Determinants of active trachoma among children aged 1-9 years in Ol Donyo Nyokie location, Kajiado County, Kenya

Nasieku L[1], Mutai J[2], Muthami L[2] Karanja S[1]

1. Jomo Kenyatta University of Agriculture and Technology, Department of Public Health Nairobi
2. Centre for Public Health Research (CPHR)

Corresponding Author: Nasieku Lengala, P.O Box 28265-00100; E-mail: naslenga01@gmail.com

Abstract

Objective: To determine the factors associated with active trachoma among children aged 1-9 years in Ol Donyo Nyokie, Kajiado County.

Methods: This was a descriptive cross-sectional study which utilized both quantitative and qualitative techniques for data collection and was carried out at Ol Donyo Nyokie, Kajiado County. Sequential sampling procedure was used to select study participants. A total of 345 mothers together with their children were sampled. The random start was adopted using lottery method and then every 3rd household until a desired sample size of 345 had been achieved. In households with more than one child, one among them was selected by lottery method. Physical examination on the children's eyes was done while their respective mothers participated in the questionnaire survey supported by observation checklist. Two Focus group discussions were also conducted among mothers and Key Informant interviews among healthcare providers.

Results: The overall prevalence of active trachoma was found to be 15.7%. Stratified by age and sex, the younger age group (1-5) years had a 2.13-fold risk of getting active trachoma ($\chi 2$ (1) =5.93, p< 0.017; AOR=2.13 [95%: CI=1.15-3.96] compared to the older group (6-9) years. There was however no significant difference between males and females (P>0.05). In the final logistic regression model; Face washing frequency (P<0.001), child's dirty face(P<0.005), water access >30 mins(P<0.006), mother's level of education(P<0.017), age of child(P<0.021), monthly income(P<0.029), pit latrine ownership(P<0.039), open defecation(P<0.054) and pit latrine usage (P<0.055) were identified as the predictors of active trachoma. In the Focus Group Discussion, about three quarters (74%) of the mothers were aware of trachoma. Majority of the mothers who were aware of trachoma indicated that water was a major challenge in the area without which trachoma could not be eliminated. Majority of the respondents did not own pit latrines and few of them also disregarded their use. From the Key Informant Interviews most of the respondents confirmed that water, lack of formal education and poverty were the major problems facing the community in the study area.

Conclusion: The prevalence was found to be high, which indicates that active trachoma is still a major public health concern in the study area. Poor socio-economic and environmental conditions exacerbate the suffering of the community and make it difficult to prevent and control trachoma. Enhancement of interventions, therefore, particularly of facial cleanliness and environmental sanitation should be addressed to ensure effective prevention and control of trachoma and to bring down the prevalence levels below the WHO threshold of (>10 % prevalence).Community participation in education and outreach services are also crucial.

Key Words: Active trachoma, children 1-9 years, risk factors, control and prevention, Kenya.

[Afr J Health Sci. 2017; 30(2):77-86]

Introduction

Trachoma is an eye infection caused by *Chlamydia trachomatis*, which may result into eye disease after repeated re-infections. It remains the principal cause of preventable blindness and the second leading cause of blindness globally [1]. Its prevalence is disproportionately high in children and women in poor rural communities. Children mostly feel the brunt of trachoma infection as it greatly affects their physical well being through pain and itching of the eyes, swelling of eyelids and watery discharge from the eyes. Trachoma infection causes papillary and/or follicular inflammation of the tarsal conjunctiva, which is referred to as active trachoma, subdivided into trachomatous inflammation follicular and trachomatous inflammation intense [2]. Recurrent infections of the conjunctiva lead to the development of scar tissue within the conjunctiva. Because of the contraction of the scar tissue, the eyelid is turned inward allowing the eyelashes to rub against and eventually abrade the cornea (trachomatous trichiasis), eventually leading to corneal opacity and blindness [2]. The global objective set by the World Health Assembly in 1998 is to eliminate trachoma as a blinding disease by the year 2020 [3]. The World Health Organization has endorsed the implementation of the SAFE strategy (Surgery to correct trichiasis, Antibiotics to treat active infection, Facial cleanliness to prevent the transmission of bacteria and environmental improvement by increasing use of latrines and access to water) to help trachoma endemic countries achieve disease elimination [4]. Children younger than 10 years primarily pre-school aged children are most susceptible to active infection, and thus the target of preventive activities, most notably face-washing to eliminate the ocular and nasal discharge that attracts flies to the face and allows the transmission of *Chlamydia* from person to person [5,6].

