Prevalence and Risk Factors of Active Trachoma among Rural Preschool Children in Wadla District, Northern Ethiopia: A Community Based Cross-Sectional Study

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Abstract

Background Trachoma is a neglected eye problem and primary cause of preventable corneal blindness. In endemic areas, initial infection occurs in early childhood, and recurrent infection progress to scarring and blindness. In the past four decades, GET2020 initiative eliminated Trachoma from developed countries through enhancements of hygiene and sanitation but still a problem of developing countries. Studies and reports also indicated the presence of high prevalence of Trachoma in Ethiopia and in the study area. Thus, the purpose of this study is to assess the prevalence and risk factors of active trachoma among rural preschool children in Wadla district, Ethiopia. Methods: A community based cross-sectional study design was considered to gather data from 583 children using sample size determination, but 596 children were screened for signs of active trachoma because of the sampling procedure nature, cluster sampling technique. Wadla district has 150 rural villages, which are similar in topography and socio-demographic status. Based on rule of thumb 30 villages (clusters) were included for the data collection. An interview on socio-demographic data were collected by health informatics professionals using structured interview questioners, which were prepared through reviewing previous literatures and pretested in Meket Woreda. Eye examination was performed by Integrated Eye Care Workers who trained for one month for the purpose of trachoma screening by Carter center-Ethiopia. Results - The prevalence of active trachoma among rural pre-school children in Wadla district was 130 (21.8%). Regarding risk factors, poor economic status (AOR (95% CI), (3.8 (1.3-11.4), being 37- 48 months old (AOR (95% CI), (4.2 (1.5-12.0), thatched house roof (AOR (95%CI), (4.4 (1.4-13.6), presence of fly in nearby home (AOR (95% CI), 4.6 (2.1-9.9), once weekly face washing frequency (AOR (95% CI), 8.6 (2.5-29.3), unwashed face for longer than a week (AOR (95% CI), 10.6 (2.9-37.7), not using soap (AOR (95% CI), 4.5 (1.8-11.3), and absence of latrine (AOR (95% CI), 5.1 (2.0-12.9) have association with active trachoma. Conclusion: Environmental factors weigh other factors and this could capture the intention of policy makers to emphasize on the environmental components like sanitation including face cleanness to decrease the prevalence of trachoma

Background

Trachoma is a neglected eye problem and primary cause of preventable corneal blindness [1, 2]. It is categorized as active trachoma (AT) and inactive types of trachoma [2-4]. In endemic areas, initial infection occurs in early childhood, and recurrent infection progresses to scarring and blindness [5, 6]. Usually, trachoma is a disease of poverty, and poor hygiene [7-9], which mainly infect children [5], and adult women because of close and long-time contact with small children, who are the main pool of trachoma infection [10]. Globally, 60 to 80 million peoples were had been active trachoma with annual deaths of 500 and 2.3 million disability adjusted life years [11].

A study in Nigeria [12] disclosed the presence of flies on the face and absence of toilet in the compound as independent factors of active trachoma. A survey in 4 African countries

revealed the prevalence of Trachomatous follicular was highest among children aged 2–5 years in Ethiopia and Niger [13].

Studies in Ethiopia reported that being female, having unclean face, not using soap, poor face washing habit, and absence of latrine as risk factors of active trachoma [14, 15]. A study in Gonder indicated being 1-5 years old had association with active trachoma[16]. Following World Health Organization's SAFE (Surgery, Antibiotic, Facial cleanness and Environmental change) strategy implementation through global elimination of trachoma (GET2020) initiative with a plan of elimination from the globe in 2020 [17]; Ethiopia launched VISION 2020 initiative in 2002 following this WHO recommendation [18].

Consequently, in the past four decades, using GET2020 initiative as weapon trachoma had been eliminated from developed countries particularly with enhancements of hygiene and sanitation but still a problem of developing countries [19].

The simple cases of trachoma can be treated by antibiotic and more complex cases can be treated with a simple surgery [20]. Irrespective of intensive SAFE implementation in Ethiopia, the prevalence in Amhara region, Wag Himra zone was 52.4% [18, 21] and one newspaper reported that Wag Himra zone was attributable to the world's highest trachoma prevalence[22]. These indicate that the prevalence of Active trachoma in most part of Ethiopia [15, 23] and in the study area, Amhara region [24-26] is still a public health problem and needs frequent assessment.

