

**PREVALENCE AND RISK FACTORS FOR TRACHOMA INFECTION AMONG
CHILDREN AGED 1-9 YEARS OLD IN OLDONYONYOKIE LOCATION,
MAGADI DIVISION, KAJIADO COUNTY, KENYA**

By

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**A Thesis Submitted in Partial Fulfilment of the Requirements for the Award
of the Degree of Master of Public Health in the School of Public Health of
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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

I dedicate this work to my loving family for their love and patience during all the times.

Their support and encouragement saw me through the course.

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DEFINITIONS OF TERMS

Active Trachoma – Active trachoma is chronic inflammation of the conjunctiva caused by infection with *Chlamydia trachomatis*. The World Health Organization simplified trachoma grading scheme defines active trachoma as TF and/or TI, where TF (trachomatous inflammation — follicular) is the presence of five or more follicles in the central part of the upper tarsal conjunctiva, each at least 0.5 mm in diameter, and TI (trachomatous inflammation — intense) is pronounced inflammatory thickening of the upper tarsal conjunctiva that obscures more than half of the normal deep vessels.

At-risk communities – Communities classified as being at higher risk of trachoma.

Attitude – Refers to a settled way of thinking or feeling about someone or something, typically one that is reflected in a person's behavior.

Clean face – Absence of dirt, dust and crusting on cheeks and forehead.

Blinding Trachoma – Includes Trachomatous scarring (TS), Trachomatous trichiasis (TT) and corneal opacity (CO) grades of trachoma.

Endemic trachoma – A prevalence of active trachoma of 5% or more in children aged one to nine years or a prevalence of trichiasis of at least 0.1% in the adult population. ‘Endemic trachoma’ is also referred to as blinding endemic trachoma.

Household – consists of one or more people who live in the same dwelling and also share meals or living accommodation, and may consist of a single family or some other grouping of people. A single dwelling will be considered to contain multiple **households** if either meals or living space are not shared.

Knowledge – Refers to a familiarity, awareness or understanding of someone or something, such as facts, information, descriptions, or skills, which is acquired through experience or education by perceiving, discovering, or learning. In this knowledge implies the community awareness of trachoma, signs and symptoms, prevention and control.

Manyatta – Manyatta is a Maasai word for settlement or compound, often temporary, established by a family or clan, or as an encampment of young warriors.

Practice – Refers to the actual application or use of an idea, belief, or method as opposed to theories about such application or use.

Prevalence of active trachoma – Includes active trachoma detected by trachoma screening programs and, in some circumstances, cases detected in clinics.

SAFE – Is a strategy developed to eliminate blindness caused by Trachoma through doing surgery, antibiotic treatment, facial cleanliness and improving the environment.

Trachoma – Trachoma (truh-KOH-muh) is a bacterial infection that affects eyes. The bacterium that causes trachoma spreads through direct contact with the eyes, eyelids, and nose or throat secretions of infected people.

Trachomatous Inflammation Intense (TI) – Is pronounced inflammatory thickening of the tarsal conjunctiva that obscures more than half of the normal deep tarsal vessels.

Trachomatous Scarring (TS) – Presence of scarring in the tarsal conjunctiva.

Trachomatous Trichiasis (TT) – At least one eyelash rubs on the eyeball or there is evidence of recent removal of in-turned eyelashes.

ABBREVIATIONS AND ACRONYMS

AMREF	–	African Medical and Research Foundation
ANOVA	–	Analysis of Variance
ASALs	–	Arid and Semi-Arid Lands
AZT	–	Azithromycin
BCC	–	Behavior Change Communication
CBM	–	Christofell Blinden Mission
CHWs	–	Community Health Workers
CO	–	Corneal Opacity
CORPS	–	Community Resource Persons
EU	–	European Union
FGDs	–	Focus Group Discussions
GET	–	Global Elimination of Trachoma
GOK	–	Government of Kenya
ICTC	–	International Coalition for Trachoma Control
IDIs	–	In-Depth Interviews
IEC	–	Information, Education and Communication
ITI	–	International Trachoma Initiative
KDHS	–	Kenya Demographic and Health Survey
KIIs	–	Key Informant Interviews
KNBS	–	Kenya National Bureau of Statistics
KU	–	Kenyatta University
KUERC	–	Kenyatta University Ethics and Research Committee
MOH	–	Ministry of Health