Trachoma is predominantly confined to resource-limited settings in developing nations of Africa, the Middle East, Asia, Latin America, Pacific Islands and remote aboriginals' communities in Australia [7]. It is currently estimated that there are about 1.3 million people are blind from the disease and a further 8.2 million have trichiasis. Globally, trachoma is responsible for a loss of approximately $2.9 billion in productivity per year [1]. Overall Africa is the most affected continent; 27.8 million cases of active trachoma and 3.8 million cases of trichiasis [8]. Twelve out of forty seven counties in Kenya have been confirmed to be trachoma endemic [9]. Overall 6 million Kenyans are at risk of infection. Trachoma Trichiasis (TT) prevalence is estimated at 3.6%, Trachoma Follicular (TF) prevalence (children 1-9 years of age) is estimated at 20.6% while trichiasis backlog is 46,000 [10].

Materials and methods

Study Design and population: This study was a descriptive cross sectional study. It was carried out in Ol Donyo Nyokie Location, Kajiado County between June-September 2015. A total of 345 mothers together with their children aged 1-9 years who were at their homes at the time of the study were enrolled. Sequential sampling procedure was used to select study participants. The random start was adopted using lottery method and then every 3rd household with a child was sampled until a desired sample size of 345 had been achieved. In households with more than one child, one among them was selected by lottery method. The study utilized both quantitative and qualitative approaches for data collection. Two separate Focus Group Discussions (FGDs) comprising of mothers of children aged 1-5 years and another one with mothers of children aged 6-9 years who were willing to participate in the study were conducted. Key Informant Interviews took place at the individual participants work station and were conducted

among healthcare providers. All the 345 children were assessed for active trachoma by two eye specialists using the WHO trachoma simplified grading system. The physical examination of the eyes was done by careful inspection of eye lashes, cornea, limbus, eversion of the upper lid and inspection of the tarsal conjunctiva by the help of magnifying binocular lenses (x2.5) and penlight torches. A case for active trachoma was defined in the light of five indicators which are watery discharge from the eyes, painful eyes, swollen eyelids, itching eyes and follicles in the eyes. The presence of all the indicators amounted to a definitive case of active trachoma.Direct observation was also used to collect data. The technique was useful in triangulation and verification of information that was obtained from other methods of data collection. Observation was made to detect any given abnormalities both on the respondent and within study environment.

Data analysis

Quantitative data was managed and validated in excel and then analyzed using Statistical Package for Social Science (SPSS) Version 23.The quantitative data was subjected to descriptive statistics; i.e. presented as means, frequency distributions and standard deviations while categorical data was subjected to cross tabulations and presented as frequencies and percentages. All variables were subjected to bivariate statistics to establish the allowable values and those variables that required transformation. Pearson's Chi Square (χ^2) test was then used to test for associations between all variables and their level of significance established. All the variables established to be significant at 15 %($p \leq 0.15$) were included in the logistic multivariate analysis to establish the factors associated with the dependent variable (active trachoma). This was done using binary logistic regression and adjusted for confounders and effect modifiers. The process applied stepwise logistic regression. The significant variables were identified at the 5% level of significance.

Qualitative data was transcribed and manually analyzed in accordance to themes and the study objectives.

Ethical Approval: The Scientific Steering Committee (SSC –SSC No.2973) and Ethical Review Committee (ERC) at Kenya Medical Research Institute (KEMRI) approved the study for scientific review and ethical approval respectively. Signed informed consent was voluntarily obtained from the respond

Results

Prevalence of Active Trachoma stratified by sex and age among children aged between 1-9 years

The overall prevalence of active trachoma in children aged 1–9 years was 15.7% (95% CI: 12.0-19.9). Table 1below gives a summary on prevalence stratified by age and sex.

