

**DETERMINANTS OF ACTIVE TRACHOMA AMONG
CHILDREN AGED 1-9 YEARS IN OL DONYO NYOKIE
LOCATION, KAJIADO COUNTY, KENYA**

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**Determinants of Active Trachoma among Children aged
1-9 Years in Ol Donyo Nyokie Location, Kajiado County, Kenya**

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**A thesis submitted in partial fulfillment for the Degree of Master of
Science in Public Health in the Jomo Kenyatta University of
Agriculture and Technology**

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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DEDICATION

It is with humbleness and honor that I dedicate this project to the Almighty God for His mercy, grace, love, wisdom and giving me the strength to complete this study. This work is also dedicated to my family. You have been my source of inspiration and encouragement.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASAL	Arid and semi-arid lands
CPHR	Centre for Public Health Research
ERC	Ethical Review Committee
ICTC	International coalition for trachoma control
ITROMID	Institute of Tropical Medicine and Infectious Diseases
JKUAT	Jomo Kenyatta University of Agriculture and Technology
MOH	Ministry of Health
CI	Confidence interval
UNDP	United Nations Development Programme
MDA	Mass drug administration
SDGs	Sustainable Development Goals
ITI	International Trachoma Initiative
KEMRI	Kenya Medical Research Institute
SAFE	Surgical, antibiotics, facial cleanliness and environmental hygiene
FGD	Focus group discussion
KII	Key informant interview
SPSS	Statistical package for social sciences
SSI	Sightsavers International
SSC	Scientific Steering Committee
GSU	General Service Unit
DALYs	Disability-adjusted life years
AMREF	African Medical and Research Foundation

TT	Trichomatous trichiasis
TF	Trichomatous inflammation follicular
TI	Trichomatous inflammation intense
TS	Trachoma scarring
TCP	Trachoma Control Project
KNBS	Kenya National Bureau of Statistics
PCR	Polymerase chain reaction
MHC	Major histocompatibility complex
CO	Corneal opacity
WASH	Water, sanitation and hygiene
MOMP	Major Outer Membrane Protein
WHO	World Health Organization

ABSTRACT

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. Its prevalence is disproportionately high in children and women in poor rural communities. This descriptive cross-sectional study sought to determine the risk factors associated with active trachoma among children aged 1-9 years. The study utilized both quantitative and qualitative methods 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 guardians together with their children were sampled. Systematic sampling was used to select 345 households. In households with more than one child, one among them was selected using simple random sampling. Physical examination of the children's eyes was done while their respective guardians participated in the questionnaire survey. In addition an observation checklist was used to assess the environment and children faces. Two Focus group discussions were also conducted among guardians of children aged between 1-5 years and another one among guardians of children aged between 6-9 years. Additionally, one Key Informant interview was conducted among healthcare providers to confirm and clarify any pending or new issues described in the structured questionnaires and FGDs. Data was analyzed using SPSS Version 23. 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-likelihood of getting active trachoma ($\chi^2 (1) = 5.93$, $p < 0.017$; AOR=2.13 [95%: CI=1.15-3.96] compared to the children aged 6-9 years. There was however no significant difference in the prevalence of trachoma between males and females. The findings of this study indicate that guardians and children in Ol Donyo Nyokie are at considerable risk of trachoma infection due to the behavioral practices and attitudes. In the final logistic regression model; the frequency of face washing was ($P < 0.001$), child's dirty face ($P < 0.005$), time taken to a water source > 30 mins ($P < 0.006$), guardian's level of education ($P < 0.017$), age of child ($P < 0.021$), monthly income ($P < 0.029$), lack of a pit

latrine ($P<0.039$), open defecation ($P<0.054$) and lack of a pit latrine utilization ($P<0.055$) were identified as predictors of active trachoma. In the Focus Group Discussion, about three quarters (74%) of the guardians were aware of trachoma. Majority of guardians (89%) indicated that water was a major challenge in the area without which trachoma could not be eliminated. A significantly high percentage (85%) of respondents had to walk for longer distances in order to access water. Majority of households (77%) lacked pit latrines; utilization was poor for the households that had latrines. From the Key Informant Interview most of the healthcare providers confirmed that water, lack of formal education and poverty were the major problems facing the community in the study area. Results therefore indicated that active trachoma is still a major public health concern in the study area. Health education and promotion activities for awareness creation with an aim of changing cultural perceptions and practices that contribute to trachoma transmission need to be emphasized. The community also needs to be encouraged to build and utilize latrines for human waste disposal and the County Government of Kajiado should consider drilling water points to promote proper hygiene practices that will help control trachoma transmission and bring down the prevalence levels below the WHO threshold of (<10 % prevalence).

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Trachoma is an eye infection caused by *Chlamydia trachomatis*, which may result into eye disease after repeated re-infections. It is the principal cause of preventable blindness and the second leading cause of blindness globally (Mariotti *et al.*, 2010; ITI, 2015). Its prevalence is disproportionately high in children and women in poor rural communities.

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 (Burton *et al.*, 2009). 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 (Burton *et al.*, 2009). The global objective set by the World Health Assembly in 1998 is to eliminate trachoma as a blinding disease by the year 2020 (Mariotti *et al.*, 2003). 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 (Emerson *et al.*, 2006).

The absence of an environmental reservoir of *C. trachomatis* is of great significance to control efforts, as it implies that a reduction of human infection would lead to fewer opportunities for transmission and the possibility for elimination of the bacteria from treated regions (Munoz & West, 1997).

In childhood, the disease presents with painful eyes, swollen eyelids, and watery discharge from the eyes, and itching of the eyes accompanied by ear, nose and throat

infections. The condition usually affects one eye and gradually spreads to the other. 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 (Ejere *et al.*, 2012).

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 (Trachoma Atlas, 2016). It is currently estimated that there are about 1.3 million people blind from the disease and a further 8.2 million with trichiasis. Several estimates for the burden of disease from trachoma have been made, giving quite variable results. The variation is partly because different prevalence data have been used and partly because different sequelae have been included.

The most recent estimate from the WHO placed it at around 1.3 million Disability-Adjusted Life Years (DALYs). The estimated number of people living in endemic districts, at risk of trachoma blindness has declined from 317 million in 2010 to 200 million in 2016 due to a combination of improved data and implementation of SAFE Strategy (Trachoma Atlas, 2016).

The burden of trachoma on affected individuals and communities can be huge in terms of both disability and economic costs that arise from the same (WHO, 2003). Globally, trachoma is responsible for a loss of approximately \$2.9 billion in productivity per year (ITI, 2015).

Africa is the most affected continent with 27.8 million cases of active trachoma and 3.8 million cases of trichiasis (Sightsavers International, 2011). Twelve out of forty seven counties in Kenya have been confirmed to be trachoma endemic. These counties are Kajiado, Baringo, Laikipia, Samburu, West Pokot, Isiolo, Marsabit, Embu, Meru, Narok, Kitui and Turkana (Situation Analysis Report, 2013).

Overall 6 million Kenyans are at risk of infection. Trachoma Trichiasis (TT) prevalence is estimated at 3.6% while Trachoma Follicular (TF) (children 1-9 years of age) at 20.6% (Trachoma Control Project Report, 2011).

1.2 Statement of the problem

More than 50 million people are infected with trachoma and between 3 and 10 million are blind as a result of the infection (Carter Center, 2009). Globally, trachoma is responsible for a loss of approximately \$2.9 billion in productivity per year (Resnikoff *et al.*, 2008; ITI, 2015). This loss of workforce places a significant burden on already strained communities and families throughout the developing world. In 2004 survey, Kajiado and Samburu were found to have exceptionally high rates of both infectious and blinding trachoma. Active trachoma prevalence in Kajiado County stood at 28.1%.

Illiteracy, poverty and environmental factors such as acute water shortage were identified as contributing factors (Karimurio *et al.*, 2006; Ministry of Public Health and Sanitation, 2008). In recent survey (AMREF, 2013), trachoma was found to have dropped to 17.4%. This is however, still way above the WHO recommended threshold of 10%.

Active trachoma greatly affects the physical well-being of children through pain and itching of the eyes, swelling of eyelids and watery discharge from the eyes. It also impacts negatively on growth and development of children in future if left unchecked in the region which in turn might affect their ability to lead healthy and productive future. Children below five years are more susceptible to trachoma infections and if not prevented at the early stages, it becomes irreversible and results in permanent blindness (Frick *et al.*, 2003). This shortcoming greatly complicates effective public health interventions. Although encompassed in the SAFE strategy in Kajiado county trachoma control projects, local individual risk factors and behavioral practices influencing active trachoma particularly in Ol Donyo Nyokie Location have not been intensely studied and hence are not adequately understood. Furthermore, the SAFE strategy is dependent on adequate information on the distribution of active trachoma and trichiasis in any specific county (Polack *et al.*, 2005).

On the contrary, there is hardly any documented information about the determinants of active trachoma specifically in Ol Donyo Nyokie location.

1.3 Justification

An individual's immediate hygienic and household environment is one of the most significant indicators of their health and well-being. Epidemiological studies have found that children are at a higher risk of Trachoma infection if they have unclean faces (Ngondi *et al.*, 2007). This study was carried out among children aged 1-9 years because active infection with *C. trachomatis* is mostly seen in young children with a peak incidence around four to six years; while subsequent scarring and blindness are seen in adults (West *et al.*, 2004). Secondly, eye health is a basic human right. A dramatic reduction in trachoma especially among women and children is critical if the world is to realize Sustainable Development Goals (SDGs) of gender equality and poverty alleviation that truly leave no one behind. It is urgent for the elimination of blinding trachoma as a public health problem by 2020.

This study, therefore, sought to address the above mentioned gap by determining the actual risk factors associated with active trachoma (TF) among children aged between 1-9 years in Ol Donyo Nyokie location, Kajiado County. The study also assessed the respective role of individual socio-demographic, attitude and practices of guardians towards active trachoma and prevalence among the above mentioned study group.

1.4 Research questions

1. What is the prevalence of active trachoma among children aged 1-9 years in Ol Donyo Nyokie location? .
2. What are the risk factors associated with active trachoma among children aged 1-9 years in Ol Donyo Nyokie location?.
3. What is the level of knowledge, attitude and practices of guardians of children aged 1-9 years towards active trachoma in Ol Donyo Nyokie location?.

1.5 General objective

To determine the prevalence of active trachoma and associated risk factors among children aged 1-9 years in Ol Donyo Nyokie location, Kajiado County.

1.5.1 Specific objectives

1. To determine the prevalence of active trachoma among children aged 1-9 years in Ol Donyo Nyokie location, Kajiado County .
2. To determine the risk factors associated with active trachoma among children aged 1-9 years in Ol Donyo Nyokie location, Kajiado County .
3. To determine knowledge, attitude and practices of guardians of children aged 1-9 years towards active trachoma in Ol Donyo Nyokie location, Kajiado County.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

Trachoma is caused by four serovars of *Chlamydia trachomatis* (A, B, Ba, and C); serovars D through K cause genital tract infection. This obligate intracellular gram-negative bacterium prefers the epithelial surfaces of the eye; the other serovars affect the epithelial surfaces of the genital tract, causing the most common form of sexually transmitted disease (Chandler, 2006). Crossover of these serovars to the alternative site is rare. The metabolically active *Chlamydia* reticulate body matures, enlarges, and finally erupts causing cell death and releasing spore-like elementary bodies, which are the infecting agent. The elementary body attaches to epithelial cells on contact through its major outer membrane protein (MOMP). The presence of these elementary bodies in the secretions from the eyes and noses of infected persons (children especially) facilitate further transmission to family or contacts age (Cook & Mariotti, 2011). The intracellular location of the organism leads to protection from antibody and complement and there is a down regulation of the host major histocompatibility complex or MHC class I molecules by infected cells, thereby reducing killing by cytotoxic T cells. Active trachoma is predominantly seen in young children, becoming less frequent and shorter in duration with increasing age, suggesting that there is some development of immunity (Grassly *et al.*, 2008). Conjunctival scarring accumulates with age, usually becoming evident in the second or third decade of life; entropion, trichiasis, and Corneal Opacity (CO) develop later (Burton *et al.*, 2009).