MOPHS	–	Ministry of Public Health and Sanitation
NACOSTI	–	National Commission for Science, Technology and Innovation
NCST	–	National Council for Science and Technology
NGOs	–	Non-Governmental Organisations
SAFE	–	Surgery, Antibiotics, Facial Hygiene and Environment
SPSS	–	Statistical Package for Social Sciences
SSI	–	Sight Savers International
TEO	–	Tetracycline Eye Ointment
TF	–	Trachoma Follicular
TF	–	Trachomatous Follicular
TS	–	Trachomatous Scarring
TT	–	Trachoma Trichiasis
TT	–	Trachomatous Trichiasis
UB	–	Upward Bound Company Limited
WASH	–	Water, Sanitation and Hygiene
WHO	–	World Health Organization

ABSTRACT

Trachoma is one of the water-related infectious diseases that affects the eyes and manifests itself in impoverished, rural areas with little access to clean safe water and proper sanitation that disproportionately afflicts women and children in poor communities. It is a bacterial disease caused by *Chlamydia trachomatis* that is highly infectious and can spread through an infected person's hands or clothing or transmitted by flies that have been in contact with discharge or nose of an infected person. The disease remains the principal cause of preventable blindness and the second leading cause of blindness globally. The current recommended surgery for trichiasis, antibiotics for active disease, facial cleanliness, and environmental change to reduce transmission (SAFE) strategy targets all key elements believed to be necessary for a short- and long-term intervention program. Even with the interventions on the ground, the prevalence of trachoma is still high. The study investigated the prevalence and risk factors for trachoma infections among children aged 1-9 years old in Oldonyonyokie Location, Magadi Division, Kajiado County. Specifically the study sought to examine the prevalence of trachoma, assess socio-demographic factors influencing trachoma prevalence, identify water, sanitation and hygiene related factors influencing prevalence of trachoma, determine whether the practice of keeping of animals affect trachoma prevalence and assess the health seeking behaviors of care givers of children affected by trachoma. The study was a cross-sectional descriptive survey that employed both quantitative and qualitative approaches. Kajiado County was purposively sampled using multi stage cluster sampling methods in the first stage; secondly Oldonyonyokie location was randomly selected. Thirdly snow ball sampling was used to select households with children aged 1-9 years old, guided by Community Health Workers (CHWs). Data was collected using interviewer administered structured questionnaires, focus group discussions (FGDs) and In-Depth Interviews (IDIs). Quantitative data was entered and analyzed using SPSS version 20, which was triangulated using qualitative data. Qualitative data was transcribed and analyzed by content analysis and presented verbatim. The results indicated that prevalence of trachoma is high (18.6%) in Oldonyonyokie, Magadi. Although this was lower than the greater Kajiado County, the prevalence was still an issue of public health concern. The main socio-demographic characteristic found to influence the prevalence of trachoma were the levels of formal education. Majority of the respondents had poor hygiene practices mainly manifested by poor latrine coverage of 11.6%, and hand washing (28.1%) after toilet use. Majority of the households kept cattle (50.9%), goats (82.6%) and sheep (57.4%) in the households, hence increasing the risk of transmission of trachoma. The results further indicated that majority of households' health seeking behaviors was poor – with only 23.1% of respondents visiting health centers after having watery eyes. The study recommends that the Ministry of Health, at County and National levels, should come up with effective, tailor-made and sustainable ways of curbing the trachoma infections. There should be concerted efforts to promote the understanding of Trachoma prevention and management in affected communities. This could be undertaken through localized Behavior Change Communication (BCC) using Information, Education and communication (IEC) materials. There should also be special programmes aimed at improving the negative hygiene practices in the communities. Traditional practices such keeping animals in the houses should be addressed so that the community is trained on behavior change.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Trachoma is a bacterial eye disease caused by *Chlamydia trachomatis* and is highly infectious and can be spread through an infected person's hands or clothing, or transmitted by flies that have been in contact with discharge from the eyes or nose of an infected person (Melese, 2003). Trachoma is one of the water-related infectious disease that affects the eye and manifests itself in impoverished, rural areas without access to clean safe water and proper sanitation. The disease excessively afflicts women and children in poor communities (WHO, 2013).

