house in separate room	23	4.1
Kept in a separate house	406	72.2
Animal dung		
Yes	331	58.9
No	231	41.1
Animal sleeping location distance from family (m)		
≤10	476	84.7
>10	86	15.3

inadequate knowledge were 2.8 times more likely to develop trachoma than those children from households headed by person with adequate knowledge (adjusted odds ratio [AOR]=2.8 [95% confidence interval {CI}: 1.9, 4.2]).

The association between latrine distance to household and trachoma was maintained after adjustment of possible confounding. The odds of developing trachoma were 1.6 times more common among children of households whose latrine distance was ≤10 m compared with those located >10 m away (AOR=1.6 [95% CI: 1.08, 2.4]).

The number of preschool children was associated with trachoma status. Those children from households having more than two preschool children were 2.2 times more likely to develop trachoma than those households having two or less preschool children (AOR=2.2 [95% CI: 1.3, 3.7]).

Presence of flies on face of children was significantly associated with trachoma status. The odds of trachoma were 6.2 times higher among children with flies observed on the face compared with their counterparts (AOR=6.3 [95% CI: 2.7, 14.7]).

Facial cleanliness of the child was significantly associated with trachoma. Those children with unclean face were 2.4 times more likely to develop trachoma than those children with clean face (AOR=2.4 [95% CI: 1.5, 3.9]) (Table 4).

Discussion

The overall prevalence of trachoma among children aged 1–9 years in this study was 224 (36.7%), which includes TF

Table 3 Child factor of trachoma among children in Zala district from February 28 to March 26, 2014

Variable	Frequency (n=611)	%
Sex		
Male	286	46.8
Female	325	53.2
Age (years)		
1–3	296	48.4
4–6	267	43.7
7–9	48	7.9
Number of preschool children		
≤2	506	82.8
>2	105	17.2
Frequency of face washing		
More than once a day	523	85.6
Once a day	43	7.0
Occasionally	45	7.4
Ocular discharge		
Yes	102	16.7
No	509	83.3
Nasal discharge		
Yes	109	17.8
No	502	82.2
Child education		
Preschool child	557	91.2
Not attending school	27	4.4
Grade 1–3 attending school	27	4.4
Soap usage for face		
Yes	582	95.3
No	29	4.7
Bathing child		
Yes	602	98.5
No	9	1.5
Frequency of bathing		
Sometimes	374	61.2
Always	237	38.8
Share towel		
Yes	172	28.2
No	439	71.8
Flies present		
Yes	63	10.3
No	548	89.7
Number of flies		
1–3	29	46.0
4–7	23	36.5
>7	11	17.5
Child facial cleanliness		
Clean	460	75.3
Unclean	151	24.7

207 (92.4%), TI eight (3.5%), and combination of TF/TI nine (4%). This result was almost comparable with the prevalence of trachoma in Ethiopia, which reported 40.1% national prevalence and 33.2% Southern regional prevalence.¹² It was also consistent with studies conducted in Samburu district of Kenya,¹³ Hai district of Northern Tanzania,¹⁴ and in Mali,¹⁵

accounting 35%, 34.9%, and 34%, respectively. However, the prevalence was lower than a report from Southern part of Sudan¹⁶ and another report from Unity state in South Sudan,¹⁷ which reported 64% and 71%, respectively. The lower prevalence in our study might be because of the increment of mass antibiotic distribution coverage with better integration of health promotion on primary eye care, health information on personal and environmental hygiene of the district.

On the other hand, the prevalence of trachoma in the current study was higher than a report from Baso Liben district,¹⁰ and another report from Mojo and Lume districts¹⁸ of Ethiopia, which reported prevalence of 24.1% and 22.51% of trachoma, respectively. It was also higher than a report from Kano state of Nigeria,¹⁹ which reported 17.5% prevalence of trachoma. The higher prevalence in the current study might be due to endemicity of the disease in the district, period of study, and geographical and cultural factors. The prevalence was also beyond the WHO benchmark definition of public health importance (AT ≥20%).^{20–22} Therefore, the finding of the current study confirmed that trachoma is still a disease of public health importance in Zala district.

In this study, it was found that children from household heads having inadequate knowledge about trachoma were 2.8 times more likely to develop trachoma compared with children from household heads who had adequate knowledge. This finding is consistent with the study conducted in Baso Liben district¹⁰ and rural zones of Ethiopia.²³ It is also consistent with a similar study from Tanzania.²⁴ It might be less access to information, education, and communication about trachoma that made the children from the household heads who had inadequate knowledge about trachoma develop trachoma.