The onset of the blinding complications of trachoma can occur in children living in regions where the pressure of infection is high (Ngondi *et al.*, 2008). Epidemiological surveys have generally found trichiasis and CO to be more common in women than men (Amendolia, 2015). This difference has been attributed to the greater life time exposure of women to *C. trachomatis* infection, through closer contact with children, the main reservoir of infection (Solomon *et al.*, 2003).

2.2 Developmental Cycle

After internalization, an endosomal membrane to form an inclusion surrounds the elementary body; a vacuole formed from normal endosomal trafficking pathways, which creates a permissive intracellular niche for the replication of *C.trachomatis*. Within the inclusion, the elementary body transforms into a larger metabolically active reticulate body which divides by binary fission, remaining within the inclusion membrane (derived from the cytoplasmic membrane of the host) for the entire duration of the organism's intracellular phase (Brunham *et al.*, 2005).

Within 40-48 hours, the reticulate bodies transform back into infective elementary bodies that are subsequently released from the inclusion vacuole to infect neighboring cells. (Figure 2.1). In the presence of growth inhibitors, such as interferon- γ , intracellular *C.trachomatis* acquires a non-replicating, persistent form and bacteria in this form differentiate back into infectious forms after removal of the inhibitor (Brunham *et al.*, 2005).

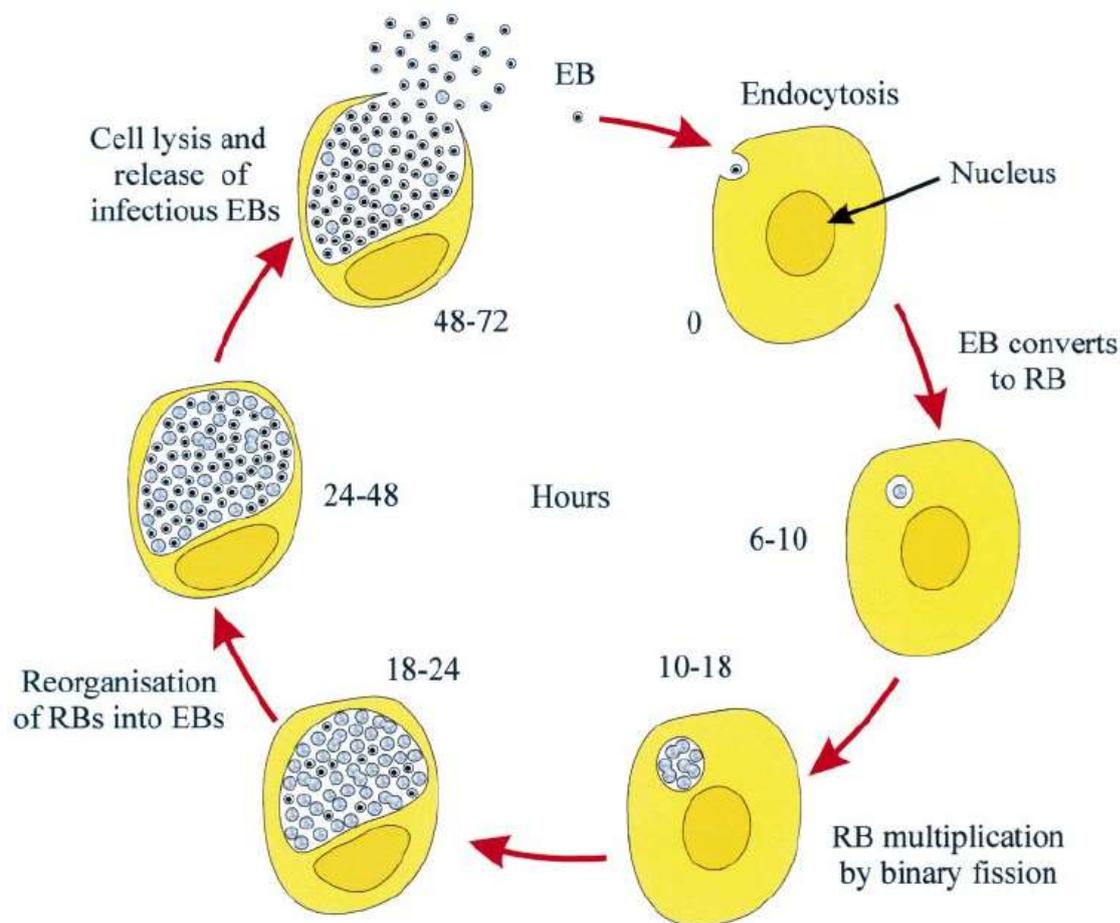


Figure 2.1: Representation of the developmental cycle of *C. trachomatis* (Moulder, 1991).

2.3 The transmission of trachoma

2.3.1 Reservoir

Cases of active trachoma that shed the elementary body stage of *C. trachomatis* are believed to be the main source of infection. Infection in children persists longer than in adults (Wright et al., 2008) suggesting that infected children form reservoir of infection.

Naso-pharyngeal *C. trachomatis* may be important in trachoma transmission but could be a result of ocular infection and probably does not constitute a separate reservoir. (Kuper *et al.*, 2003) found that children with active trachoma were also likely to have nasal specimens' positive for *C. trachomatis*. However, the rate of reinfection after topical eye treatment was similar in children with a positive nasal swab at baseline compared to those who were negative, when faster reinfection in those with positive swabs may have been expected if there were a naso-pharyngeal reservoir.

2.3.2 Mechanism for trachoma transmission

Direct contact with the eye, throat and nose secretions of the infected individuals or contact by using the towels and clothes with these secretions will lead to the spreading of this infection as illustrated in figure 2.2. Limited access to latrines increases fecal contamination of the environment, providing breeding material for the fly *Musca sorbens*, which is implicated in trachoma transmission (Emerson *et al.*, 2004). For many trachoma endemic countries the socioeconomic developments that might promote the disappearance of the disease are likely to be very slow in arriving, which in the light of demographic trends and in the absence of effective control programmes was predicted to lead to an increase in the total numbers blind from trachoma.

Mostly the transmission occurs at a lightning pace between the family members, poor hygiene conditions (crowded living, lack of proper sanitation, unavailability of water and poverty) is one of the main reasons for the wide spread of this disease in developing countries. Migration is thought to facilitate the reintroduction of infection. Historical epidemiology of trachoma strongly supports the view that general improvements in hygiene can have a profound long term effect on this disease (Burton *et al.*, 2009).

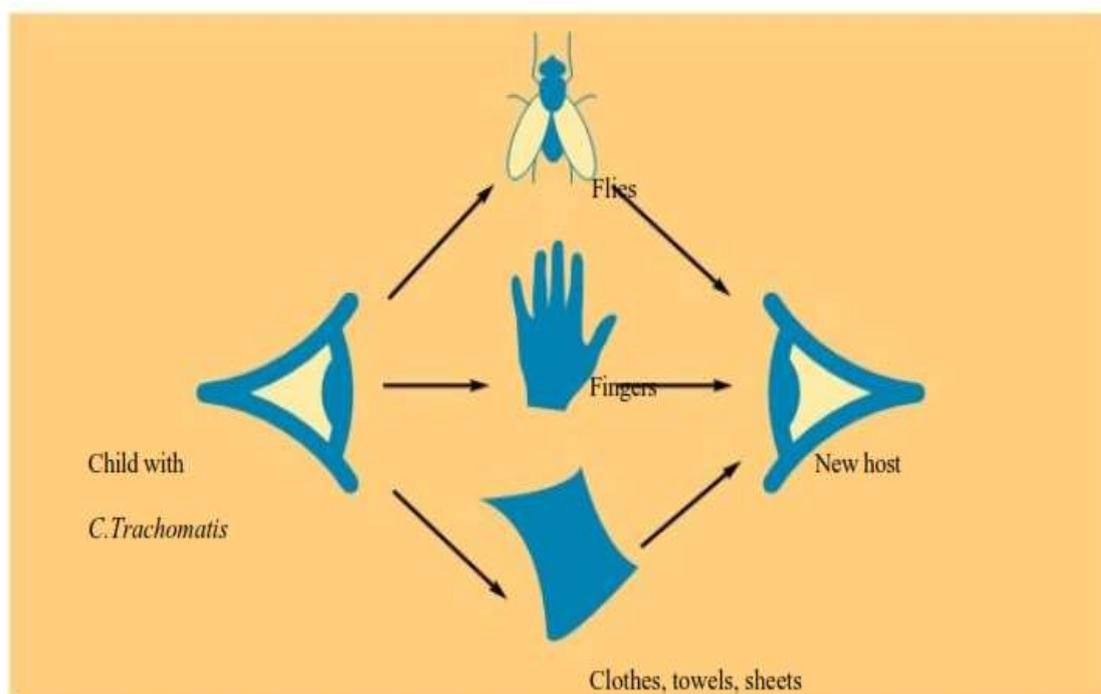


Figure 2.2: Representation of transmission mechanism for trachoma (The Carter Centre, 2006)

In a study conducted in Mali on the risk factors for trachoma, a number of factors were found to be key epidemiological determinants of the disease. These include; Low economic status, Crowding at room level, Presence of flies in living areas, Lack of hygiene and behavioral factors relating to water use (Schemann *et al.*, 2001).

Another study conducted in Ethiopia on the prevalence of risk factors for trachoma in a rural locality identified the following as strong causal agents of trachoma; Child-care among women, habits and frequency of face washing, presence of cooking places in living rooms and sharing same rooms with animals (Ngondi *et al.*, 2008).

2.4 Water access and Sanitation in the prevention of trachoma

The importance of water in the epidemiology of this disease is intuitively obvious when one considers the modes of transmission. But, water's link to trachoma is perhaps more complex than it would seem. In a detailed review of available studies of water and trachoma, Prost and Negrel concluded that there was a general reduction in trachoma rates as water access improved (Prost & Negrel., 1989).

However, it is also not clear whether water availability/access should be measured in terms of distance to source or time to fetch water. Cairncross has noted that a “water use plateau” exists in areas of scarce water supplies throughout the world. The amount used may vary, but the plateau of use exists from a few minutes from the house to 30 min away (Cairncross, 1999). After 30 min, water use declines from the plateau and hence, those beyond 30 min of a water source are likely to benefit most from a new and closer water source.

2.5 Epidemiology of trachoma

Trachoma is endemic in over 42 countries. It is generally confined to resource-limited settings in developing nations of Africa, the Middle East, Asia, Latin America, Pacific Islands and remote aboriginals’ communities in Australia (Trachoma Atlas, 2016). The estimated number of people living in endemic districts, at risk of trachoma blindness, has declined from 317 million in 2010 to 200 million in 2016, due to a combination of improved data and implementation of SAFE Strategy (Surgery, Antibiotic treatment, Facial cleanliness and Environmental improvement) (Trachoma Atlas, 2016).

Globally, trachoma is responsible for a loss of approximately \$2.9 billion in productivity per year (ITI, 2015). Several estimates for the burden of disease from trachoma have been made, giving quite variable results. The variation is partly because different prevalence data have been used and partly because different sequelae have been included. The most recent estimate from the WHO placed it at around 1.3 million Disability-Adjusted Life Years (DALYs). A key issue in producing a reliable estimate of the global burden of trachoma is the limited amount of reliable survey data from endemic regions (Burton & Mabey, 2009).

In order to develop better estimates of the burden of trachoma there needs to be a coordinated effort to conduct population-based surveys with a national sampling frame in representative countries from endemic regions. There is limited evidence of premature mortality due to blindness in general. Further studies on this specifically in relation to trachoma would be of value (Burton *et al.*, 2009).