Trachoma can be controlled and prevented among the pastoralists through proper hygiene and sanitation practices but the challenge is huge because of their nomadic way of life in search of pastures and water for their cattle despite efforts by stakeholders to curb trachoma (AMREF, SSI and MOH, 2004). In an endemic community, the primary reservoir of *Chlamydia trachomatis* is in children, particularly those between 1-9 years, due to the transmittable nature of trachoma (AMREF, SSI and CBM, 2011). Reported prevalence decreases with increasing age, with less than 5% of adults showing signs of active infection (West, 2004). In hyper-endemic areas, active disease is most common in pre-school children with prevalence rates as high as 60-90% (WHO, 2010a).

Trachoma is one of the leading causes of preventable blindness in the world (ITI, 2009). Communities that are affected with trachoma are often those with few resources like water scarcity to maintain good hygiene and limited health facilities for eye treatment that can cause trachoma (Mabey *et al.*, 2003). Trachoma normally affects the most

vulnerable members of communities mostly women and children (Mariotti, 2010). Because of its disappearance in developed countries, trachoma had largely been forgotten as a public health issue until recently when a new antibiotic donation program coupled with renewed focus by the World Health Organization (WHO) rekindled interest in eradicating blinding trachoma (West, 2003).

Worldwide, it is approximated that 6 million people are blind due to trachoma; 50 million are infected and 540 million are at risk of getting infected (Burton, 2009). Trachoma is endemic in 55 countries, primarily in Africa and Asia. Trachoma prevalence in Kenya varies broadly from region to region. Of Kenya's 47 counties, 12 have been confirmed to be trachoma endemic. In Narok, Turkana and Samburu Counties, trachomatous inflammation-follicular (TF) prevalence has been $> 30\%$; Kajiado, West Pokot and Marsabit Counties (10-30%); and finally in Baringo, Laikipia, Meru North, Kitui, Embu and Isiolo counties, the TF prevalence has ranged from 5-10%. In counties with TF prevalence $> 10\%$, trachoma is considered to be an issue of public health concern and in need of full Surgery, Antibiotics, Facial Hygiene and Environment (SAFE) interventions (International Coalition for Trachoma Control [ICTC], December 2013). Trachoma is mainly found in the arid areas in the Rift Valley and North-Eastern Kenya regions and by 2013 all the 12 endemic Counties had been surveyed. Risk factors such as lack of or insufficient water and unhygienic practices, practice of keeping cattle within households and poor health seeking behaviors lead to high prevalence of trachoma mostly in the Arid and Semi-Arid lands (ASALs) (Kaimuno, 2006).

In Kenya, generally 6 million people are at risk of infection. This is because such populations live in poor conditions especially where households cohabit with cattle in dry

rural areas, poor environmental sanitations and inadequate water supply. These inhabitants therefore do not meet the WHO water quality standards and do not have water sources that are functional and running sustainably. Trachoma Trichiasis (TT) prevalence is estimated at 3.6%, while Trachoma Follicular (TF) prevalence (especially in children 1-9 years of age) is estimated at 20.6% (Kaimuno, 2006). In Kenya, Trachoma is considered as the second leading cause of avoidable blindness, accounting for 19% of the blindness (Kaimuno, 2006).

African Medical and Research Foundation (AMREF), Ministry of Health (MOH) and Sight Savers International (SSI) undertook a survey in 2004 in seven out of 18 trachoma endemic districts where overall prevalence rate was indicated at 23% and 3.3% for infectious and blinding trachoma respectively for all the seven districts (AMREF, SSI and MOH, 2004). These results are way above the 10% and 1% maximum manageable levels for infectious and blinding trachoma respectively, given by the WHO (WHO, 2010a). Two (Kajiado and Samburu) out of the seven surveyed districts were found to have exceptionally high rates of both infectious and blinding trachoma. The prevalence rate for infectious and blinding trachoma was found to be 28.1% and 3.3% in Kajiado and 35% and 6% in Samburu. Laikipia, another surveyed district, had a prevalence rate of 9.5% for infectious trachoma and 1.2% for blinding trachoma (AMREF, SSI and MOH, 2004).

The 2004 Kajiado and Loitokotok baseline survey showed a prevalence of 74%, 64%, and 53% of active trachoma in children and 6%, 5%, and 4% of blinding trachoma among adults in Lenkism, Kimana, and Entonet locations respectively. The WHO defines

trachoma as a district-wide public health problem when active disease and Trichiasis prevalence are above 10% and 1%, respectively (WHO, 2010a) and (Ministry of Public Health and Sanitation [MOPHS], 2008).