Methods

Study design and population

A community based cross-sectional study design was used from March 11/2017 to April 26/2107. The population of Wadla district was 128,170 with 64,574 males and 63, 596 females. There were 28,414 households in this district and resulting an average of 4.51 persons per house ratio [27]. The source population are children aged 1-5 years and their care givers in 150 rural villages of Wadla district, whereas the study population are children aged 1-5 years and their care givers in 30 selected clusters or villages.

Sampling Procedure

Wadla district has 20 Kebeles with a total of 247 villages. Of these 150 were rural villages. While selecting study participants two stage sampling techniques were used. The first stage was selecting 30 of 150 rural clusters or villages as study population. The second phase was choosing 583 children within those 30 villages or cluster. The study includes all children aged 1 to 5 years from 499 households based on cluster sampling assumption (Figure 1).

Sample size determination

The sample size estimated using single population proportional formula and got 583. The assumptions used was proportion of 35.7% [12], 95% CI, 5% margin of error, 1.5 design effect and 10% non- response rate. It is calculated as

$$n = \frac{(1.96)^2 (0.357X\ 0.643)}{(0.05)^2},$$

$$n = \frac{3.8416x.229551}{(0.0025)} = 352.7 \approx 353$$

After adding a design effect of 1.5, it gives (353 X 1.5) +353 = 529.5+52.95=882.45=583

Data collection tools and procedures

The interview part like socio-demographic data were collected by diploma in health informatics professionals using structured interview questioners, which were prepared through reviewing previous literatures [26, 28].

Eye examining was performed by Integrated Eye Care Workers (IECWs) who trained for one month for the purpose of trachoma screening by Carter center-Ethiopia. The training was delivered using both pictures and live patients. Each of the trainer diagnosed 5 live patients and read 10 pictures of different active trachoma signs independently. The diagnosis and picture reading were assured by the trainers' weather they diagnosed correctly or not. While they were screening children, they initially observe the eyelashes and cornea to appreciate two of the inactive types of trachoma then eversion of the upper lid and inspection of the upper tarsal conjunctiva using WHO simplified grading scheme to identify the active stages using 2.5 times loupe magnifiers [4].

Data Analysis

Data were checked for normality using hosmer-lemeshow-goodness-of-fit, and then coded and entered into Epi-info version 7 and transferred to statistical package for social science version 23 for data analysis. Both bi-variable and multi - variable analysis was carried out. Potential co-linearity was considered and tested. Variables with P-value less than 0.05 in multivariable analysis were considered as statistically significant.

Results

Socio – demographic characteristics of care-givers

Although, the sample size was 583, a total of 596 preschool children from 499 households were screened for signs of active trachoma using cluster sampling technique. All the children aged 1 to 5 years from a single household were examined for trachoma. This causes to have 100% response rate. All 499 households' children aged 1-5 years were included in the study. All 499 households were Amhara in ethnicity and were a follower of Ethiopian orthodox Christianity ***(Table 1).***

Environmental characteristics

Households, which consume less than 20 litter of water per day were 180 (36.1%) and 459 (92%) households were walking 1/2hr to fetch water. Seventy-four percent (371) of the respondents were had private latrine in their nearby house whereas 243 (48.7%) household's surrounding were had feces ***(Table S1).***

Nearly, twenty nine percent of houses were had clean grass house roof, 26.7% had thatched corrugated iron roof, 27.5% had thatched grass roof and 16% were had a clean corrugated iron house roof

Characteristics of children

Off the total screened children for active trachoma 301 (50.5%) were males and 295 (49.5%) were females ***(Table 2).***

Prevalence of Trachoma

The prevalence of active trachoma in Wadla district was 130 (21.8%), [(95%, CI), (18%, 25%)]. Of these 106 (81.5%) was TF, 13 (10%) was TI, and both TF and TI were 11 (8.5%). There was no trachomatous scarring (TS), trachomatous trichiasis (TT), and corneal opacity CO).

Regarding sex of children, 56.2% female and 43.8% male children were had active trachoma.

The prevalence of active trachoma among 12 – 24 months old children was 2.3%, of 25-36 months old was 10.8% and of 48-59 months old was 29.2%.