Africa is the most affected continent; 27.8 million cases of active trachoma and 3.8 million cases of trichiasis (Sightsavers International, 2011). Twelve out of forty seven counties in Kenya have been confirmed to be trachoma endemic. These counties are Kajiado, Baringo, Laikipia, Samburu, West Pokot, Isiolo, Marsabit, Embu, Meru, Narok, Kitui, and Turkana (ICTC, 2013). 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 (Trachoma Control Project, 2013).

Two of the seven surveyed counties in the year 2004, Kajiado and Samburu were found to have exceptionally high rates of both infectious and blinding trachoma. The prevalence rates for infectious and blinding trachoma respectively were found to be 28.1% and 3.3% in Kajiado and 35% and 6% in Samburu. These are way above the 10% and 1% maximum manageable levels for infectious and blinding trachoma respectively given by the WHO (Trachoma Control Project, 2011).

2.6 Clinical Manifestation and Diagnosis of trachoma

After a brief incubation period of 5–10 days, the initial infection will result in a mild conjunctivitis that heals without permanent damage. As little immunity exists, repeated infections result in an exaggerated response: intense inflammation and scarring of the upper sub tarsal conjunctiva, distortion of the lid margin that results in a shortened upper lid pulling the eye lashes inward (trichiasis). The early signs of trachoma (follicular disease and intense inflammation) are seen in children; scarring and trichiasis is observed in the older population (Burton *et al.*, 2009).

The World Health Organization has devised a simplified grading scheme for assessment of trachoma in communities (Table. 2.1), which demonstrates the progression of disease that may take place over years of infection and reinfection. The early signs of trachoma are detected by everting the upper eyelid and examining with a 2.5 loupe (preferably) for the follicular stage (TF): characteristic white or yellow follicles of 0.5–2.0 mm. As disease worsens, the intense inflammatory stage (TI) may be seen. Trachomatous scarring (TS) begins as small stellate scars that with time coalesce to form the dense scar tissue that distorts normal lid architecture.

This is followed by frank trachomatous trichiasis (TT) and corneal opacity (CO) (Burton *et al.*, 2009).

Giemsa stain of the intracytoplasmic inclusions and or culture of the organism are difficult and laborious and generally unavailable in endemic areas. Although both are specific, they are not sensitive. Four nucleic acid amplification tests are commercially available for the diagnosis of *C. trachomatis* infection. All were developed primarily for diagnosis of urogenital chlamydial infections and only two (Amplicor (Roche) and LCx (Abbott)) have been tested in ocular chlamydial infections (Solomon *et al.*, 2008). It is clear that the positive predictive value of clinical exams falls with falling prevalence and it is postulated that in persons who have had trachoma, any ocular infection or irritation may stimulate the typical follicular response seen in early trachoma. In at least one study, while clinical exams continued to find a few active cases, no infection could be detected by Polymerase Chain Reaction (PCR) tests done simultaneously with clinical exams in a control program in Tanzania (Solomon *et al.*, 2004). Therefore, for practical public health purposes, the available and cost-effective method is the clinical examination. Should the cost and ease of application of the PCR tests be reduced and their role with respect to prevention of blindness be clarified, these tests could add an increased measure of accuracy to the current public health control programs possibly allowing the discontinuation of antibiotic treatment sooner than reliance on clinical grading would dictate.

Table 2.1: WHO simplified system for grading trachoma (Solomon *et al.*, 2004)

Type	Grade	Abbreviation	Description
Active trachoma	Trachomatous follicular inflammation	TF	Presence \geq five follicles in the upper tarsal conjunctiva (each follicle \geq 0.5 mm)
	Trachomatous intense inflammation	TI	Intense inflammatory thickening of the tarsal conjunctiva that obscures $>1/2$ of the normal deep tarsal vessels; the tarsal conjunctiva appear red, rough and thickened. There are usually numerous follicles that may be partially or totally covered by the thickened conjunctiva.
Scarring trachoma	Trachomatous scarring	TS	presence of scarring in the superior tarsal conjunctiva
	Trachomatous trichiasis	TT	At least one eyelash rubs on the ocular surface/evidence of recent removal of in-turned eyelashes
	Corneal opacity	CO	visible opacity in the pupillary region of the cornea

2.7 Control and Prevention of trachoma

It is water's link to poverty and poor hygiene that makes its role crucial in halting trachoma transmission. Water is essential but not sufficient to control trachoma. That is, access to water is usually less among the poor and likewise, poor hygiene cannot improve without water (Sanoussi *et al.*, 2012). This was the clear intention of the WHO in developing a strategy that incorporated the three major elements of public health improvement: primary, secondary and tertiary preventive measures. SAFE entails: (S) trichiasis surgery to halt corneal damage (tertiary prevention); (A) antibiotic treatment (single-dose azithromycin, 20 mg/kg of body weight for children and 1g for adults (secondary prevention); (F) face washing or improved facial hygiene (primary prevention); and (E) environmental change including access to water and improved sanitation (primary prevention (WHO, 2014b). This was first described in the WHO manual, Achieving Community Support for active trachoma or infection by itself is not immediately sight threatening and many infections are asymptomatic. Thus, active disease and infection control should consist of community-based efforts to interrupt transmission to other children and adults, by isolating infectious secretions and treatment of infection. Prevention of trachoma-related blindness requires a number of interventions.

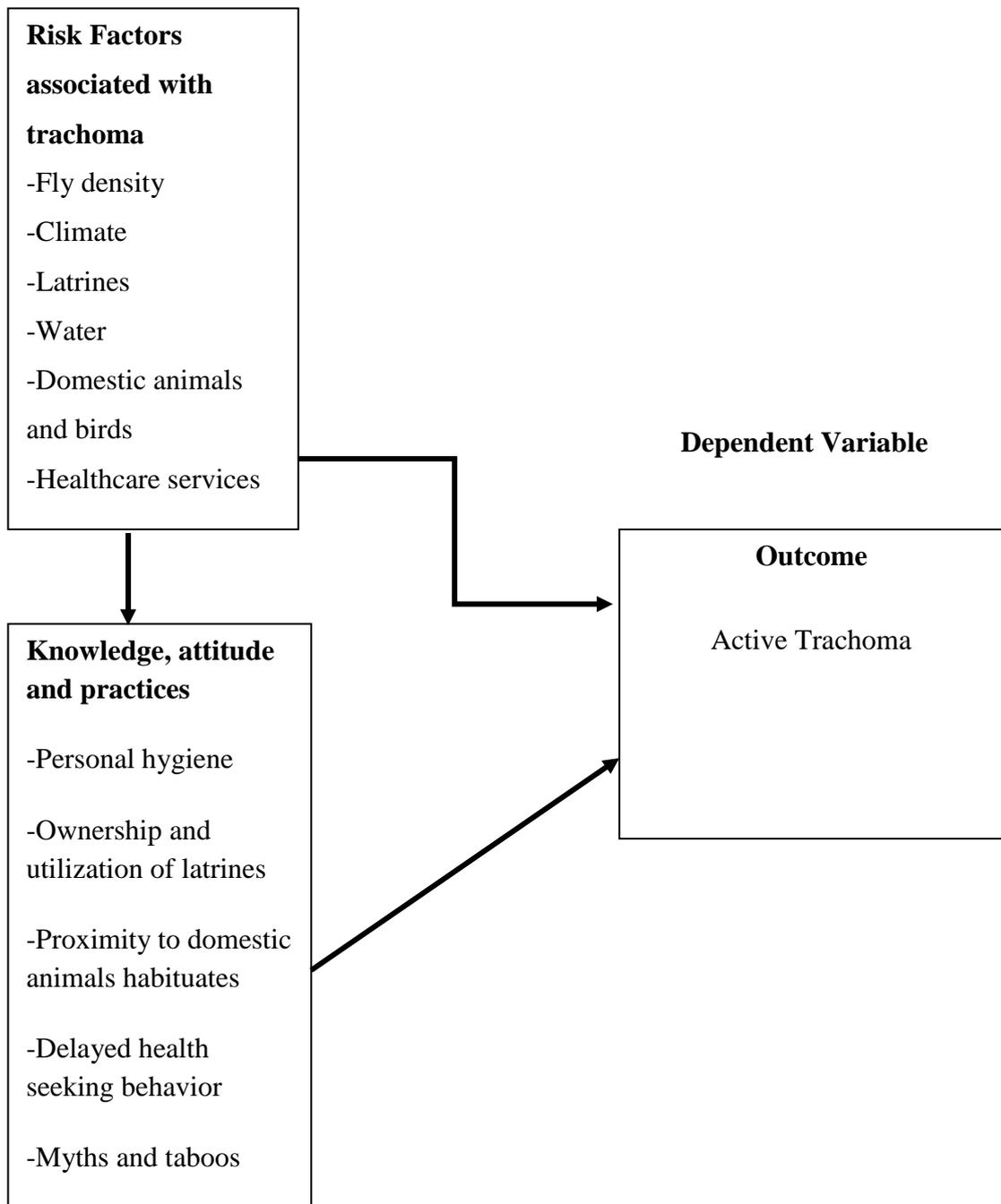
Table 2.2: SAFE strategy on trachoma prevention (Sightsavers International, 2011)

Safe acronym	Definition
Surgery	-To correct in-turned lashes
Antibiotics	-To treat active infection using Azithromycin
Facial Cleanliness	-To reduce disease transmission through face washing
Environmental Improvement	-To increase access to clean water and improve sanitation to facilitate disease

The WHO currently recommends the use of either oral azithromycin or topical tetracycline. Both of these antibiotics have been demonstrated to be effective in clinical trials at reducing the prevalence of both active disease and *C. trachomatis* infection (Schachter *et al.*, 1999). The evidence based supporting the effectiveness of face washing and an environmental intervention in reducing trachoma is more limited (Sumamo *et al.*, 2007). However, the historical epidemiology of trachoma strongly supports the view that general improvements in hygiene can have a profound long-term effect on this disease. Pain from eyelashes rubbing on the eyeballs can be alleviated through trichiasis surgery (Alemayehu *et al.*, 2004).

2.8 Conceptual Framework

A conceptual framework was adopted and modified from literature review. Trachoma transmission occurs mainly through flies or direct contact. Limited access to latrines increases fecal contamination of the environment, providing breeding material for the fly *Musca sorbens*, which is implicated in the transmission of trachoma. The settings where children's exposure occurs include the home with domestic animals and birds, hygiene status and the ambient environment. In addition to preventative and remedial actions, external ambient conditions such as climate, economic and social conditions impact on both exposure and health outcomes also play an important role in trachoma transmission.



Independent variables

Figure 2.3: Conceptual Framework

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study area

Ol Donyo Nyokie location is an arid and semi-arid lands (ASAL) region in Kajiado County with the mean temperature ranges of 18–38 °C and is located about 120 km southwest of Nairobi. The location lies between latitudes 2°15'60.0"S 37°34'00.0"E. It has an elevation of 1,134 meters. It is made up of nine villages namely: Ol Doinyo Nyokie, Ilaramatak, Nesimiti, Nkeek pusi, Koora, Loosunyai, Kamakuru, Ngama and Ngulukok naibor village. The location had an estimated human population of approximately 4317 as at 2009 (Kenya National Bureau of Statistics report, 2010), out of which 1200 were children aged between one to nine years (projected by an annual growth rate of 2.84% to 2015). The population is predominantly the Maasai community. It is classified as a hard to reach region and is primarily arid grasslands. The mean annual rainfall is 440 mm and is distributed over two rainy seasons, which consists of the “long rains”, from March to May and the “short rains”, from October to December. Transport, roads, communication networks and infrastructure in the region is poor, with many areas inaccessible by road.

The Maasai are nomadic pastoralists whose major economic activity is cattle rearing. A small percentage of the population, however, relies on small-scale businesses and farming for income. Data collection was done at household level. A household is defined as a group of people who share a common cooking pot. Usually, a number of households (3 or more) exist in one compound which is locally referred to as *Manyatta*.



Figure 3.1: Map of Kenya showing the study sites (Map data ©2017 Google)

3.2 Study design

This study adopted a descriptive cross-sectional design and utilized both quantitative and qualitative technique for data collection on determinants of active trachoma among children aged 1-9 years at household level.