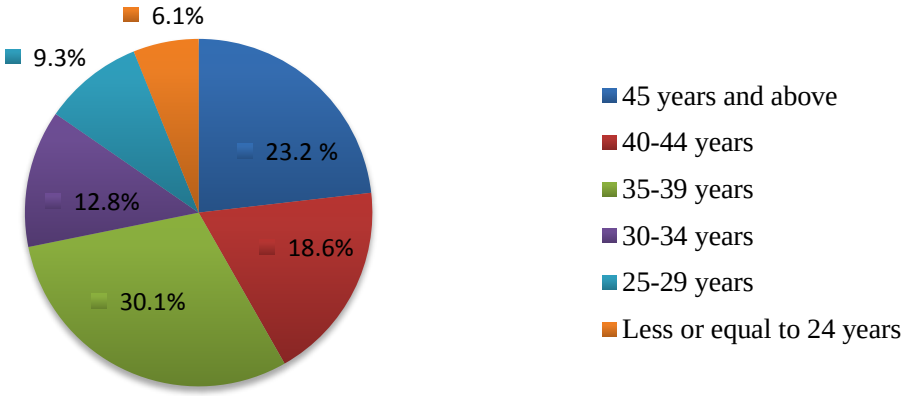
Table 1: Prevalence of active trachoma stratified by age and sex among children aged 1-9 years

Variable		No. of children with active trachoma (n)	Proportion of children with active trachoma (%)	95% Confidence Interval
Sex	Males (n=153)	25	16.3	10.9-23.2
	Females (n=192)	29	15.1	10.4-21.0
Age	1-5 Years (n=184)	37	20.1	14.6-26.7
	6-9 Years (n=161)	17	10.6	6.4-16.3

Socio-demographic characteristics of the respondents

The mean ± standard deviation (SD) age of respondents was 37.6±7.71years. The age distribution pattern of the respondents is given in figure 1 below.

Figure 1: Age distribution pattern of the respondents (n=345)

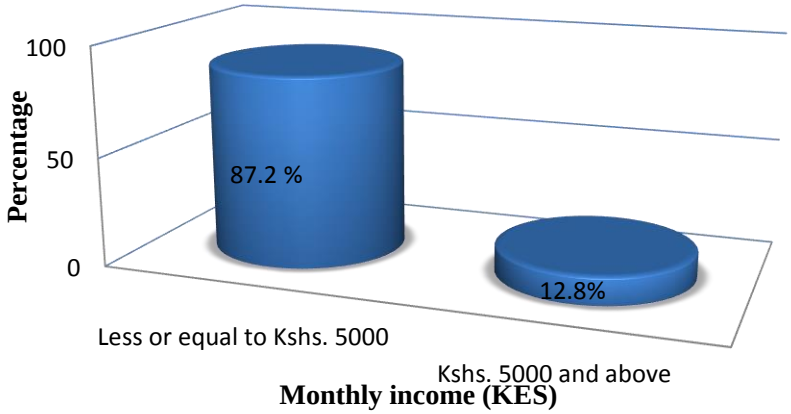


Respondents with no formal education were76.2% (95% CI: 71.4-80.6) and their children had a 2.00- fold risk ($\chi 2$ (1) =4.88, p < 0.035; AOR=2.00 [95%: CI=1.07-3.75]) of getting the disease compared to those whose parents could read and write. Majority of respondents (82.9%, CI: 82.9-90.3) in the study area were unemployed.

Potential risk factors for active trachoma

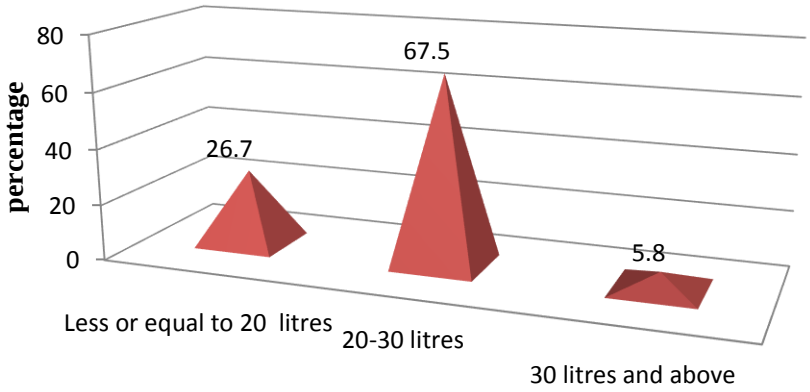
The average monthly income was ≤Kshs.5000which constituted majority the households (87.2%, CI: 83.3-90.6). The prevalence of active trachoma was high in children whose parents earned Kshs. 5000 or less ($\chi 2$ (1) =6.84, p < 0.053; AOR=0.11 [95%: CI=0.02-0.81]).