Risk Factors

Socio-demographic, personal and economic factors

On bi-variable analysis poor economic status (COR (95% CI), (4.638(2.353-9.143), being in 24-36 months old (COR (95% CI), (.498 (.254-.975), educational status of fathers (COR (95%CI), (1.696 (.845-3.404), educational status of mothers (COR (95% CI), (2.962 (1.320-6.647), MUAC of children < 13.9cm (COR (95% CI), (1.696 (1.139-2.527) were had association with active trachoma. But on multi-variable analysis only poor economic status (AOR (95% CI), (3.804 (1.267-11.424) and being in 37- 48 months old (AOR (95% CI), (4.213 (1.475-12.034) increase the odds of active trachoma ***(Table S2).***

Environmental factors

The multi variable analysis indicated thatched grass house roof (AOR (95%CI), (4.402 (1.425-13.597), and presence of fly near to home increase the odds of active trachoma ***(Table 3).***

Discussion

The prevalence of Active Trachoma in rural Wadla district among rural preschool children was 21.8%, [(95%, CI), (18%, 25%)]. This puts the district on the second stage of World Health Organization threshold [17]. The research indicates SAFE strategy were unsuccessful in the last 7 years in Wadla district [29]. There are also studies [14, 15, 25, 28] that reported the prevalence of Active Trachoma above 20%. It displays that trachoma is still a public health problem. The finding also agreed with previous reports and researches [15, 30] done in Africa and different parts of Ethiopia, such as the 6^{th} meeting report of WHO, that reported the prevalence of active trachoma in Algeria was 26%, in Burkina Faso was 26.9% [30] and a study in different regions of Ethiopia reported the prevalence as 22.6% in Somali region, in Tigray region 26.5% and 19.1% in Gambela region [15].

The finding of this study was lower than that of the studies done in southern Sudan was 64.5% [31], in Egypt was 49% [32], and in Nigeria was 35.7% [12]. This variation might be the result of different study period and difference in health care service. Because this study conducted after 8 years in relative to these comparing studies. In addition, intensive SAFE strategy implementation in all endemic countries were reached peak in the past seven years. Similarly, the finding is lower than many studies 59.2% [33], 32.4%, 42.4%, 56.9% [28], 62.6% [14], 40.1% [23] conducted before 2015. Therefore, the current reduction of active trachoma in the study area and in other endemic areas across the continent [16]

Africa, is mainly the result of SAFE strategy and improved socio-demographic characteristics. But, the finding of this study was higher than a study conducted in 2016 in Gonder, Ethiopia (12.1%) [16]. The difference might be because of different study population, level of urbanization and difference in infrastructure. This study done only in rural children aged 6 moths to 5 years but the comparative one is in urban children aged 1 – 9 years old [16].

The prevalence of TI in this study area was 3.4% agreed with the study conducted in South Wollo zone was 4.3% [34], and lower than the study in South Gonder zone was 7.0% [34]. This discrepancy might be the result of different study subjects and this discrepancy agreed with the statement that the progress of trachoma from one stage to other stage is gradual and increases as age increases [2].

The study showed washing face once weekly (AOR (95%CI), 8.686 (2.577-29.277) and unwashed face for longer than a week (AOR (95% CI), 10.592 (2.974-37.727) as well as presence of fly in near home (AOR (95% CI), 4.603 (2.138-9.911) had positive association with active trachoma, which is in line with a study conducted in southern Sudan, and Gonder, Ethiopia [35, 36]. Absence of toilet (AOR (95% CI), 5.089 (2.011-12.876) also had positive association with active trachoma, which is similar with a study conducted in Nigeria, Egypt, north-west Ethiopia, and Gonder [34, 35, 37, 38]. The presence of human excreta near to home (AOR (95%CI), 5.089 (2.011-12.876) was also increase the odds of active trachoma. This is supported with a study conducted in Dera district, Ethiopia [39]. This study also reported not using soap while washing face were increasing the odds of acquiring active trachoma (AOR (95%CI), 4.493 (1.788-11.290) and it is supported by the study conducted in Dessie city, Ethiopia, and Gonder, Ethiopia [35, 40].

All of these positively risk factors agreed with a literature that trachoma is mainly attributed to environmental factors, sanitation and hygiene practice. The Bazaar vector, *Musca Sorben* is also proposed as major risk factor of trachoma, which is multiplied in open field human excreta. Therefore, the absence of latrine increase the occasion of fly multiplication sites and densities of fly and in turn causes active trachoma[41]. The poor habit of hygiene and sanitation as well as failure to use soap also contribute for the presence of ocular and nasal discharge on children’s face, which open the opportunities for flies to contact with unclean face of those children.

Thatched grass house roof (AOR (95% CI), 4.402 (1.425-13.597) had association with active trachoma, which is in line with a study done in central Ethiopia [42] and poor economic status (AOR (95% CI), 3.804 (1.267-11.424) also increase the odds of active trachoma supported by the study done in Gonder, Ethiopia [35]. These association are also consistent with a literature that trachoma is a disease of poverty, overcrowding, and poor hygiene [8, 9].