3.3 Study population

These were mothers (herein referred to as guardians) together with their children aged 1-9 years within the study site and who were at their homes at the time of study.

3.3.1 Inclusion criteria

1. Children aged 1-9 years
2. Children whose guardians gave consent to participate in the study
3. Guardians aged 18 years who accepted to participate in the study

3.3.2 Exclusion criteria

1. Children whose guardians did not give consent to the study
2. Children >9years of age
3. Children from neighbouring locations or visiting families

3.4 Quantitative Data

3.4.1 Sample size determination and sampling design

The sample size was determined using Cochran's formula (Cochran, 1977), after allowing for non-response rate of 10%. The minimum estimated sample size at 95% confidence interval and 5% level of significance was given as:-

$$\mathbf{n = \frac{Z^2 pq}{d^2}}$$

Where; n= Expected sample size

Z= Std deviate corresponding to 95% CI (1.96)

P= estimated prevalence of active trachoma in Kajiado County was 28.1% based on a survey carried out in 2004, (MOH, 2008).

d=statistical error at 0.05 (5% precision).

$$n = \frac{1.96^2 (0.281) (1-0.281)}{0.05}$$

$$=310.46$$

$$=310$$

The estimated sample size was adjusted for non-response rate of 10%. Thus the final sample size was;

$$=310(1-0.1) =310/0.9=345$$

3.4.2 Sampling technique

A total of 345 households were systematically chosen by initially randomizing a starting point. Geo-referenced maps used during the 2009 Kenya Population and Housing Census survey were obtained from the administrative offices so as to determine the spread of households within the location. To get a skip interval of households, sampling was done proportionate to the population of children aged 1-9 years in the location which was estimated to be 1200 at the time of study (projection by an annual growth rate of 2.84% to 2015) according to Kenya National Bureau of Statistics report of 2010 and this was divided by the sample size of 345. A skip interval of 3 households was hence used to choose the next household until the desired sample size of 345 was achieved i.e every 3rd household with a child aged 1-9 years was sampled. In households with more than one child, one among them was

selected using simple random sampling. The respective guardians of the children aged 1-9 years were interviewed in the selected households after seeking written informed consent.

3.5 Questionnaire survey

Prior to conducting the study, courtesy calls were paid to the relevant administrative authorities within the study area to brief them on the study scope and the details of the questionnaire. A structured questionnaire was prepared and pre-tested at the neighboring location of Oltepesi and 31 guardians (10% of 345) participated in the pre-test. The questionnaire was supported by an observation checklist. The tool was translated to Maasai and Kiswahili and back-translated to Maasai to ensure accuracy of translation. The survey team was composed of the principal investigator, assisted by four trained trachoma monitors and an eye specialist.

Upon receiving informed consent, the questionnaire was administered to the guardians of children aged 1-9 years. Information obtained from the guardians included: demographic factors, personal hygiene, domestic animals ownership, sanitation, healthcare facility, household water source etc. The trachoma monitors and the eye specialist obtained information on the age of the children and their disease status using the WHO trachoma simplified grading system (WHO, 2004) with binocular examination loupe (2.5 times magnification) and torch light.

A case of active trachoma was defined using five indicators which were traced through clinical examination of the eligible subjects by an eye specialist and trained trachoma monitors. The indicators were 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 (Thylefors, 1987). On average, 15 children were examined daily and the presence or absence of each sign of trachoma recorded on data collection form for each study individual.

3.6 Facial Examination and Environment inspection

Children were assessed for facial dirt that was defined by presence of ocular discharge, nasal discharge and/or flies on the face. Manyattas were also visited for availability of waste disposal pit, garbage can and latrine. Availability of water tank or well in the manyatta, the condition it was in and their utilization by the household members.

3.7 Data Management and Analysis

Data was cleaned and validated by checking for questionnaire completeness and consistency. All the data was then entered into a computer spreadsheet, Microsoft Excel® (Microsoft Corporation, USA) followed by descriptive analysis using SPSS Version 23.0 (SPSS, Inc., Chicago, IL). Data with quantitative variables were expressed as mean (\pm SD) and range, frequencies and percentages. Percentages and the corresponding 95% confidence intervals (95% CI) were calculated using the method described by Collett (2002). Data was presented using graphs and frequency tables. Analysis of contingency tables was done and Chi-square statistic used to test for association between predictor and outcome variables. The differences between the parameters of estimate were considered significantly different at $P \leq 0.05$.

3.8 Qualitative Data

3.8.1 Focus group discussion

The FGD participants were all guardians of children aged 1-9 years. One FGD focused on experiences of guardians with children aged between (1-5 years). The other FGD focused on guardians with children aged between (6-9 years). A total of twenty-four participants were purposively selected to participate in the FGD. The participants were selected on the basis of child bearing and rearing and also their involvement in the community activities. The FGD explored level of awareness on trachoma, attitude and practices of guardians and children towards active trachoma as well as determined the socio-economic and demographic factors associated with

active trachoma among children aged between 1-9 years. The guardians assembled at Ol Donyo Nyokie GSU camp dispensary. A standard FGD guide (Appendix 4) was used to collect data.

3.8.2 Key informant interview

Key informant interviews were conducted to confirm and clarify any pending or new issues described in the structured questionnaires and FGD. Key informants were purposively selected among healthcare providers in the location and comprised of clinical officers, community health workers and nurses who were working in the location's health facility. A total of 10 participants were intermittently interviewed their place of work. Particular attention was given to more detailed understanding of areas of discordance between data from FGD and structured interviews (Bernard, 1994).

3.9 Qualitative Data Analysis

Qualitative data was analyzed manually. The audio recorded data from all the key informant interviews and FGD were transcribed. The key issues in all the transcripts were coded and organized into coherent categories and reported as themes and a short report was produced for each discussion topic. The qualitative data was presented in form of exemplary quotations.

3.10 Ethical considerations

Approval for study was sought from the Scientific Steering Committee (SSC) and Ethical Review Committee (ERC) at Kenya Medical Research Institute (KEMRI) (Appendix 6). Written informed consent was sought from the respondents before participation in the study. A verbal explanation was given to the guardians whom were requested to sign the consent form voluntarily under no coercion. The names and responses of the study participants were not to be exposed or revealed to anyone other than the investigators involved in the study.

CHAPTER FOUR

RESULTS

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

Out of 345 children aged 1-9 years, 54(15.7% (95% CI: 12.0-19.9) had trachoma. Aggregated by gender, the prevalence for 25 males was 16.3% (95% CI: 10.9-23.2) and 15.1% (95% CI: 10.4 -21.0) for 29 females. Though there was no significant difference between males and females, boys had apparently a higher prevalence than the girls ($P \geq 0.05$). The prevalence also varied significantly between the age groups of 1-5 and 6-9 years at 20.1% (95% CI: 14.6-26.2) and (10.6%, 95% CI: 6.3-16.4) respectively. Notably, however, the younger age group (1-5) years had a 2.13 likelihood 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 (Table 4.1).

Table 4.1: Prevalence of active trachoma stratified by age and sex among children aged 1-9 years

Variable	Characteristic of children	Frequency (n)	Proportion of children with active trachoma (%)	95% Confidence Interval
Sex	Males	153	16.3	10.9-23.2
	Females	192	15.1	10.4-21.0
Age(yrs)	1-5 Years	184	20.1	14.6-26.7
	6-9 Years	161	10.6	6.4-16.3

4.2 Risk factors associated with active trachoma

4.2.1 Socio-demographic characteristics of the respondents

Results indicated that 80 guardians (23.2%, 95% CI: 18.8-28.0) were aged 45 years and above, 64 guardians (18.6%, 95% CI: 18.8-28.0) were 40-44 years, 104 guardians (30.1%, 95% CI: 25.3-35.2) were 35-39 years, 44 guardians (12.8%, 95% CI: 9.4-16.7) were 30-34 years, 32 (9.3%, 95% CI: 6.4-12.8) were 25-29 years while 21 guardians (6.1%, 95% CI: 3.8- 9.2) were less than 24 years. The mean \pm standard deviation (SD) age of guardians was therefore 37.6 \pm 7.71 years (Fig 4. 1)

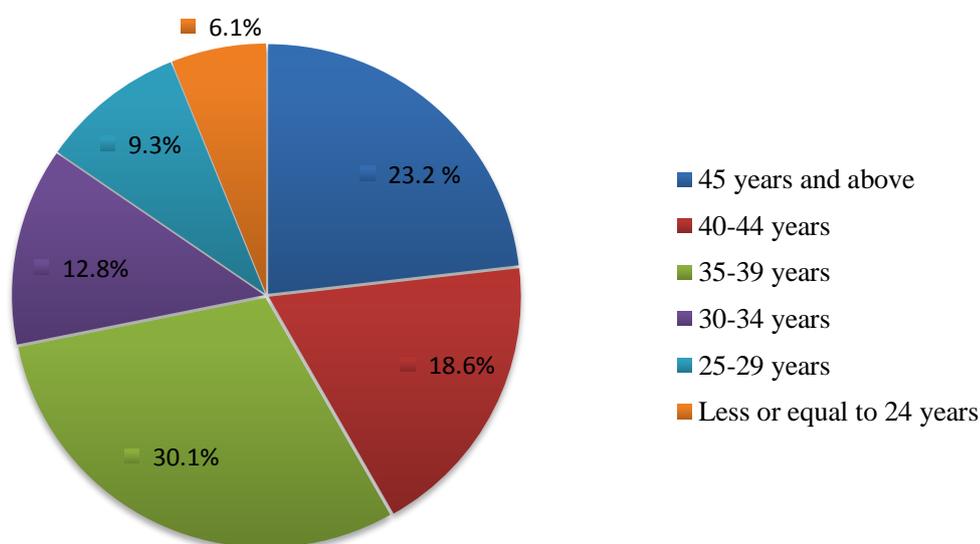


Figure 4.1: Distribution of guardians of children aged 1-9 years in Ol Donyo Nyokie with regard to age

Majority of respondents 286 (82.9%, CI: 78.5- 86.7) had stayed in their current village for more than 11 years while 59 guardians (17.1%, CI: 13.3-21.5) had stayed in their current village for less than 10 years ($P \geq 0.05$). In terms of religion 332

guardians (96.2%, 95% CI: 93.6-98.0) were Christians. Distribution of the respondents by literacy status showed that 263 (76.2%, 95% CI: 71.4 -80.6) had no formal education while 82 (23.8 %, 95% CI: 19.4-28.6) were able to read and write. The respondents with no formal education 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. Most of the respondents (82.9%, CI: 82.9-90.3) in the study area were unemployed while only 13.1% (95% CI: 9.7-17.1) were formally employed (Table 4.2).

Table 4.2: Socio-demographic characteristics of guardians of children aged 1-9 years

Variable	Characteristic	Proportion of respondents (n = 345)	Percentage (%)	95% CI
Duration of Stay	≤10 years	59	17.1	13.3-21.5
	≥11 years	286	83	78.5-86.7
Religion	Christian	332	96.2	93.6-98.0
	Muslim	13	3.8	2-6
Employment status	Unemployed	300	82.9	82.9-90.3
	Formally employed	45	13.1	9.7-17.1
Education level	No formal education	263	76.2	71.4-80.6
	Primary and above	82	23.8	19.4-28.6

4.2.2 Income as a potential risk factor for active trachoma

Results indicated that out of 345 respondents, 301 (87.2%, CI: 83.3-90.6) were earning less than Kshs 5000. Chi-square statistics further indicated that the prevalence of active trachoma was significantly higher among households earning less than Kshs. 5000 compared to those earning Kshs. 5000 and higher ($\chi^2 (1) = 6.84$, $p < 0.053$; AOR=0.11 [95%: CI=0.02-0.81]).