Figure 2: Monthly income of the respondents (n=345)



The study results demonstrated that 67.5% (95% CI: 62.3-72.5) of the respondent families consumed between 21-30 liters of water per day; 26.7% (95% CI: 22.1-31.7) less or equal to 20 liters of water per day while 5.8% (95% CI: 3.6-8.8) consumed 31 litres and above as shown in figure 2 below.

Figure 3: Volume of water consumed per household per day (n=345)

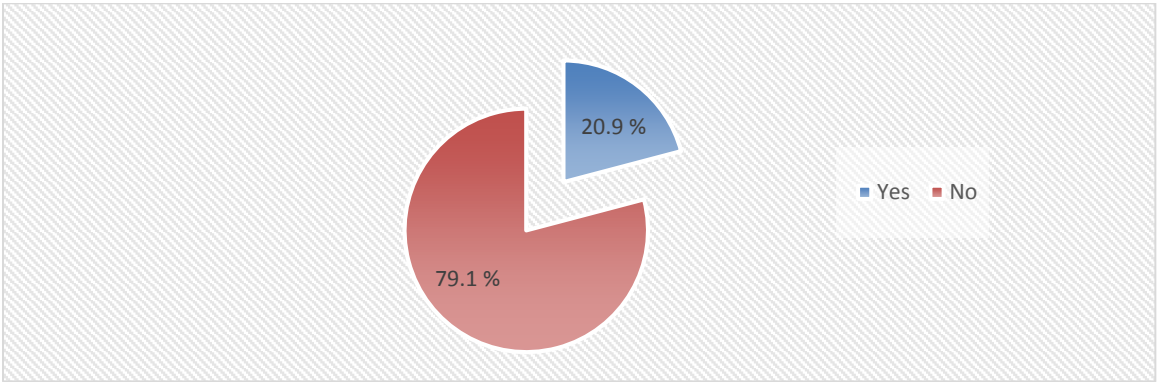


Collected water was mainly used for domestic purposes like drinking, washing and cooking. Many respondents (31.9%, CI: 27.0–37.1) drew water from earth pan commonly known as Silanga (in Maasai language). Majority of respondents (70.4%, CI: 65.3–75.2) could only access water in more than 30 minutes by walking distance and their children had a 3.94–fold risk ($\chi 2$ (1) =10.47, p < 0.001; AOR=3.94 [95%: CI=1.63–9.53])of getting active trachoma. This implies a strong association between water sources distance and the occurrence of the disease. More than half of the respondents (56.8%, CI: 51.4–62.1) did not wash hands after every visit to the latrine while 34.2 % (95% CI: 29.2–39.5) used soap and water to clean their hands.

Less than half of the respondents (43.8%, CI: 38.5–49.2) washed their faces more than twice per week. Respondents' children who washed their faces once per week had a 2.23 –fold risk ($\chi 2$ (1) =6.50, p < 0.011; AOR=2.23 [95%: CI=1.19–4.18]) of getting active trachoma. Upon observation of the children's faces, 47.8% (95% CI: 42.4–53.2) were clean while 52.2% (95% CI: 46.8–57.6) were unclean. Flies were observed on 55.4% (95% CI: 39.3–50.1) of the children's faces. Almost all the respondents (89%, CI: 85.2–92.1) used water in a basin for bathing.

Figure 4 below shows that majority of the respondents (79.1%, CI: 74.5–83.3) did not have a pit latrine. Ownership of a pit latrine was significantly associated with the occurrence of the disease. Those who did not have a pit latrine had a 1.97– fold risk$\chi 2$ (1) = 4.37, P< 0.045; AOR=1.97; [95% CI=1.03–3.76]) of getting active trachoma than those who had pit latrines. Having a pit latrine and using it was also significantly associated with the disease. Respondents who did not use a pit latrine had a 1.22–fold risk ($\chi 2$ (1) = 6.02, P< 0.02; AOR=1.22; [95% CI=1.00–1.49] of getting the disease.