The current study showed that the odds of developing trachoma were 1.6 times more common among children of households whose latrine distance was ≤10 m compared with those whose latrine distance was >10 m. This is in line with studies conducted in Gambia²⁵ and Hawzien district, Tigray.²⁶ On the contrary, a study from Egypt showed that the presence of a functional latrine near the house had been associated with lower trachoma prevalence.²⁷ The decrease in latrine distance from the household possibly allowed flies to be in the house and frequent exposure of the children to the flies possibly made them develop trachoma.

Those children from households having more than two preschool children were 2.2 times more likely to develop trachoma than those households having two or less preschool children. This is consistent with a study conducted in Hai district Tanzania.¹⁴ This could be due to the fact that increases in number of preschool children decreases care

Table 4 Multiple logistic regression predictors of trachoma among children aged 1–9 years in Zala district from February 28 to 26 March 2014

Variables	Trachoma statue		COR (95% CI)	AOR (95% CI)
	Yes No (%)	No No (%)		
Knowledge of trachoma				
Inadequate knowledge	126 (56.2)	119 (30.7)	2.9 (2.06, 4.07)*	2.8 (1.9, 4.2)*
Adequate knowledge	98 (43.8)	268 (69.3)	1	1
Latrine distance (m)				
≤10	134 (59.8)	196 (50.6)	1.5 (1.04, 2.02)*	1.6 (1.09, 2.4)*
>10	90 (40.2)	191 (49.4)	1	1
Number of preschool children				
≤2	166 (74.1)	340 (87.9)	1	1
>2	58 (25.9)	47 (12.1)	2.5 (1.7, 3.9)*	2.2 (1.3, 3.7)*
Flies on face				
Yes	53 (23.7)	10 (2.6)	11.7 (5.8, 23.5)*	6.3 (2.7, 14.7)*
No	171 (76.3)	377 (97.4)	1	1
Facial cleanliness				
Clean	130 (58.0)	330 (85.3)	1	1
Unclean	94 (42.0)	57 (14.7)	4.2 (2.8, 6.2)*	2.4 (1.5, 3.9)*

Note: *Significant at $P \leq 0.05$.

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; COR, Crude odds ratio.

given to the children by the household members/care givers. Moreover, depletion of family resource as a result of caring for increased number of preschool children might increase the risk of exposure to poor hygiene and consequently to *Chlamydia* infection.

Presence of flies on the face of children was significantly associated with trachoma status. The odds of trachoma were 6.2 times higher among children observed with flies on their face compared with their counterparts. This is in line with two studies from Mali,^{15,28} and a study conducted in Maksegnit town, Northwest Ethiopia²⁹ that showed children with flies on their face were over two times more likely to have active trachoma than those children without flies on their face. Studies from Southern Sudan,¹⁶ Nigeria,¹⁹ Senegal,³⁰ have also reported the same finding. However, it disagrees with a study conducted in Samburu district.¹³ The difference could be due to the endemicity of the area and low hygienic practice in which flies were attracted by unclean faces.

Facial cleanliness of the child was significantly associated with trachoma. Those children with unclean faces were two times more likely to develop trachoma than those children with clean faces. This is comparable with studies conducted in Southern Sudan,¹⁶ Kano state of Nigeria,¹⁹ Maksegnit town, Gondar,²⁹ Kaolack district Senegal,³⁰ Dangla, Ethiopia,³¹ Ankober, Ethiopia,³² and Kersa district of Southwestern Ethiopia.³³ This is due to the fact that children with unclean faces could be more likely to spread ocular secretions infected with *C. trachomatis* among one another, particularly if their face is cleaned by the same cloth, unclean face produces eye

discharge that attracts flies, which is the main transmission mechanism. Dacron swabs for the Chlamydia RNA polymerase chain reaction test were not done to confirm ocular chlamydia infection. This was the limitation of the study.

Conclusion and recommendation

The prevalence of trachoma among children aged 1–9 years found in Zala district was high. Among a number of risk factors, head of household having knowledge about trachoma, distance from latrine to household, number of preschool children in the household, presence of flies on the face of the child, and cleanliness of the child's face were independently associated with trachoma. Hence, it is a serious problem and requires immediate attention, such as creating an awareness program in the community, informing parents about the severity of trachoma, and encouraging children and parents to practice hand washing, proper excreta disposal, and cleanliness of surrounding areas.

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Disclosure

The authors report no conflicts of interest in this work.

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