Conclusion

The prevalence of trachoma is high in the study area. Environmental factors weigh other factors and this could capture the intention of policy makers to emphasize on the

environmental components like sanitation including face cleanness to decrease the prevalence of trachoma while caring preschool children.

Abbreviations

COR – Crude odd ratio, AOR- Adjusted odd ratio, CI – Confidence interval, AT-Active Trachoma, SAFE-Surgery, Antibiotics, Facial Cleanness, Environmental Changes, GET2020- Global elimination of Trachoma in 2020, WHO- World Health Organization, TT-trachomatous trichiasis, TF- trachomatous follicular, TI- trachomatous intense, TT-trachomatous trichiasis, CO- corneal opacity, MUAC-Mid upper arm circumference.

Limitation

- The study didn't take stool sample. Because of this the relation of active trachoma with sanitation and hygiene or intestinal parasitic infection is not established
- The lack of research on children aged 1 to 5 years impose us to discuss with researches done on children aged 1 to 9 years. This might decrease the reliability of the research.

Declarations

Ethical Consideration

Prior to the commencement of this study ethical approval letter was obtained from Mekelle University. The study protocol was evaluated and approved by the Health Research Ethics Review Committee [HRERC 0917/2017] of College of Health Sciences, Mekelle University. Written permission was also obtained from Woldia zonal health department and send to Wadla district health office. The Woreda health office was also approved the permission got from North Wollo zone health department. Finally, written consent was taken from children's parents or care givers for interview and eye screening after explaining the purpose of the study to the care givers of children. Confidentiality was also maintained by omitting the name and personal identification of respondents (both children and care givers) because it was not compelled to the study.

STROBE statement: the manuscript is reported in a format which adheres to STROBE guidelines, (http://www.strobe-statement.org/) for reporting observational research according to BioMed Central editorial policies (http://www.biomedcentral.com/submissions/editorial-policies#standards+of+reporting).

Consent for Publication

Participants (care givers) were informed and gave their written consent to publish the findings in repeatable international journals.

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Availability of data and materials

The raw material supporting the conclusions of this research will be available to researchers needing the data to use for non-commercial purposes.

Author Contributions

Conceived the title and designed the study: MWK, and AMA. Field study: MWK, KDT. WMT, MAG, AMA. Analyzed the data: MWK, AMA, KDT, MAG, WMT. Critically revising the work: MWK, AMA, KDT, MAG. Writing the final paper: MWK, WMT, AMA and KDT. Finally, all authors have read and approved the final version of this manuscript”

Competing interests

The authors declare that they have no any conflicting of interests

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Tables

Table 1: The socio-demographic and related factors of households in the study of Prevalence and risk factors of active trachoma among rural preschool children in Wadla district, Northern Ethiopia, 2016/17, (n=499).

Variables	Frequency (n=499)	Percent (%)
Sex of head of Household		
Male	383	76.8
Female	116	23.2
Marital status of head of household		
Married	492	98.6
Divorce	7	1.4
Social Class or status of household		
Poor	144	28.9
Medium	279	55.9
Rich	76	15.2
Occupation of head of house hold		
Farmer	466	93.4
Merchant	17	3.4
Government employee	16	3.2
Educational status of head of household		
Unable to read and write	325	65.1
Able to read and write	109	21.8
Up to grade 8	35	7
Grade 9-12	19	3.8
Diploma and above	11	2.2
Educational status of mothers		
Unable to read and write	380	76.2
Able to read and write	55	11
Up to grade 8	23	4.6
Grade 9-12	35	7
Diploma	6	1.2
Number of rooms		
One	424	85
Two and More	75	15
Family Size		
Less than 6	286	57.3
Greater than/Equal to 6	213	42.7
Total number of children less than five years in the house		
One	424	85
Two	69	13.8
Three	6	1.2
Number of children less than ten years in the house		
One	132	26.5
Two	240	48.1
Three	102	20.4
Four	25	5
Adult Face washing habit		
At least one times per a day	417	83.6
Less than 7 times per week	82	16.4

Table 2: The socio-demographic characteristics of children on the prevalence and risk factors of active trachoma among rural preschool children in Wadla district, North East Ethiopia, 2017, (n=596)