Figure 4: Ownership of a pit latrine in the respondent manyatta (n=345)



Majority of respondents children (86.1%, CI: 82.0-89.6) defecated in the open field. Majority of respondents (68.4%, CI: 63.2-73.3) dumped human solid waste/garbage in the open field ($\chi 2$ (1) = 4.89, P< 0.037; AOR=1.94; [95%CI=1.07-3.51]).

More than half of the respondents (52.2%, CI: 46.8-57.6) indicated that they did not have eye problems two weeks before the study. Having eye problems was found to be significantly associated with the disease ($\chi 2$ (1) = 5.88, P< 0.018; AOR=2.08; [95%CI=1.14-3.78]).

The study also found out that many respondents (56.2%, CI: 50.8-61.5) sought medical attention for eye problems from the alternative medicine (or herbalists).The findings revealed that the distance and location of the health facility was significantly associated with the disease ($\chi 2$ (2) = 13.84, P< 0.001).Among the respondents, 80.9% (95% CI: 76.3-84.9) of the households had goats,74.8% (95% CI: 69.9-79.3)had sheep, 57.4% (95% CI: 52.0-62.7) had cows and 30.4% (95% CI: 25.6-35.6) had dogs. All the respondents kept their animals in the compound.

Logistic regression analysis of the risk factors associated with active trachoma

All the variables that had been established to be significant at 15 % ($p \leq 0.15$) were fitted into the binary logistic regression model to identify the factors that were independently associated with active trachoma. Refer to Table 2 below.

Table 2: Logistic regression analysis on the predictors of active trachoma

Variables	B	S.E	Wald	Df	P Value	Exp (B)
Face washing frequency	1.313	.404	10.593	1	**.001***	3.719
Child's unclean face	1.122	.402	7.780	1	**.005***	3.071
Water access in <30mins	1.554	.567	7.515	1	**.006***	4.732
Mother level of education	1.025	.431	5.665	1	**.017***	2.786
Age of child	.918	.399	5.291	1	**.021***	2.504
Monthly income	-2.444	1.122	4.741	1	**.029***	.087
Latrine ownership	.992	.481	4.259	1	**.039***	2.697
Open defecation	-.979	.508	3.714	1	**.054***	.376
Use of pit latrine	.718	.374	3.679	1	**.055***	2.050
Constant	-3.409	2.187	2.429	1	.119	.033

***Statistically significant at P ≤ 0.05**

Discussion

Prevalence of active trachoma among children aged between 1–9 years

In this study, the prevalence of active trachoma was found to be 15.7 %.There was however a noticeable drop as compared to a recent survey conducted by AMREF in the whole Kajiado 17.4% [11].The slight variation could be attributed to increased awareness on the disease. One respondent noted;

"I know trachoma is an eye disease that can cause blindness. It is caused by flies and unclean faces". (FGD, female, 37 years)

Though there was no significant difference between males and females, males had apparently a higher prevalence than the girls. Although this is consistent with a study conducted in the same county **[**12**]**, it contrasts the study conducted in a different county, Samburu [13].There is also consistency with study done in Yemen [14].Notably, however, the younger age group (1–5) years had a higher risk of getting active trachoma compared to the older group (6–9) years. The possible explanation for the variation is that children aged 1–5 years are the main infectious pool (reservoir for disease) since they cannot care for themselves and have more contacts.

Socio–demographic characteristics of respondents

Children whose mothers lacked formal education were more likely to have active trachoma. This finding concurs with a study conducted in Tanzania [15]. An educated mother may be more aware of the benefits of hygiene practices to the health of her children than an illiterate mother.

One respondent observed;

"The communities here do not seek medical attention when the disease is still at an early stage because of lack of education and ignorance; they only seek medical attention when the disease is at an advanced stage". (KII, Male, 29 years)

Environmental and behavioral factors associated with active trachoma

The finding shows that increasing distance to the nearest water source is significantly associated with rising trachoma prevalence. This study is compatible with a study conducted in Tanzania [15]. Upon observation, majority of households had no tanks for water conservation. This was a negative attribute given the association between water and active trachoma. According to the WHO, increased access to water facilitates good hygiene practices especially for face washing or bathing everyday which is vital to achieving sustainable elimination of the disease [16].