This study was focused on prevalence and risk factors for trachoma infection among children 1-9 years of age in Kajiado County. If the risk factors and prevalence are not minimised, then risks of developing active trachoma and blindness are high. Understanding the prevalence and risk factors so that preventive and treatment interventions are recommended motivated the study be undertaken on prevalence and risk factors for trachoma infection among children aged 1-9 years old in Oldonyonyokie Location, Magadi Division of Kajiado County in Kenya.

1.2 Problem Statement

Children under 9 years are the major reservoir of the bacteria for the infective trachoma as children under this age cannot take care of themselves and are therefore affected more seriously because this group is characterized by unclean faces, nasal discharge, foods on faces and dust that attract eye-seeking flies, which are the bacteria carriers (Gambhir *et al.*, 2007). Also children below 9 are more likely to touch their eyes more often thus encouraging auto-reinfection of Trachoma. Children's physical wellbeing is affected by active trachoma through pain and itching of the eyes, swelling of eyelids and watery discharge from the eyes. If not controlled earlier, the disease results into irreversible permanent blindness (Frick *et al.*, 2003).

Despite efforts by Non-Governmental Organizations (NGOs) such as the AMREF, SSI and the MOH and other stakeholders in continued health promotion and sensitization

interventions to curb trachoma, the prevalence rates are still high in some counties in the country. In reference to Kenya Trachoma Situation Analysis Report of 2013, 12 out of 47 counties were confirmed Trachoma endemic; Kajiado has been included to have infectious trachoma prevalence in excess of 10%, making the disease an issue of public health concern hence requiring interventions in line with WHO recommendations on disease control and management / elimination (ICTC, December 2013).

Additionally, the proportion of people with easy access to safe water (19%) and basic sanitation (13%) is very low in the Kajiado compared with 52% and 45% in the country respectively (AMREF, SSI and MOH, 2004). The low proportion of people accessing safe water and basic sanitation is a hindrance to successful interventions. In the 2004 baseline, active trachoma prevalence in Kajiado County stood at 28.1%, way above the WHO recommended threshold of 10%. Lack of awareness, poverty, sanitation, hygiene and environmental factors such as acute water shortage were identified as contributing factors (Kaimuno, 2006) and (Ministry of Public Health and Sanitation, 2008).

Lastly trachoma has negatively affected the economies in the developing world because it is responsible for an expenditure of approximately US\$2.9 billion in productivity per year globally (ITI, 2009). This loss of workforce places a major burden on already strained communities and families throughout the developing world.

Pressing concerns have found that trachoma prevalence can go down if the risk factors are controlled. Therefore this concern led to the investigations toward finding what were the prevalence and risk factors for trachoma infection among children aged 1-9 years old in Kajiado.

1.3 Justification of the Study

WHO states that trachoma is a serious health problem when the active disease and trichiasis prevalence exceed 10% and 1% respectively (WHO, 2010a, 2010b, and MOPHS, 2008).

Loss of sight is caused from recurrent infections recurring over and over the years. The ultimate success of Global Elimination of Trachoma (GET) 2020 relies on how to block transmission and reducing the community prevalence of infection. It is logistically impractical to attain this by surgery and antibiotic therapy alone, which is a short term solution. Therefore control programmes need to be enhanced by the inclusion of strategies that reduce transmission – this includes the facial washing and environmental improvement as part of the SAFE strategy, which is a long term solution. The need for the provision of surgery and the use of antibiotics is not in doubt, but on their own they are unlikely to be successful (ICTC, 2013).

According to the findings of Jeremy and Kidd (2007) from an evaluation conducted on the burden of active trachoma among children aged 1-9 years old, it was concluded that the Trachoma Integrated Project met the active trachoma objective in terms of clinical signs and reported symptoms among children aged 1-9. Nevertheless, the subject remains the sustainability of reduction of trachoma. This is probably because of the overwhelming lack of education in the community about the risk factors of trachoma infection. It was recommended that more emphasis be placed on educating affected communities about proper use of latrines to promote hygiene, increased access to water, and providing appropriate husbandry in the practices of keeping cattle in the households and health

seeking behavior (Mabey *et al.*, 2003). This information will be beneficial because such communities have had problems with level of education for women since they are the caregivers in their household. If emphasis is put on place then prevalence of trachoma reduces. Therefore the study aimed to relate prevalence of active trachoma to predisposing and risk factors of the disease so as to inform the control programmes and interventions.