Variables	Frequency (n=596)	Percent
Sex of children		
Male	301	50.5
Female	295	49.5
Age of children in months		
12 – 24	208	34.9
25 – 36	102	17.10
37 – 48	129	21.6
49 – 59	157	26.3
Current breast-feeding status of children		
Yes	239	40.1
No	357	59.9
Face washing frequency of children		
2 or more times per a day	108	18.1
Once daily	79	13.3
2 to 6 times per week	149	25
Once weekly	167	28
Stays unwashed for longer than a week.	93	15.6
Habit of child bathing for at least one times per a week		
Yes	445	74.7
No	151	25.3
Use of soap for face washing		
Yes	264	44.3
No	332	55.7
Use of soap for hand washing		
Yes	254	42.6
No	342	57.4
Face of children on observation		
Clean face	280	47
Ocular discharge	89	14.9
Nasal discharge	75	12.6
Flies on the face of child		10.6
Ocular and nasal discharge	34	5.7
Ocular & nasal discharge & flies on the face	55	9.2
Presence of other eye problem		
Yes	146	24.5
No	450	75.5
Type of eye problem (n=146)		
Discharge	96	65.6
Itching	8	5.3
Excessive tear	25	17.1
Redness of eye	18	12.2
Took drug during mass drug administration in the last year		
Yes	515	86.4
No	81	13.6

Variables	Trachoma (n=596)		OR (95% CI)	
	Presence (%)	Absence (%)	COR	AOR
House roof				
Clean iron	15 (11.5)	82 (17.6)	1.00	1.00
Thatch iron	24 (18.5)	141 (30.3)	0.9(0.5-1.9)	0.9 (0.3-2.8)
Clean grass	27 (20.8)	144 (30.9)	1.0(0.5-2.0)	0.7 (0.2-2.2)
Thatch grass	64 (49.2)	99 (21.2)	**3.5 (1.9-6.7) ***	**4.4 (1.4-13.6) ***
Fly in near House				
Yes	96(73.8)	206 (44.2)	**3.6 (2.3-5.5)**	**4.6 (2.1-9.9) ***
No	34 (26.2)	260 (55.8)	1.00	1.00
Face washing frequency				
Two/more times	9 (6.9)	99 (21.2)	1.00	1.00
Once daily	2 (1.5)	77 (16.5)	0.3 (0.1-1.4)	0.2 (0.03-1.3)
2-6 times per week	15 (11.5)	134 (28.8)	1.2 (0.5-2.9)	1.366 (.365-5.114)
Once weekly	63 (48.5)	104 (22.3)	**6.7 (3.1-14.1) ***	**8.7 (2.6-29.3) ***
Unwashed for a week.	41(31.5)	52 (11.2)	**8.7 (3.9-19.2) ***	**10.6 (2.9-37.7) ***
Soap for face washing				
Used	26 (20)	238 (51.1)	1.00	1.00
Not used	104 (80)	228 (48.9)	**4.2 (2.6-6.7) ***	**4.5 (1.8-11.3) ***
Soap for hand washing				
Used	35 (26.9)	219 (47.0)	1.00	1.00
Not used	95(73.1)	247 (53.0)	**2.4 (1.6-3.7) ***	1.6 (0.8-3.6)
Household Latrine				
Present		364 (78.1)	1.00	1.00
Absent		102 (21.9)	**2.0 (1.3-3.0) ***	**5.0 (2.0-12.9**) *
Waste around house				
Exist	80(61.5)	214 (45.9)	**1.9 (1.3-2.8) ***	**3.4 (1.6-7.6) ***
Not exist	50 (38.5)	252 (54.1)	1.00	1.00
Place of cooking				
Within the house	102 (78.5)	295 (63.3)	**2.1 (1.3-3.3) ***	1.3 (0.6-2.9)
Out of house	28 (21.5)	171 (36.7)	1.00	1.00

Variables	Trachoma (n=596)		OR (95% CI)	
	Presence (%)	Absence (%)	COR	AOR
House roof				
Clean iron	15 (11.5)	82 (17.6)	1.00	1.00
Thatch iron	24 (18.5)	141 (30.3)	0.9(0.5-1.9)	0.9 (0.3-2.8)
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Once weekly	63 (48.5)	104 (22.3)	**6.7 (3.1-14.1) ***	**8.7 (2.6-29.3) ***
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Out of house	28 (21.5)	171 (36.7)	1.00	1.00

Table 3: The bi-variable and multi-variable logistic regression for the presence of association between active trachoma and environmental as well as related factors on the title prevalence and risk factors of active trachoma among rural preschool children in Wadla district, Northern Ethiopia, 2016/17