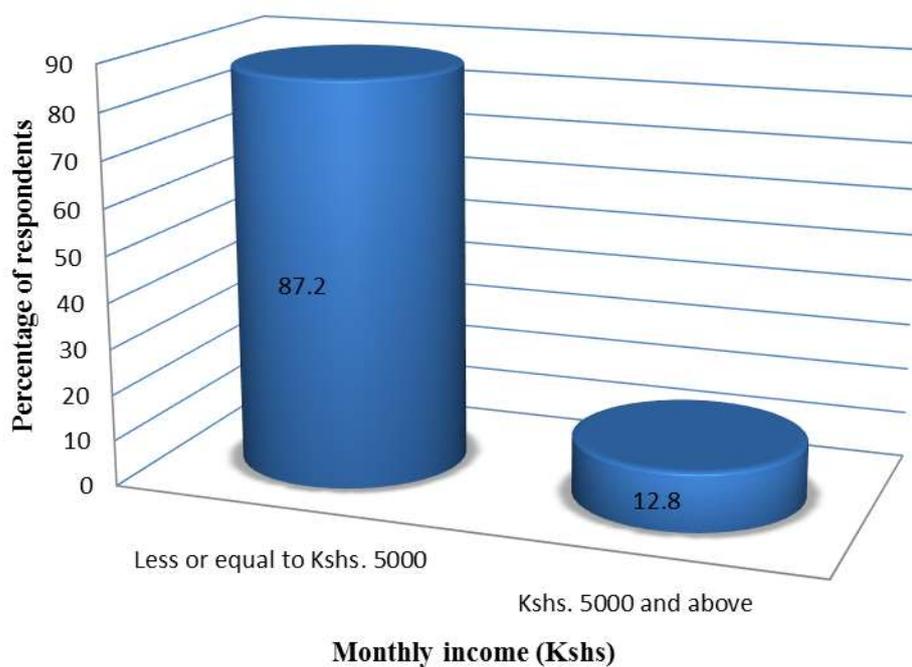


Figure 4.2: Distribution of respondents with regard to monthly income in Kshs.

4.2.3 Water as a potential risk factor for active trachoma

The findings revealed that 325 (94.2%, 95% CI: 91.2 -96.4) of the respondents did not have adequate water in their compounds. Only 20 (5.8%, 95% CI: 3.6-8.8) of the respondents had running water in their compound. The study results demonstrated that 233 (67.5%, 95% CI: 62.3-72.5) of the respondents families consumed between 21-30 liters of water per day; 92 respondents (26.7%, 95% CI: 22.1-31.7) less than 20 liters of water per day while 20 (5.8%, 95% CI: 3.6-8.8) consumed 30 litres and above.

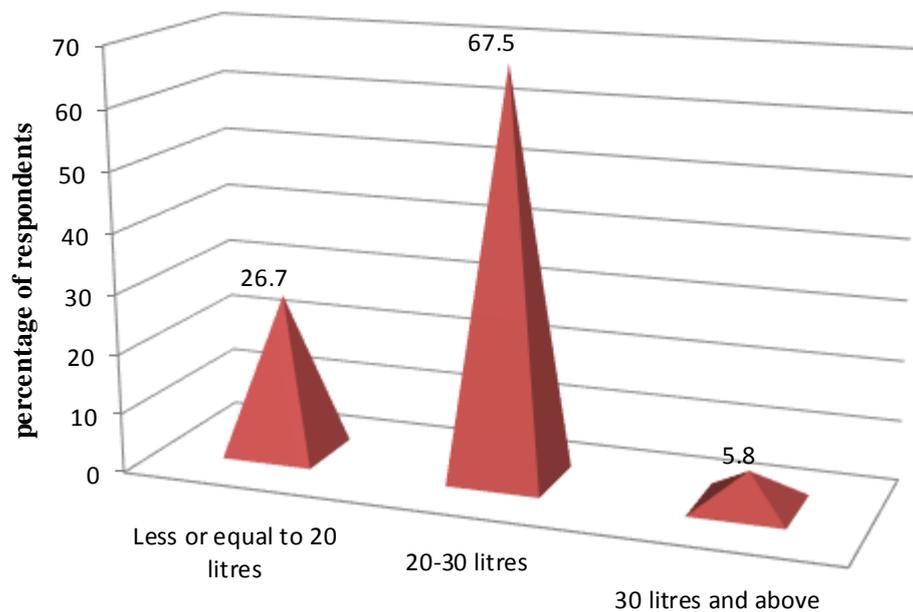


Figure 4.3: Volume of water consumed daily per household in litres

Collected water was mainly used for domestic purposes like drinking, washing and cooking. The study findings showed that the most common sources of water for domestic consumption were; earth-pan, natural springs and dams. By proportion, many respondents 240 (69.6%, CI: 64.4-74.4) drew water from earth pan commonly known as a Silanga (in Maasai language), 57 respondents (16.5%, 95% CI: 12.8-20.9) from natural springs while 48 (13.9%, 95% CI: 10.4-18.0) drew water from dams.

4.2.4 Time taken to a water source

Majority of respondents 243 (70.4%, CI: 65.3-75.2) could only access water in more than 30 minutes by walking distance. Children from households who could not access water within 30 minutes had a 3.94-likelihood ($\chi^2 (1) = 10.47$, $p < 0.001$; AOR=3.94 [95%: CI=1.63-9.53]) of getting active trachoma than those who could access water within 30 minutes or less by walking distance. This implies a strong correlation between water sources distance and the occurrence of the disease. More than half of the respondents 196 (56.8%, CI: 51.4-62.1) did not wash hands after every visit to the latrine while 118 respondents (34.2 %, 95% CI: 29.2-39.5) used soap and water to clean their hands.

Table 4.3 Availability and time taken to a water source as potential risk factors for active trachoma

Variable	Response	Proportion of respondents (n = 345)	Percentage (%)	95% CI
Availability of adequate water in the compound	Yes	20	5.8	3.6-8.8
	No	325	94.2	91.2-96.4
Running water in the compound	Yes	20	5.8	3.6-8.8
	No	325	94.2	91.2-96.4
Source of water		325		
	Earth pan	240	69.6	64.4-74.4
	Natural springs	57	16.5	12.8-20.9
	Dams	48	13.9	10.4-18.0
Time taken to a water source	≤ 30 minutes walking	102	29.6	24.8-34.7
	≥30 minutes walking	243	70.4	65.3-75.2
Hand wash after every latrine visit	Yes	149	43.2	37.9-48.6
	No	196	56.8	51.4-62.1
Detergent used in washing hands	No	227	65.8	60.5-70.8
	Yes	118	34.2	29.2-39.5

4.2.5 Face washing and bathing practice

On face washing practice 233 respondents (67.5%, 95% CI: 62.3-72.5) reported that they do not wash their faces with clean water and soap. Only 112 respondents (32.5%, 95% CI: 27.5-37.7) claimed to wash their faces with clean water and soap.

More than half of the respondents 194 (56.2%, CI: 50.8-61.5) indicated that they washed their faces once weekly while 151 (43.8%, 95% 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 -likelihood ($\chi^2 (1) = 6.50, p < 0.011$; AOR=2.23 [95%: CI=1.19-4.18]) of getting active trachoma than those who washed their face twice or more in a week. Upon observation of the children's' faces, 165 (47.8%, 95% CI: 42.4-53.2) were clean while 180 (52.2%, 95% CI: 46.8-57.6) were unclean. Flies were observed on 154 (44.6%, 95% CI: 39.3-50.1) of the children's' faces. Many respondents 304 (88.1%, CI: 84.2 -91.3) claimed that their children bathe while 41 (11.9%, 95% CI: 8.7-15.8) did not bathe. Majority 224 (64.9%, CI: 59.6-70.0) bathe once in a week while 121 (35.1%, 95% CI: 30.0-40.4) bathe more than twice per week. Almost all the respondents 307 (89%, CI: 85.2-92.1) used water in a basin for bathing. The results also indicated that more than half 212 respondents (61.4%, CI: 56.1-66.6) did not see any problem with sharing bathing water.

Table 4.4: Face washing and bathing practice of respondents children

Variable	Response	Proportion of respondents (n = 345)	Percentage (%)	95% CI
Face washing with clean water	Yes	112	32.5	27.5-37.7
	No	233	67.5	62.3-72.5
Face washing frequency per week	Once	194	56.2	50.8-61.5
	≥Twice	151	43.8	38.5-49.2
Child's face cleanliness	Clean	180	52.2	46.8-57.6
	Not clean	165	47.8	42.4-53.2
Presence of flies, mucous secretions on the eyes and nose	Yes	191	55.4	49.9-60.7
	No	154	44.6	39.3-50.1
Bathing	Yes	304	88.1	84.2-91.3
	No	41	11.9	8.7-15.8
Bathing frequency per week	Once	224	64.9	59.6-70.0
	≥Twice	121	35.1	30.0-40.4
Nature of bathing water	Flowing water	38	11	7.9-14.8
	Water in a basin	307	89	85.2-92.1
Respondents' opinion on bathing water sharing	Acceptable	133	38.6	33.4-43.9
	Not acceptable	212	61.4	56.1 -66.6

4.2.6 Latrine and sanitation

Majority of the respondents 274 (79.4%, CI: 74.8 -83.6) did not have a pit latrine while only 71 (20.6%, 95% CI: 16.4-25.2) owned pit latrines. Lack of a pit latrine was significantly associated with the occurrence of the disease. Those who did not have a pit latrine had 1.97- likelihood $\chi^2 (1) = 4.37, P < 0.045; AOR=1.97; 95\% CI=1.03-3.76$) of getting active trachoma than those who had pit latrines. Respondents who did not utilize a pit latrine had a 1.22-fold risk ($\chi^2 (1) = 6.02, P < 0.02; AOR=1.22; 95\% CI=1.00-1.49$). Majority of respondents children 297 (86.1%, CI: 82.0-89.6) defecated in the open field.

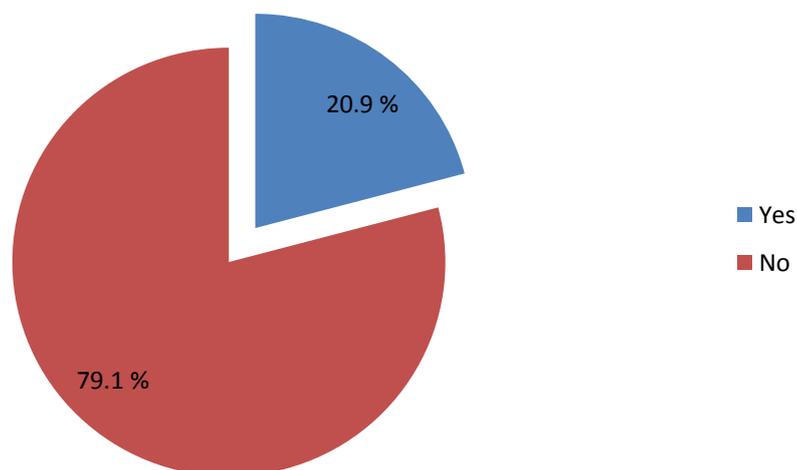


Figure 4.4: Distribution of respondents with regard to ownership of pit latrines

Almost all the respondents 340 (98.6%, CI: 96.7-99.5) reported that there were no myths associated with the use of pit latrine. Further, the study findings revealed that 187 respondents' households (54.2%, CI: 48.8-59.5) had human solid waste/garbage within 6 meters from the manyatta while 158 households (45.8% CI: 40.5-51.2) lacked.

Majority of respondents 236 (68.4%, CI: 63.2-73.3) dumped human solid waste/garbage in the open while 109 respondents (31.6%, CI: 26.7-36.8) used dust bins for dumping. The findings showed that prevalence of active trachoma was higher in households disposing their domestic solid waste in the open field ($\chi^2 (1) = 4.89, P < 0.037; AOR=1.94; 95\% CI=1.07-3.51$) than those who disposed the waste in a dustbin.