1.4 Research Questions

The specific research questions for this research included the following:

- a. How is the prevalence of Trachoma in Magadi, Kajiado County?
- b. What are the socio-demographic factors that determine trachoma prevalence?
- c. Does water, sanitation and hygiene (WASH) related factors influence prevalence of trachoma?
- d. Does the practice of keeping animals within households influence trachoma prevalence in Magadi?
- e. What are the health seeking behaviors of the care givers of children affected by trachoma?

1.5 Hypothesis

1.5.1 Null Hypotheses

Ho – Socio-demographic characteristics do not determine trachoma prevalence at Oldonyonyokie location, Kajiado County.

Ho – There is no relationship between household WASH-related factors and the prevalence of trachoma.

Ho – The practice of keeping animals within households has no influence on trachoma prevalence.

1.6 Objectives of the Study

1.6.1 General Objective

To determine prevalence and risk factors for trachoma infection among children aged 1-9 years old in Oldonyonyokie Location, Magadi Division, Kajiado County, Kenya.

1.6.2 Specific Objectives

- a. To examine prevalence of Trachoma in Magadi, Kajiado County.
- b. To assess socio demographic factors that influence trachoma prevalence.
- c. To identify WASH- related factors that influence prevalence of trachoma.
- d. To determine whether the practice of keeping animals within households affect trachoma prevalence.
- e. To assess health seeking behaviors of care givers of children affected by trachoma.

1.7 Significance of the Study

The findings of this study will help guide in drawing up some implementation program of interventions from healthcare providers in Kenya to identify and prioritize the interventions in the communities using the SAFE strategy, and in particular to identify communities with active trachoma in order to implement face cleaning and environmental changes.

The primary beneficiaries of the study are the children aged between 1-9 years in Kajiado County because they will be taught and learn on how to prevent trachoma through education and personal hygiene.

Secondary beneficiaries include care givers, immediate community members and similar trachoma endemic areas / counties as they will use the disseminated findings for prevention and control of trachoma. The MOH will benefit from the research as it can replicate the study to similar regions, which will help scale up trachoma control hence reduce blindness due to trachoma and also reduce expenditures especially during surgeries and buying of antibiotics.

1.8 Limitations

The study was targeting caregivers to children 1-9 years. The study focused on women as the caregivers. The limited formal education among many of the respondents was a hindrance to the researcher, hence use of CHWs to interpret the questions to the respondents.

The study was also limited on the pastoralist nature (nomadism) of this community therefore the findings of this study are not specific to that locality only but involved other pastoral communities. Applications of the findings were however limited to populations with similar characteristics (resource poor, and rural areas with undeveloped infrastructures). The rugged terrain made it difficult to move across the division. This made it difficult to reach some respondents.

Further, access to latrines does not necessarily translate to latrine use. Indications of latrine use and water allocation practices were not recorded, which may have caused us to overlook certain relationships between active trachoma and determined risk factors. Since this study was conducted in April, during the rainy season, the actual prevalence may be higher than what is estimated in this study.