Note: “*” = P - value less than 0.001 and “**” = P - value less than 0.05 on bi-variable analysis

Figures

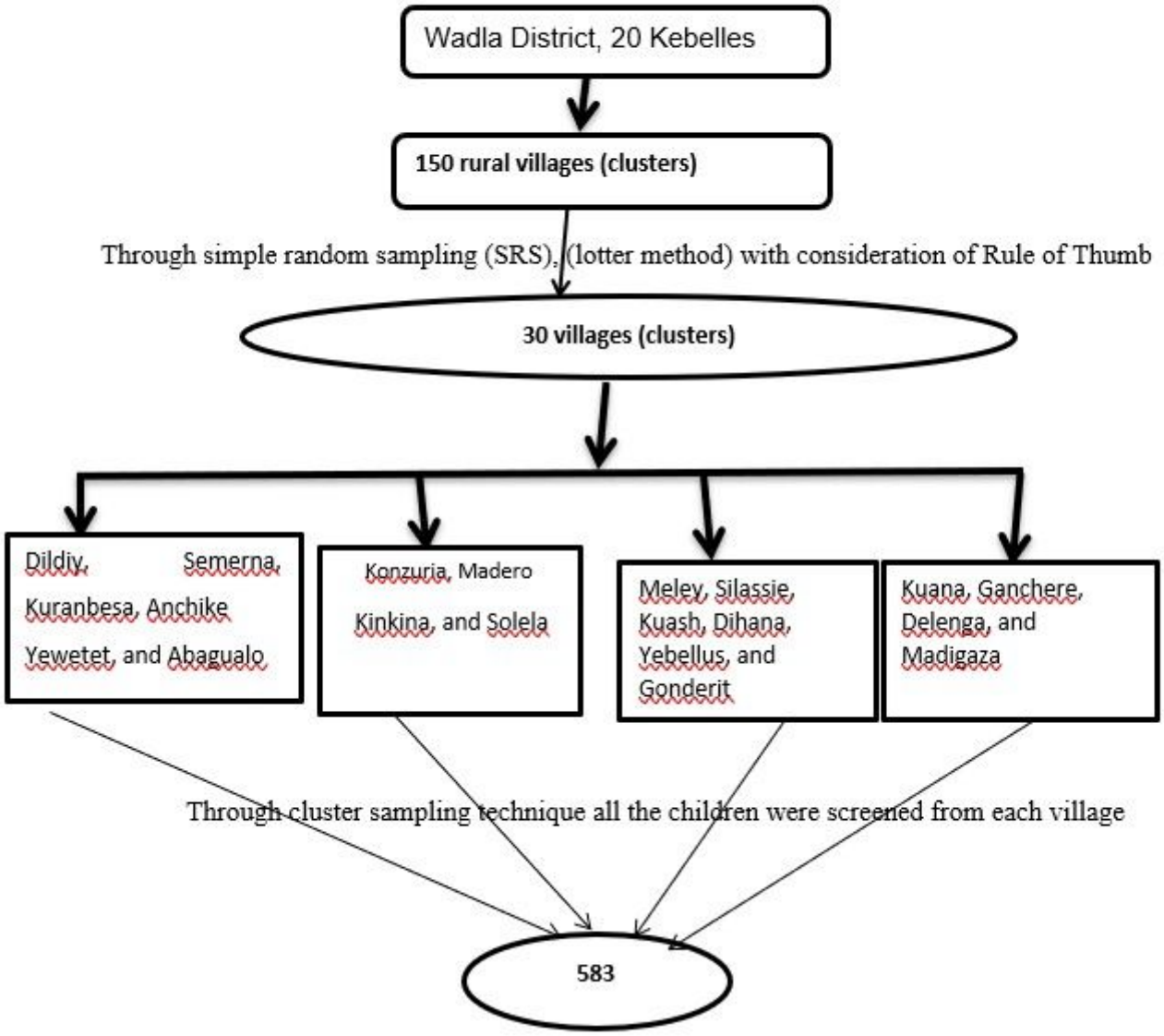

Figure 1

Schematic presentation of Sampling Selection Procedure for the study on the prevalence and risk factors of active trachoma among rural preschool children in Wadla district, North Wollo zone, Amhara region, north east Ethiopia, 2016/17.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- STROBE.docx
- TableS2.docx
- TableS1.docx
- PointPointResponseBMC.docx