A child's dirty face was significantly associated with active trachoma. This finding is similar to a study that identified presence of ocular and nasal discharge as risk factors for the presence of flies on the eyes in Gambia [17]. A study among children in Ethiopia [18] also came up with the same finding and the burden is higher in the semi–nomadic areas. Upon observation many children had flies on their faces. This finding is consistent with a study conducted in Nigeria [19].There is dire need for water and sensitizing the community on good hygiene practices especially for face washing to ultimately reduce the potentiality of trachoma transmission and achieve sustainable elimination of the disease. One respondent noted;

"Eikiti enkare nikiata meituku nkera ngonyek" (We have very little water therefore we give first priority to cooking and drinking but not to clean children faces). (FGD, Female, 45 years)

The prevalence of active trachoma was higher in households disposing their domestic wastes in the open field. The finding agrees with the study conducted in

Ethiopia and Kenya [20, 13].The finding concurs with a statement from one respondent who noted;

"If we dispose solid waste/garbage in proper ways we will be reducing breeding opportunities for flies which transmit trachoma". (FGD, Female, 19 years)

Pit latrine ownership and usage was significantly associated with disease. The finding agrees with the study by [21]. Most of the community members in the study the main cause of not controlling the disease. For example, one respondent noted;

"Our people disregard latrines because we are not used to them. We are forced to run to the bush to relieve ourselves. Furthermore if a child defecates in the open field it can be eaten by dogs". (FGD, Female, 44 years)

This implies that the environment is contaminated and is thus a good reservoir for breeding flies. Reducing the availability of suitable breeding media for flies by providing latrines has been hypothesized to reduce trachoma. Communities with a higher proportion of households using latrines were more likely to experience a reduction in the prevalence of trachoma.

More than half of the respondents sought treatment from herbalists as their first resort in case they suffered from an eye condition. It can be assumed therefore, that this proportion would be greater in the more remote regions of Kajiado County where conventional health care is relatively inaccessible to the community. This also agrees with findings of [22].Rapid spread of the infection could be attributed to the tendency of many community members to seek treatment from traditional healers or self-medications in response to the initial symptoms instead of going to health centres, and only sought medical treatment when the disease was at an advanced stage [23]. The nearest health facility was about 5 km from the respondents' manyattas. This showed that majority of the study respondents had to endure long distances to access medical attention from their nearest health facility yet accessibility and affordability of medical treatment are important issues in the prevention of trachoma. A study in South Africa reported that, access to health care is a particular concern given the centrality of poor access in perpetuating poverty and inequality. Even when health services are provided free of charge, monetary and time costs of travel to a local clinic represent the price of access to health care [24].

CONCLUSION

The prevalence of trachoma in the study area was found to be 15.7%, a high fact contrary to WHO recommended threshold of 10% prevalence. This is a strong indication that trachoma is still a major public health concern in the study area. The fact that 15.7% are affected shows a disjointed growth and development of children in future if active trachoma is unchecked in the region which might in turn affect their ability to lead healthy and productive future. Lack of access to clean and safe water hinders effective prevention and control of active trachoma as it is a water related disease and this impacts on the achievement on Sustainable Development goal (SDG) on health. Delayed health seeking behavior and use of herbals, will delay early onset of diagnosis and treatment thus increasing the risk of active trachoma among the community. Outreach services in the region and health education should therefore be enhanced in Ol Donyo Nyokie for elimination of trachoma.