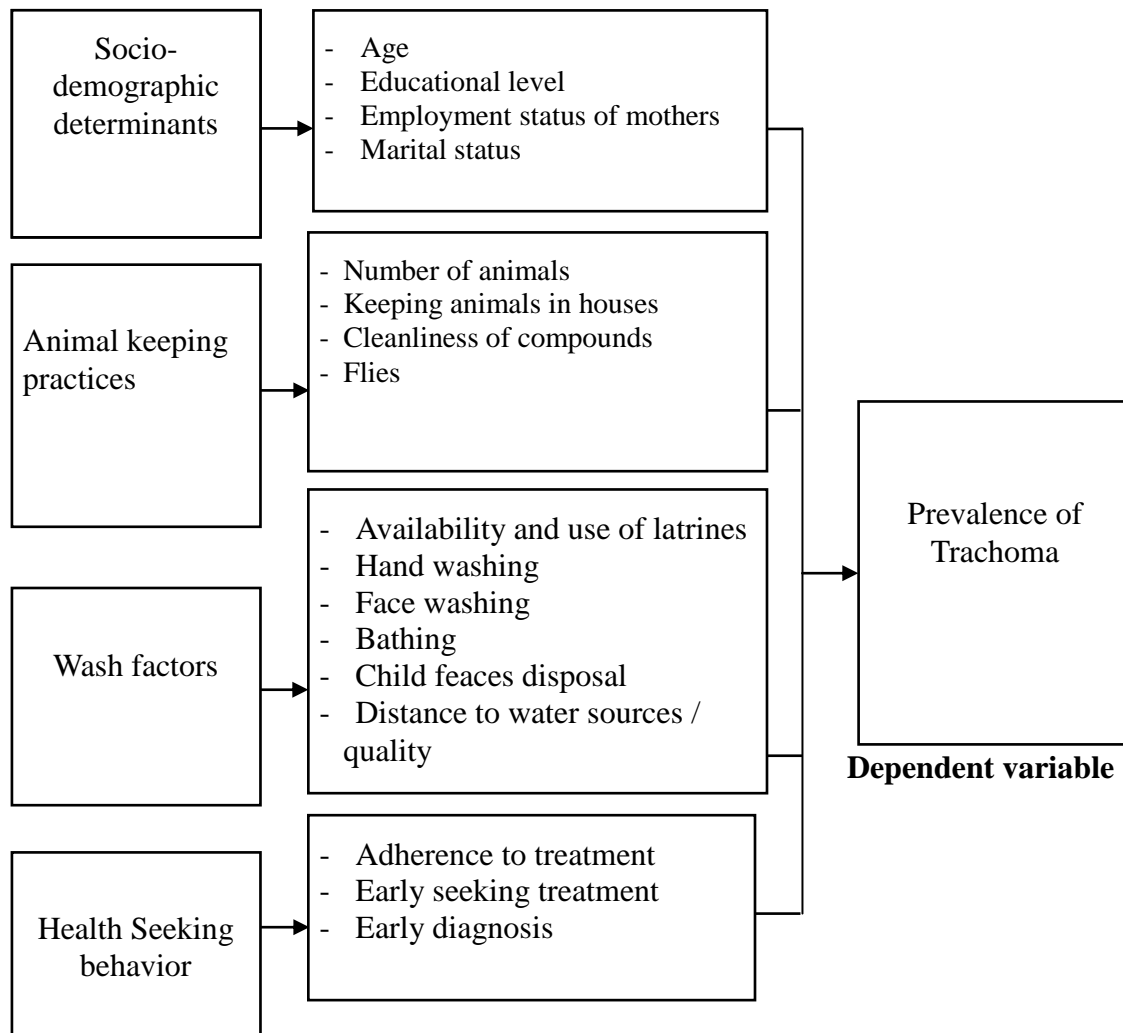
1.9 Delimitations

The study examined women as the caregivers of children aged 1-9 years and how trachoma spreads through them to children because they have the greatest contact with children in their households.

The nomadic nature of the pastoralists forced the researcher to move long distances to collect the information. The poor infrastructure experienced during data collection was handled through use of a motor bike that was able to maneuver around the rugged terrain.

1.10 Conceptual Framework

A conceptual framework of determinants of trachoma control among caregivers of children (1-9) years was adopted and modified from literature review, and this assisted to construct the conceptual framework for this study. Figure 1.1 below shows the relationships of the independent variables and dependent variables that were studied to the outcome.



Independent variables

Figure 1.1: Conceptual Framework

Source: (Researcher, 2015)

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter presents synthesis of literature review associated with prevalence and risk factors of trachoma infection among caregivers of children aged 1-9 years of age and summary of related literature.

2.1 A Preview of Trachoma Infection

Trachoma is an infectious eye disease that is a leading cause of preventable blindness worldwide. When a person's eyes get infected with *Chlamydia trachomatis*, the bacteria develop in the cells of the conjunctiva. This infection usually results in the development of inflammation and a few follicles under the upper eyelid (stage TF). In most cases TF get better in weeks or months. Occasionally the infection causes more severe inflammation (stage TI) and the eyes may become painful, white or watery discharge may be present, and the individual may feel uncomfortable (Mabey, 2008). These signs of active disease (stages TF and TI) are seen mostly in children, ((Mariotti *et al.*, 2010).