Table 4.5: Latrine and sanitation as potential risk factors for active trachoma

Variable	Response	Proportion of respondents (n = 345)	Percentage (%)	95% CI
Latrine ownership	Yes	71	20.6	16.4-25.2
	No	274	79.4	74.8-83.6
Defecation	Open defecation	297	86.1	82.0-89.6
	Use of latrines	48	13.9	10.4-18.0
Myths associated with use of latrines	No	340	98.6	96.7-99.5
Evidence of solid waste within 6meters from the manyatta	Yes	187	54.2	48.8-59.5
	No	158	45.8	40.5-51.2
Place for waste disposal	Open field	236	68.4	63.2-73.3
	In a dustbin	109	31.6	26.7-36.8

4.2.7 Health care facility and accessibility

More than half of the respondents 180 (52.2%, CI: 46.8-57.6) indicated that they did not have eye problems while 165 respondents (47.8%, CI: 42.4-53.2) indicated that they had 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 194 (56.2%, CI: 50.8-61.5) sought medical attention for eye problems from the alternative medicine (or herbalists), 138 respondents (40%, CI: 34.8-45.4) sought medical attention from the pharmacy while 13 respondents (3.8%, CI: 2.0-6.4) sought medical attention from the hospital. More than half of the respondents 187 (54.2%, CI: 48.8-59.5) indicated that the nearest health facility was about 5km from their homes. The findings revealed that the distance and location of the health facility was significantly associated with the disease ($\chi^2 (2) = 13.84, P < 0.001$).

Table 4.6: Health care as a potential risk factor for active trachoma

Variable	Response	Proportion of respondents (n = 345)	Percentage (%)	95% CI
Eyes problem in the last 2 weeks before study	Yes	165	47.8	42.4-53.2
	No	180	52.2	46.8-57.6
Medical facility	Alternative medicine	194	56.2	50.8-61.5
	Pharmacy	138	40.0	34.8-45.4
	Hospital	13	3.8	2.0-6.4
Approximate distance of the nearest health facility	≤ 5km	187	54.2	48.8-59.5
	5- 10km	133	38.6	33.4-43.9
	≥10 km	25	7.2	4.7-10.5

4.2.8 Ownership of domestic animals and poultry by the respondents as potential risk factors for active trachoma

Among the respondents 279 households (80.9%, 95% CI: 76.3-84.9) had goats, 258 households (74.8%, 95% CI: 69.9-79.3) had sheep, 198 households (57.4%, 95% CI: 52.0-62.7) had cows, 30.4% (95% CI: 25.6-35.6) had dogs and 93 (27%, 95% CI: 22.3-32.0) had chicken. All the respondents kept their animals in the compound except for the chicken which were kept inside the manyatta. Refer to table 4.7.

Table 4.7: Ownership of domestic animals by the respondents

Variable	Response	Proportion of respondents (n =345)	Percentage (%)	95% CI
Cows ownership	Yes	198	57.4	52.0-62.7
	No	147	42.6	37.3-48.0
Goats ownership	Yes	279	80.9	76.3-84.9
	No	66	19.1	15.1-23.7
Sheep ownership	Yes	258	74.8	69.9-79.3
	No	87	25.2	20.7-30.1
Dogs ownership	Yes	105	30.4	25.6-35.6
	No	240	69.6	64.4-74.4
Chicken	Yes	93	27.0	22.3-32.0
Ownership	No	252	73.0	68.0-77.7

4.2.9 Bivariate analysis of the factors associated with active trachoma

Bivariate analysis is shown in table 4.8.

Table 4.8: Association between active trachoma and the potential risk factors

Variables	AOR	95% CI Lower Upper	X2 (df)	P Value
Age of child	2.13	1.15-3.96	5.93 (1)	0.017*
Employment Status	1.93	0.91-4.10	3.03 (1)	0.120
Sex of child	1.61	0.90-2.88	2.57 (1)	0.135
Washing hands after latrine visit	0.61	0.34-1.08	2.89 (1)	0.101
Bathing	0.53	0.24-1.15	2.69 (1)	0.110
Bathing frequency	1.60	0.89-2.89	2.47 (1)	0.123
Use of pit latrine	0.46	0.24-0.86	6.02(1)	.018*
Child's dirty face	2.38	1.26-4.50	7.36(1)	.007*
Eye problems in the last two weeks	2.08	1.14-3.78	5.88(1)	.018*
Evidence of solid waste/Garbage	0.58	0.32-1.03	3.48(1)	.074
Where garbage is disposed	1.94	1.07-3.51	4.89(1)	.037*
Monthly income	0.11	0.02-0.81	6.84(1)	.053*
Pit latrine ownership	1.97	1.03-3.76	4.37(1)	.045*
Source of water	-	-	5.46 (2)	.065
Time taken to a water source (>30mins)	3.94	1.63-9.53	10.47 (1)	.001*
Frequency of face washing	2.23	1.19-4.18	6.50 (1)	.011*
Nearest health facility distance	-	-	13.84 (2)	.001*
guardian level of education	2.00	1.07-3.75	4.88 (1)	.035*
Defecation	0.49	0.24-1.03	3.69 (1)	.055*

***Statistically significant at $P \leq 0.05$**

4.2.10 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. The variables; face washing frequency, Child's dirty face, water access >30 mins, guardian level of education, age of child, monthly income, pit latrine ownership, defecation behind manyatta/bush and use of pit latrine were identified as the predictors of active trachoma in the final analysis as presented in table 4.9.

Table 4.9: Logistic regression analysis on the predictors of active trachoma

Variables	B	S.E	Wald	Df	P value	Exp (B)
Frequency of washing face	1.313	.404	10.593	1	.001	3.719
Child's dirty face	1.122	.402	7.780	1	.005	3.071
Water access in <30mins	1.554	.567	7.515	1	.006	4.732
guardian 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
Lack of latrine	.992	.481	4.259	1	.039	2.697
Open defecation	-.979	.508	3.714	1	.054	.376
Utilization of pit latrine	.718	.374	3.679	1	.055	2.050
Constant	-3.409	2.187	2.429	1	.119	.033

4.3 Knowledge, attitude and practices of guardians towards active trachoma

4.3.1 Assessment on knowledge and awareness

The FGDs revealed that the majority (74%) of the participants reported to have heard about trachoma. The sources of information included clinics/hospitals, outreach services, schools, and community health workers trained by AMREF. A 37-year-old

female said, *“I know trachoma is an eye disease that can cause blindness. It is caused by flies and unclean faces. I heard about trachoma through our community health worker”*.

A 30-year-old female business woman said: *“Some are informed while others are not, depending on the literacy level. If you didn’t go to school then you can’t be informed about it”*. A 26-year-old female from said: *“Me personally, I don’t think that am well informed about it, because I only know that it is caused by flies but about the symptoms and the medications? I don’t know”*. Illiteracy and ignorance exacerbates the suffering of the community and makes it difficult to prevent and control trachoma. This was echoed by one of the male respondents aged 29 from the Key informant interview who reported that, *“Due to illiteracy and ignorance, people here do not seek medical attention when the disease is still at an early stage; they only seek medical attention when the disease is at an advanced stage when the only option left is surgery”*.

Some of the participants (57%) had some information on how the disease can be prevented. For example, a 27-year-old female said: *“I think trachoma can be prevented if we observe hygiene and make sure our children faces are kept clean”*.

A female 19 years old said: *“For example, if we dispose solid waste/garbage in proper ways we will be reducing breeding opportunities for flies”*.

4.3.2 Attitude and Practices

It was the general view of participants that mothers and children are the most vulnerable group. They attributed this to traditional Maasai culture where mothers remain at home to do the home chores and also take care of the children and in the circumstances, close contact is almost inevitable. On the other hand, husbands leave homes to graze the animals and look for food to sustain their families as explained by a 35 year old housewife: *“I think mothers and children are the most vulnerable. because apart from just being the primary care takers of children we have other*

roles of cooking over wood or dung fires in poorly ventilated homes and also milking cattle in the family compound”.

This was echoed by a 37-year-old male key informant interviewee who felt that mothers and children were more at risk. The interviewee stated as follows: *“For me, women and children are the ones who frequent the clinic while only few men do. I would say perhaps this is attributed to the responsibilities women have of taking care of their children and doing the daily home chores. Children can also pass bacteria to the mothers and sisters who care for them”.*

One of the factors that the participants mentioned that could pose as a barrier in control of trachoma is the attitude of mothers towards those infected with the disease. A 45-year-old female said: *“I strongly believe that this disease is a curse caused by evil eyes. Why are we not getting cured?.”*

Most of the community members (83%) thought that they were the main cause of not controlling the disease. For example, one of the respondents, a housewife aged 43 years reported that *“the households with latrines do not use them.”* A 50 year old said: *“Open defecation is not a problem my child. If a child defecates behind the houses it can be eaten by dogs, and you know dogs are also important because they give us security”.*

More than half of the participants (61%) thought that more toilets should be built, according to the community; they should come together and build toilets. Majority of households (77%) lacked pit latrines. The government and the NGOs also need to be more involved in supporting building latrines and educating the community on health education and sanitation more often.

A 44 years old mother said *“our people disregard latrines because we are not used to them. We are forced to run to the bush to relieve ourselves and in most cases we forget to wash our hands after visiting the toilet”.* This was further echoed by one of the respondent, a 45 year old key informant interviewee who reported that *“There is*

need for the community to be sensitized on how to use the latrines for not many do wash hands after visiting the toilet”.

Some of the participants (68%) thought that treating trachoma is expensive and time consuming. They also claimed that visiting the health facility for treatment was expensive and drugs were sometimes out of stock and some opted to use herbal treatment which they found cheap. These sentiments were reflected by a 31-year-old female who said: *“We rely on outreach missions sometimes and free checkups and eye ointments from the government.*

I spend 600 Kshs to and from on transport alone to GSU camp dispensary which is about 30km. You get to the dispensary only to be told the eye ointment is finished. “Is it really fair and sometimes we have borrowed that money?”

This was echoed by a 49 -year-old male key informant interviewee who reported that *“We are faced with the challenge of azithromycin and tetracycline eye ointment drugs we don’t get enough to cater for the community and sometimes they are forced to go back without medication.*

A 23-year-old female said: *“I felt there was no need to visit the hospital because my husband gave me some herbal medicine and it has helped somehow. I don’t like conventional medicine because it causes nausea”.*

A key informant interviewee reported that *“We give azithromycin and tetracycline eye ointment to patients but with the home administration we are not sure whether the treatment regime is strictly adhered to or they use herbal medicine”*

Majority of the participants (89%) were of the opinion that trachoma is a serious disease, and water shortage in the area which is very hot and dry exposed them to infection. These sentiments were reflected by a 27-year-old mother: *“We have very little water therefore we give first priority to cooking and drinking but not to clean children faces”.*

Similar thoughts were echoed by a 35-year old mother said: *“Bring us water tanks for conserving water like those provided by AMREF because we hardly get water in this semi arid area and we have to walk to long distances in such of water”*.

This was echoed by a 33 -year-old male key informant interviewee who reported that *“The major problem that we all experience here is water shortage.*

AMREF and the Ministry of Health have provided fewer tanks but they are not enough and it takes long before we get rain putting in mind this is a semi –arid land”. A significantly high percentage of respondents (85%) had to walk long distances in order to access water. Table 4.3.1 gives the verbatim quotations from the themes that emerged during the discussion.