REFERENCES

1. International Trachoma Initiative. 2015, what is trachoma? http://www.trachoma.org/core/sub.php?cat=trachoma&id=trachoma, accessed on 21 October 2016
2. Burton MJ and Mabey DC. The global burden of trachoma: a review. PLoS Negl Trop Dis 2009; 3: e460

3. Mariotti SP, Pararajasegaram R and Resnikoff S. Trachoma: looking forward to Global Elimination of Trachoma by 2020 (GET 2020). Am J Trop Med Hyg 2003; **69(5 Suppl)**: 33–5
4. Emerson PM, Burton M, Solomon AW et al. The SAFE strategy for trachoma control: using operational research for policy, planning and implementation. Bull World Health Organ 2006; **84**: 613–9
5. West S. Trachoma and antibiotic use: the 'A' in SAFE. Expert Rev Anti Infect Ther 2012; **10**: 75–83
6. Ejere H, Alhassan MB and Rabiu M et al. Face washing promotion for preventing active trachoma. Cochrane Database Syst Rev 2012; (4): CD003659
7. Polack S, Brooker S, Kuper H, Mariotti S, Mabey D, Foster A. Mapping the global distribution of trachoma. Bull World Health Organ 2005;**83 (12)**:913–919.
8. Sightsavers International. Elimination of Blinding Trachoma Ten-year strategic fast tracking plan in 24 countries Nov. 2011
9. ICTC Situation Analysis Report for the Trachoma Control Programme, Kenya 2013
10. Trachoma Control Project. End-term evaluation inception report, upward bound company limited Nairobi, Kenya, 2011
11. AMREF 2013 preventing Trachoma, preserving Sight http://amref.org/news/news/preventing-trachoma-preserving-sight-/ accessed on 12/10/2016
12. Karimurio J: Prevalence of trachoma in six Districts of Kenya. East Africa Medical Journal 2006: 83, 4
13. Mutunga DM, Ng'ang'a Z, Mbakaya C and Muthami L:The socio demographic characteristics of parents/guardians and 1-9 year old children infected with active trachoma in Samburu District.Prime Journal of Social Science2013; **2(11)**: 502-508
14. Talal AS, Yahia A., Raja'a., Tawfeek K. and Al-Zubiery: Chlamydia trachomatis infections among Yemeni school pupils in relation to environmental conditions. Saudi Med J 2003; 24 (1)
15. Mahande MJ, Humprey DM and Eliningaya JK: Association between water related factors and active trachoma in Hai district, Northern Tanzania infect Dis Poverty 2012; **1**: 10
16. WHO. (2010b). Water-Related Diseases Trachoma.http://www.who.int/water_sanitation_health/diseases/trachoma/en/index.html .Accessed on 12/10/2016
17. Harding-Esch EM, Edwards T, Sillah A, Sarr I, Roberts CH, Snell P, *et al*. Active trachoma and ocular chlamydia trachomatis infection in two Gambian regions, on course for elimination by 2020. 2009
18. Muluken A., Mulualem E.and Melese Y: Prevalence and risk factors of active trachoma among children in Gondar Zuria district north Gondar Ethiopia, 2016; **1**:1-5
19. Mpyet C, Goyol M, Ogoshi C: Personal and environmental risk factors for active trachoma in children in Yobe state, north-eastern Nigeria. Trop Med Int Health 2010; **15**: 168-172
20. Thomas A: Prevalence of trachoma and associated factors of children aged 1-9 years in community led total sanitation and hygiene triggered village and none triggered in GirarJarsoWoreda, North Shoa, Oromia, Ethipia. Imperial Journal of Interdisciplinary Research 2016; 2
21. Burton M., Holland M., Faal N., Aryee E., Alexander N., Bah M and Bailey R: Which Members of a Community Need Antibiotics to

Control Trachoma? Conjunctival Chlamydia trachomatis Infection Load in Gambian Villages. *Investigative Ophthalmology & Visual Science*2003;**44(10)**, 4215–4222

22. Arthur SaitabauNg'etich, Claudio Owino and Ahmad Juma: Utilization of trachoma eye care services in central division of Kajiado County, Kenya. International Research Journal of Public and Environmental Health2016; **3 (3)**: 32–46
23. Munguti PN, Ng'ang'a Z, Muttunga J: Knowledge, practices and perception on trachoma and its influence on health seeking behaviour of the pastoralist patients in Kajiado Central Division, Kenya*East and Central Africa Medical Journal* 2015; **2**: 89–96
24. Zoë M., Cally A. and Murray L: Distance as a barrier to health care access in South Africa. A Southern Africa Labour and Development Research Unit Working Paper Number 97. Cape Town: SALDRU, University of Cape Town; 2013