The cycle of active infection repeated over many years leads to the development of scars on the conjunctiva (stage TS). Scarring indicates that an individual has had repeated trachoma infections in the past, and is more common in adults although it can be seen first in teenage children in trachoma-endemic areas. As active infections lead to more scarring, the scars slowly develop into a network. Overtime this network of scars contracts, shortening the inner lining of the eye. This shortening distorts the lid margin, pulling the eye lashes closer to the eye. Eventually the lashes are pulled around so far that they touch the eye. This is called trichiasis (stage TT) and is seen typically in individuals

over the age of 35 years, although cases do occur in individuals in their 20s or younger (Bailey, 2001).

The rubbing of the lashes scratches the transparent part of the eye (the cornea) and other infections develop. The combination of scratching and other infections finally turns the cornea opaque, and the individual loses vision (stage Corneal Opacity [CO]). Vision can be restored only by corneal transplant, but patients report improved vision after trichiasis surgery, which reverses the in-turning of eyelashes (Frick *et al.*, 2003).

C. trachomatis transmission occurs through infected ocular secretions on shared towels, clothes, and beddings. Trachoma is passed between family members and households that are in close proximity. Flies have been associated with trachoma risk by acting as a vector for *C. trachomatis* found in the ocular secretions of an infected person (Mecaskey, 2003). Fly populations increase in areas where there are latrines, livestock such as cattle, or uncovered feces.

It has been a challenge to control trachoma especially in children. Most children with active trachoma complain of sore or dry eyes, many assume that it is a feeling of sand in their eyes or experience some ocular discharge; majority of individuals are not aware they are infected. Active trachoma is mostly ignored and goes untreated. In sharp contrast, trichiasis is a terrible condition that is impossible to ignore. There are many traditional beliefs as to why some individuals get trichiasis, but people in the endemic regions do not associate the mild eye problem seen in children to the shock of trichiasis and blindness in adults.

Risk factors for trachoma transmission include limited access to clean and safe water, poor sanitation infrastructure, poor personal hygiene (for example face washing), exposure to flies lack of latrines or latrines built close to living quarters and cattle cohabiting with people in households, (Mecaskey, 2003; West, 2004; WHOa, 2010).

Children can easily be freed to pursue the development of academic skills and to contribute to family and community endeavors by tackling the determinants of trachoma control among caregivers of children (1-9) years. In hyper-endemic areas, active trachoma is most common in pre-school children. In some cases prevalence is as high as 60-90% (West, 1991). The prevalence of active trachoma reduces as age increases. In areas where trachoma has been endemic for a long time, the presence of conjunctiva scars increases with age (Congdon, 1993).

2.2 Risk Factors for Active Disease

Blinding Trachoma remains a huge problem where living conditions facilitate continuous transmission of *Chlamydia trachomatis* among family members. The following are the main risk factors that lead to transmission of trachoma.

2.2.1 Water

Inadequate or lack of water is a major cause of poor hygienic conditions and has been associated with the risk of trachoma, although some studies have found that hygienic conditions vary on provision of a convenient water point (Ngondi *et al.*, 2008). Most population-based cross-sectional studies have found a positive association between the distance from the household to the water source and the prevalence of active trachoma in the household or among children. It is evident that distances to places of water sources

constrain the amount of water brought to the houses hence becoming a scarce resource for use of hygiene purposes (West *et al.*, 1991). People staying far from water sources are likely to collect less water; hence, the amount of water that they can use for household uses is restricted (West *et al.*, 2004). It is evident that on average, families with trachoma have been found to use less water per person per day than families without trachoma (Mariotti, 2010). There are also various facts that trachoma is associated with unsafe water sources (Ngondi *et al.*, 2008). It is possible that houses using unsafe water collect less water in general and therefore use less for hygiene purposes. When there is limited water in the household, decisions on how to use water become an issue (AMREF, SSI and MOH, 2004).

2.2.2 Flies

Presence of flies has been associated with trachoma infection. Research done by MOH, AMREF and SSI found an association between fly density in the household or the presence of flies on children's faces and the presence / severity of trachoma (AMREF, SSI and MOH, 2004). Flies act as physical vectors for transmission of *Chlamydia trachomatis*.

Musca sorbens, the eye-seeking fly, normally breeds on human faeces on the ground. The faeces in latrines do not support the breeding of *M. sorbens*. It is therefore important to remove human faeces through appropriate construction and use of latrines (Emerson *et al.*, 2001). This may reduce the fly populations leading to decreased trachoma (West, 2003). The population of flies is dependent on waste disposal, presence of cows, defecation sites and altitudes (Cumberland *et al.*, 2008).