Table 4.10: Emergent themes on Knowledge, Attitude and Practices (KAPs) and Exemplary Quotations from FGD and KII

Sub-Themes	Response(s)
Knowledge	<p><i>“I know trachoma is an eye disease that can cause blindness. It is caused by flies and unclean faces. I heard about trachoma through our community health worker.”-37 year old female (FGD)</i></p> <p><i>“Some are informed while others are not, depending on the literacy level. If you didn’t go to school then you can’t be informed about it”.-30 year old female (FGD)</i></p> <p><i>“Due to illiteracy and ignorance, people here do not seek medical attention when the disease is still at an early stage”.-29 year old male (KII)</i></p>

Attitude *“Ketiū ena moyan anaa keata ng’oki meishunye meishiu” (“I strongly believe that this disease is a curse caused by evil eyes.”)-*
45 year old female (FGD)

Practices *“I think trachoma can be prevented if we observe hygiene and make sure our children faces are kept clean.” -27 year old female (FGD)*

“For example, if we dispose solid waste/garbage in proper ways we will be reducing breeding opportunities for flies”.-19 year old female (FGD)

Response(s)

“Open defecation is not a problem my child. If a child defecates behind the houses it can be eaten by dogs, and you know dogs are also important because they give us security”.-50 year old female (FGD)

“Our people disregard latrines because we are not used to them. We are forced to run to the bush to relieve ourselves and in most cases we forget to wash our hands after visiting the toilet”.-44 year old female (FGD)

“There is need for the community to be sensitized on how to use the latrines for not many do wash hands after visiting the toilet”.-45 year old male (KII)

Social *“I think mothers and children are the most vulnerable. because apart from just being the primary care takers of children we have other roles of cooking over wood or dung fires in poorly ventilated*

homes”.-35 year old female (FGD)

“For me, women and children are the ones who frequent the clinic while only few men do. I would say perhaps this is attributed to the responsibilities women have of taking care of their children and doing the daily home chore.”-37 year old male (KII)

“We rely on outreach missions sometimes and free checkups and eye ointments from the government. I spend 600 Kshs to and from on transport alone to GSU camp dispensary which is about 30km.” -31 year old female (FGD)

Response(s)

“We are faced with the challenge of azithromycin and tetracycline eye ointment drugs we don't get enough to cater for the community and sometimes they are forced to go back without medication”.-49 year old male (KII)

Cultural

“I felt there was no need to visit the hospital because my husband gave me some herbal medicine and it has helped somehow. Conventional medicine because it causes nausea”.-23 year old female (FGD)

“We give azithromycin and tetracycline eye ointment to patients but we are not sure whether the treatment regime is strictly adhered to or they use herbal medicine”.-32 year old male (KII)

Environment *“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”).-27 year old female (FGD)*

“We have to walk to long distances in search of water”.-35 year old female (FGD)

“Water shortage is the main problem. AMREF and Ministry of Health have provided fewer tanks but they are not enough and it takes long before we get rain putting in this semi –arid land”.-33 year old male (KII)

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

5.1.1 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 survey conducted by AMREF in the whole Kajiado 17.4% (AMREF in 2013). The slight variation could be attributed to increased awareness on the disease and mass drug administration (MDA). Those who reported to have heard about trachoma were more likely to know what trachoma is, how it is spread, its potential to lead to blindness and prevention measures through the safe strategy, than those who reported not to have heard about trachoma. Despite the implementation of SAFE strategy (surgery for trichiasis, antibiotics for active disease, facial hygiene and environmental improvement) to reduce the transmission of the disease, the prevalence is still way above the WHO recommended threshold which could be attributed to the poor sanitation and water supply conditions in the study area.

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 (Karimurio, 2006), it contrasts the study conducted in a different county, Samburu (Mutunga *et al.*, 2013). There is also consistency with study done in Yemen (Talal, 2003).

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.

5.1.2 Socio-demographic characteristics of respondents

Guardian's level of education was significantly associated with the occurrence of the disease. Children whose guardians lacked formal education were more likely to have active trachoma. This finding concurs with a study conducted in Ethiopia (Kassahun *et al.*, 2012). Similar finding was reported in Tanzania (Mahande *et al.*, 2012). These might be due to the effect of literacy of the guardian that is especially important because she is the primary care taker of the children. An educated guardian may be more aware of the benefits of hygiene practices to the health of her children compared to uneducated guardian.

Similarly, association between income and the disease were found to be compatible with other studies. Children from households getting less monthly income were more likely to have trachoma. A similar outcome was reported in Ethiopia (Adane *et al.*, 2015). The possible explanation could be due to effects of poverty, lack of hygiene, lack of education and inadequate information.

5.1.3 Environmental and behavioural 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 (Mahande *et al.*, 2012). According to the WHO, availability of clean water is a prerequisite to the sustainable growth and development of communities around the world.

Upon observation, majority of households had no tanks for water conservation. This was a negative attribute given the association between water and active trachoma. Increasing access to water facilitates good hygiene practices especially for face washing or bathing everyday which is vital to achieving sustainable elimination of the disease (WHO 2010b). Poverty creates a major barrier to gaining access to clean water, perpetuating the link between trachoma, lack of water, sanitation, hygiene education, and economic development (UNDP, 2006).

Gaining information on face washing is difficult, as the validity of self-reporting is questionable, measures of a clean face are subjective and certain indicators (discharge and flies) are more reliable than others (dust and food on the face). Observational data indicated that a child's dirty face and face washing frequency 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 (Harding-Esch *et al.*, 2009). A study among children in Ethiopia (Muluken *et al.*, 2016) 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. The presence of more flies on face was associated with more chance of having active trachoma. This finding is consistent with a study conducted in Nigeria (Mpyet *et al.*, 2010). It has been noted that personal sanitation through improving access to water and encouraging facial cleanliness may eliminate *C. Trachomatis* (Edwards *et al.*, 2006). More than half of the participants interviewed were of the opinion that trachoma is a serious disease, and water shortage in the area which is very hot and dry exposed them to infection since their priority was not to clean children faces. Even if water is not available daily, very little water is required to wash a child's face and helps to prevent trachoma.

The prevalence of active trachoma was higher in households disposing their domestic wastes in the open field. Upon observation, majority lacked proper designated garbage disposal pits within the manyatta. In some cases dogs fed on garbage and left over foods. The finding agrees with the study conducted in Ethiopia and Kenya (Thomas, 2016; Mutunga *et al.*, 2013). Some of the respondents interviewed felt that if they did proper waste disposal, then trachoma could be controlled.

Presence of a pit latrine and utilization was significantly associated with disease. The finding agrees with the study by (Burton *et al.*, 2003; Haile *et al.*, 2013), which notes that reducing the availability of suitable breeding media for flies by providing latrines have also been hypothesized to reduce trachoma.

More than half of the respondents sought treatment from herbalists as their first resort in case they suffered from an eye condition suspicious of trachoma. 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 (Saitabau *et al.*, 2016). 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 (Munguti *et al.*, 2015).

However in a study done in Uganda, about 44% of the respondents reported that they used traditional remedies to treat their eye conditions despite them living in close proximity to modern health units (Nyathirombo *et al.*, 2013).

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. These costs may pose a significant barrier for vulnerable segments of the population, leading to overall poorer health (Zoe *et al.*, 2013).

The study found no significant association between cattle ownership and active trachoma. However, the presence of cattle has been associated with trachoma in some studies (Adane *et al.*, 2015). It is argued that cattle living in the living room or in the yard might increase the density of flies and subsequently the presence of trachoma.

5.2 Study Limitations

The study focused on mothers of children aged 1-9 years because mothers have the greatest contact with their children and are likely to have significant influence over the behaviors and beliefs of their children.

The prevalence of active trachoma was determined by clinical field detection which provides a general idea of the public health significance, but does not detect *C. trachomatis* and therefore may have been inadequate for determining the risk of transmission as opposed to microbiological identification of *C.Trachomatis*.

The terrain was extremely rugged in most parts, which was coupled with a poorly developed transport network in the area.

5.3 Conclusions

- The prevalence of active trachoma among children aged 1-9 years was 15.7%. This was a strong indication that trachoma is still a major public health concern in the study area.
- Lack and utilization of pit latrines, feces around the manyatta, time taken to a water source, monthly income, guardian's level of education, child's age, child face washing frequency and cleanliness of face were independently associated with active trachoma. Lack of or utilization of pit latrines encourages open defecation which provides suitable breeding media for *Musca Sorbens* flies which are known to transmit trachoma.
- Knowledge on trachoma was average but numerous environmental and human factors contributed to the transmission of trachoma. Delay in health

seeking behavior and use of herbals delayed early onset of diagnosis and treatment of the infection thus increasing the risk and spread of trachoma. Accessibility to the health care facilities and the affordability of both transport and hospital service charges were cited as the main reasons.

5.3 Recommendations

Following the conclusions:

- The prevalence of trachoma was 15.7%, a high fact contrary to WHO recommended threshold of 10% prevalence. Therefore there is need for rigorous health education and promotion activities for trachoma awareness creation in the study area in order to control and prevent trachoma and probably bring its prevalence levels down below the WHO threshold of >10% prevalence.
- There should be a strong collaboration between Water and Sanitation (WASH) programmes and the Trachoma Control Program to support access to water and sanitation. Ensuring provision of water sources will allow adequate water flow, which may assist the community with personal and domestic hygiene issues. Access to water and frequent use of latrines are essential factors of the 'E' component of the SAFE strategy in trachoma control.
- The communities need to be encouraged to build and utilize latrines for human waste disposal to reduce the risk of trachoma.

- Attitude and cultural practices that increase risk of trachoma need to be addressed in the communities living in the remote areas like Ol Donyo Nyokie to promote early health seeking behaviour and enhance compliance on the use of essential eye ointments and not herbals.
- The County Government of Kajiado in collaboration with the Central Government need to also invest more in accessible health care facilities. There are only two dispensaries in the whole Ol Donyo Nyokie Location (GSU Camp dispensary and Ol Donyo Nyokie. Villagers from the furthest have to spend so much on transport to get to the dispensaries. Spatial geomapping should be done.
- Further studies examining specific hygiene practices and role of domestic animals and birds in transmission of trachoma may be useful.

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APPENDICES

Appendix 1: Subject enrolment information and consent form

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

Researchers

Name	Institution	Role on project
Nasieku Lengala	JKUAT	Principle Investigator
Prof. Simon Karanja	JKUAT	Co-Investigator
Dr. Joseph Mutai	KEMRI	Co-Investigator
Mr. Lawrence Muthami	KEMRI	Co-Investigator

Researchers' statement

We request you to participate in a research study. The purpose of this consent form is to give you the information you will need to help you decide whether to participate in the study or not. Please read the form carefully. You may ask questions about the purpose of the research, what we would ask you to do, the possible risks and benefits, your rights as a volunteer, and anything else about the research on this form that needs clarification. When we have answered all your questions, you can decide if you want to participate in the study or not. This process is called “informed consent.” We will give you a copy of this form for your records.

Purpose of the study

The aim of this study is to determine factors associated with active trachoma among one to nine year-old children in Ol Donyo Nyokie location, Kajiado County.

Study procedures

We aim to enroll 345 guardians of children aged 1-9 years old into the study. Children typically have the highest rates of infection and are believed to be the main source of trachoma infection. As a parent, you likely have significant influence over the behaviors and beliefs of your child/children. During the interviews, we will ask you questions pertaining to your children's demographic characteristics as well as their health status particularly in relation to active trachoma. You will also be requested to give any relevant information about factors that are associated with active trachoma. If you agree, your child will be examined for signs of trachoma and your home and compound will also be inspected. If therefore, you agree to participate you will be requested to give permission by signing the consent form and a questionnaire will be administered to you.

Risks/discomforts

This study will consume some time which may not have been budgeted for by the respondent. It will take about 2 hours of your time. It may therefore be an inconvenience in the respondent's daily chores.

Benefits

This research project is purely academic; there are no direct benefits to the participants. The findings will benefit science by adding information to solve health challenges in our society as well as enhance worldwide effort underway to control/eliminate trachoma. However, children recruited for the study will be able to know whether they have trachoma or not; those with the disease will be referred to the nearest health facility for medical attention.

Study costs

If you agree to participate, there will be no payment to you and for any study procedures to be carried out.

Alternative to participation

The participants are free to refuse to participate; no penalty or loss will accompany any individual for participating or not participating in the study.

Confidentiality

All information given will be treated with a high level of confidentiality; no name(s) will be used. Instead, a unique code for each informant will be used. The responses noted from our discussions and interviews will be locked up for information security and will be destroyed after exactly one year from the day of data collection.

Voluntariness

This exercise is totally voluntary, the chief researcher will be very grateful for your participation.

Contacts

In case of any queries or concerns, please contact Nasieku Lengala on 0729256999

Your rights as a Participant

This research has been reviewed and approved by the Ethics Review Committees of The Kenya Medical Research Institute (KEMRI). This committee reviews research studies in order to help protect participants. If you have any questions about your rights as a research participant you may contact:

The Secretary; KEMRI Ethics Committee 020-2722541-2713349-072220590

Subject's statement

This study has been explained to me. I am providing consent for study participation on my behalf. I have read this form or had it read to me. I volunteer to take part in this research. I have had a chance to ask questions. I understand that I will be

interviewed on my child's/children's trachoma status after which they will be physically examined for the disease. If I have questions later about the research, I can ask one of the researchers listed above. If I have questions about my rights as a research subject, I can call the KEMRI Ethical Review Committee. I will receive a copy of this consent form.

Name of subject

Signature of subject/Thumb print

Date

Copies to: Researcher

Subject

Appendix 2: Respondent questionnaire

Cross sectional community based survey Questionnaire for determinants of

Questionnaire serial number			
Research assistant's name			
Date of interview	Day	Month	Year
Duration of stay (years) in current			

active trachoma

A: Social demographic information for guardian

1. Age (Years)/ Year of Birth.....
2. What is your relationship with the children?

1. Parent	
2. Guardian (specify)	

3. How many children do you have of your own?
4. How many other children do you live with/are living with you on your household?.....

5. What is your level of education?

1. No formal education	
2. Primary and above	

6. What is your employment status?

1. Unemployed	
2. Formally employed	

7. What is your religion?

1. Muslim	
2. Christian	

B: Child's details and disease status

No	Sex 1-M 2-F	Age (yrs)/Year born	Level of education		Signs and symptoms				
			1	2	Itching eyes	Follicles	Watery discharge	Painful eyes	Swollen eyelids
					1-no 2-yes	1-no 2-yes	1-no 2-yes	1-no 2-yes	1-no 2-yes

NB: For level of education: 1 = none, 2= Primary

C: Socio-economic characteristics

a) Monthly Income

1. What is the approximate total monthly household income in (Kshs.)

1. ≤ 5000	
2. ≥ 5000	

b) Water

2. In your opinion is there adequate water in your compound?

1. Yes	
2. No	

3. Is there running water in your compound/manyatta?

1. Yes	
2. No	

4. What is the volume of water consumption per household per day? (Litres)

1. ≤ 20	
2. 20-30	
3. ≥ 30	

5. What is the source of your water?

Source	1 – No; 2– Yes
1. Earth pan (Silanga)	
2. Dam	
3. Natural spring	

6. About how long is the water source from the village?

1. ≤ 30 minutes	
2. ≥ 30 minutes	

c) Domestic animals

7. Do you live with your domestic animals in your manyatta?

Animal or Bird	1-No	If yes, where?	
	2- Yes	In the compound	Outside compound
1. Cows			
2. Goats			

3. Sheep			
4. Dogs			
5. Chicken			

d) Personal Hygiene

8. Individuals should wash their hands every time they visit the latrine.

1. Agree	
2. Disagree	

9. What do you use in washing your hands?

1. Plain water	
2. Water and soap	

10. Individuals should wash their face with clean water.

1. Agree	
2. Disagree	

11. How often in a week?

1. Once	
2. \geq Twice	

12. Do you bathe?

1. Yes	
2. No	

13. How often in a week?

1. Once	
2. \geq Twice	

14. What is the nature of the water you use for bathing?

1. Flowing water	
2. Water in a basin	

15. Individuals should not share bathing water.

1. Agree	
2. Disagree	

e) Latrines and Sanitation

16. Do you have a pit latrine?

1. Yes	
2. No	

17. If yes, individuals should use it.

1. Agree	
2. Disagree	

18. If no, where do you defecate?

1. Open defecation	
2. Use of latrines	

19. Are there any myths associated with use of the latrines?

1. Yes	
2. No	

20. If yes, what are these myths?

.....
.....
.....

21. Is there evidence of solid waste or garbage within 20 meters of the house (This does not include animal droppings)

1. Yes	
2. No	

22. Where do you dispose of garbage?

1. Open field	
2. In a dust bin	

f) Health care

21. Have your eyes been having problems in the last two weeks?

1. Yes	
2. No	

22. Where do you seek medical attention for eye problems?

1. Alternative medicine (herbalists)	
2. Hospital	
3. Pharmacy	

23. How far is the nearest health facility from your home?

1. ≤ 5 km	
2. 5-10 km	
3. 5 km	
4. ≥ 10 km	

24. Do you normally go for medical treatment at government or church-run health facility?

1. Yes	
2. No	

25. If no, why?

.....
.....
.....

Thank you

Appendix 3: Observation checklist

Section A

No.	Observation of the environment of the Manyatta.	Yes	No.	Comment
1	Can a garbage bin/can be seen in the manyatta?			
2	Can a garbage can/bin be seen inside the manyatta?			
3	Is there a garbage hole for burning trash slightly			
4	Is there a pit latrine in the compound or slightly			
5	Does the latrine have a cover to block flies?			
6	Is there a water collection point near the manyatta?			
7	Is there a well?			
8	Is there a tap?			
9	Does the tap have running water?			
10	Is there a large tank for collecting water?			
11	Is there water in the tank?			
12	Is the tank covered to protect it?			
13	Are there food containers/utensils that are unwashed			
14	Are the food containers/utensils covered to protect			

Section B

No.	Observation of the child(participant)	Yes	No.	Comment
1	Is the face clean?			
2	Are there signs of dirt, flies, mucous secretions on eyes and nose?			
3	Are there signs of trachoma that can be seen? (i.e. TF, TI, TS, TT, CO)			

Appendix 4: Focus group guide (guardians)

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

Introduction: May I take this opportunity to welcome you to this interview which may take between 40 - 50 minutes. The essence of this session is to get your views regarding active trachoma as a disease in your community. The main objective is to help determine the factors associated with active trachoma that will enhance worldwide control efforts towards its elimination. Please note that there are no right or wrong responses or answers to the issues or questions below. Also feel free to give any contribution or response to any of the issues/questions at any time. Kindly do not feel offended if I interject or ask for any clarification or more information when you will be responding.

Date of Interview.....

Name (Optional).....

Gender.....

Year of birth.....

Start Time.....

End

Time.....

Knowledge/awareness

1. What is trachoma?

Probe: - Community understanding of trachoma

- Who can contact trachoma?

- Is the community aware of how trachoma is transmitted?

Social factors

2. Social factors that enhance the spread of trachoma in the community

Probe:-Sharing of bathing water, cloths, towels etc.

-Use of latrines?

Economic factors

3. Economic reasons that contribute to the spread of trachoma that you know of?

Probe:-cost of services, socio-economic status or income of the household, -occupation of woman/husband

Community practices

4. What are the community practices that enhance the spread of trachoma?

Probe: Gender issues – role of women and men and children

- Living structures – how are they built? Who lives inside?

-Who are more exposed in terms of gender to trachoma and why?

-How can this exposure to trachoma be reduced/eradicated?

5. Where does the community go for trachoma treatment and management?

Probe: - Accessibility in terms of distance to the specific places

- Reasons for the choice of the place

- Who are the providers?

6. What is currently being done to reduce the risk of trachoma

Probe: - Existence of government agencies

- NGOs, and what each has done/is doing

- Involvement of the community in the control of trachoma

- At what stage are they involved?

Note: Thank the participants for their contributions and time

Appendix 5: Key informant interview guide (health care providers)

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

Instructions: Welcome remarks to the individual. Inform him/her about the estimated duration of the discussions and the main objective of the interview; that the main objective is to help determine prevalence and factors associated with active trachoma among children aged 1-9 years. Please note that there is no right or wrong response or answer to the issues or questions below. Also let him/her to feel free to give any contribution or response to any of the issues/questions at any time. Inform him/her not to feel offended when you interject or ask for any clarification or more information when he/she is responding.

Date of interview.....

Name (Optional).....

Year of birth.....

Sex.....

Health facility.....

Knowledge/awareness

1. What is your knowledge of trachoma at the community level?

Probe: - What do you know about trachoma?

- What do you think is the community perspective regarding trachoma?

- What causes trachoma? / How is it spread?

- Is the community aware of how trachoma is transmitted?

Community practices

2. What are the community practices that enhance the spread of trachoma?

Probe: Gender issues – role of women and men and children

- Living structures – how are they built? Who lives inside?

-Who are more exposed in terms of gender to trachoma and why?

-How can this exposure to trachoma be reduced/eradicated?

3. How often do you treat individuals with trachoma?

Probe: - Availability and adequacy of drugs

- Efficacy of drugs for treatment

- Qualifications of personnel

4. On average, at what stage of trachoma infection do individuals typically seek medical attention

Probe: - Immediately they experience they have eye infection

-After one month of infection

- When trachoma is on advanced stage

5. What could be done to improve healthcare system to enhance trachoma management in the community?

Probe - Accessibility and affordability issues

- Role of various stakeholders

-Involvement and participation of the community,

-Involvement of NGOs and government agencies

6. What is currently being done to reduce the risk of trachoma?

Probe: - NGOs, and what each has done/is doing

- Involvement of the community in the control of trachoma

Note: Thank the individual for his/her contributions and time

Appendix 6: Ethical Review letter



KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
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E-mail: director@kemri.org info@kemri.org Website: www.kemri.org

KEMRI/RES/7/3/1

April 27, 2015

**TO: NASIEKU LENGALA,
PRINCIPAL INVESTIGATOR**

**THROUGH: DR. CHARLES MBACKA,
THE DIRECTOR, CPHR,
NAIROBI**

Dear Madam,

**RE: SSC PROTOCOL NO. 2973 (RESUBMITTED-INITIAL SUBMISSION):
DETERMINANTS OF ACTIVE TRACHOMA AMONG CHILDREN AGED 1-9 YEARS
IN OL DONYO NYOKIE LOCATION, KAJIADO COUNTY, KENYA.**

Reference is made to your letter dated 16th April, 2015, KEMRI/Scientific and Ethics Review Unit (SERU) acknowledges receipt of the revised study protocol on April 21, 2015.

This is to inform you that the Committee notes that the issues raised during the 237thB meeting of the KEMRI/Ethics Review Committee (ERC) held on 18th March, 2015 have been adequately addressed.

Consequently, the study is granted approval for implementation effective this day, **27th April, 2015** for a period of one year. Please note that authorization to conduct this study will automatically expire on **April 26, 2016**. If you plan to continue data collection or analysis beyond this date, please submit an application for continuation approval to SERU by **March 15, 2016**.

You are required to submit any proposed changes to this study to SERU for review and the changes should not be initiated until written approval from SERU is received. Please note that any unanticipated problems resulting from the implementation of this study should be brought to the attention of SERU and you should advise SERU when the study is completed or discontinued.

You may embark on the study.

Yours faithfully,

**PROF. ELIZABETH BUKUSI,
ACTING HEAD,
KEMRI/SCIENTIFIC AND ETHICS REVIEW UNIT**

In Search of Better Health

Appendix 7: Evidence of Publication



KENYA MEDICAL RESEARCH INSTITUTE

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KEMRI/AJHS/ 504/2017

14th June, 2017

Ms. Nasieku Lengala
Institute of Tropical Medicine and Infectious Diseases,
Jomo Kenyatta University of Agriculture and Technology,
Box 62000-00200
NAIROBI

Dear Madam,

AJHS/2016/504 – Determinants of active trachoma among children aged 1-9 years in OI Dony Nyokie location, Kajiado County, Kenya by Nasieku Lengala et al

This is to inform you that the above manuscript has been approved for publication in the African Journal of Health Sciences.

It was noted that your study was on determinants of active trachoma among children aged 1-9 years in OI Dony Nyokie location, Kajiado County, Kenya

Thank you for taking interest in the journal.

Yours faithfully,


for:
DR. HUDSON A. LODENYO
EDITOR-IN-CHIEF

AFRICAN JOURNAL OF HEALTH SCIENCES

In Search of Better Health