2.2.3 Cattle

As reported in some prevalence studies in some African countries, presence of cattle and cattle rearing have been associated with trachoma. Livestock excreta attract flies; so, presence of livestock dung in the household proximity increases fly populations hence the transmission (AMREF, SSI and MOH, 2004). *Musca sorbens* breeds in livestock excreta thus presence of livestock and livestock dung in the household proximity increases fly populations (Emerson *et al.*, 2004). The presence of livestock dung attracts houseflies that breed *M sorbens* that land on the children eyes and infect them with trachoma.

Some studies conducted in Tanzania independently and significantly associated presence of trachoma with cattle staying in the living rooms (Taylor *et al.*, 2010).

2.2.4 Hygiene Promotion

One of the major transmission routes of trachoma is secretions from an infected child's eyes to another person's eyes, either via hands, cloths such as towels or handkerchiefs, or via flies. It has been shown that regular and sustained face washing can lead to a reduction in active trachoma. Face washing reduces the number of secretions on the face which attract flies and therefore less chance of infected secretions from being taken by flies to infect other persons. Frequent face washing possibly also reduces chances of automatic re-infection. Hygiene promotion for face washing, as well as for improved excreta disposal and environmental sanitation, can have positive effects. As the peak rates of active trachoma occur in children aged 2-7 years (WHO, 1997), child-to-child hygiene promotion is particularly a useful method of transferring the messages. Innovative hygiene promotion techniques used in water, hygiene and sanitation programmes are needed.

In another Tanzanian study by Taylor *et al* (2010), children observed in homes having clean faces were less likely to have trachoma or severe trachoma as compared with children with unclean faces. A longitudinal study by Solomon (2003) of children at two time points six years apart found that children with unclean faces who had clean faces at follow up were less likely to have severe trachoma at follow up (odds ratio = 0.21) compared with children who had unclean faces at both time points. Further research in Tanzania determined specific elements of an unclean face that were related to the risk of trachoma in children. Four elements were studied: flies, nasal discharge, food on faces, and dust. Children having flies on faces and nasal discharge simultaneously had a two-fold increased risk of active trachoma compared with children without these signs (Emerson *et al.*, 2006):

Face washing obviously has no effect on the course of an episode of infection, but may reduce the likelihood of auto-reinfection or transmission of infection to others. Several studies (Abdou *et al.*, 2007; Regassa & Teshome, 2004) have found that mothers of children with trachoma are more likely themselves to have active disease compared with women who either did not take care of children or whose children did not have trachoma. Flies seeking moisture and protein, which may be physical vectors of infection, are liable to be less attracted to clean faces than to faces with ocular and nasal secretions.

2.2.5 Latrine Coverage

A study was conducted in Gambia (Emerson *et al.*, 2006) on the role of eye-seeking flies as vectors of trachoma and testing the provision of simple pit latrines, without additional health education, as a sustainable method of fly control. A community-based, cluster-randomized controlled trial was used where seven sets of three village clusters were

recruited and randomly assigned to either an intervention group that received regular insecticide spraying or provision of pit latrines (without additional health education) to each household, or to a control group with no intervention. The primary outcomes were fly-eye contact and prevalence of active trachoma among the children between 1 to 9 years.

Latrine provision with health education was associated with a significant reduction in fly-eye contact by *M sorbens*. Removal of human feces from the environment, through the provision of basic sanitation, is likely to greatly reduce fly density, eye contact and hence trachoma transmission (Emerson *et al.*, 2004).

2.3 Trachoma Control and Prevention

Active trachoma by itself is preventable because it is an asymptomatic infection. It is important to control at this stage to avoid blinding complications later in life. 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.

The WHO has adopted a resolution to eliminate blinding trachoma by 2020. To achieve this goal, WHO recommends the use of the SAFE strategy for countries implementing trachoma control programmes.

According to AMREF, SSI & CBM (2011), SAFE stands for: **S**urgery – to correct in-turned lashes, **A**ntibiotics – to treat active infection using Azithromycin, **F**acial Cleanliness – to reduce disease transmission through face washing. This is done by installing leaky tins in schools to encourage face washing and washing hands.

Environmental Improvement – to increase access to clean water and improve sanitation to facilitate disease elimination, (ICTC, December 2013).

During the earlier stages of trachoma, it is treatable with antibiotics such as AZT or tetracycline ointment. Pain from eyelashes rubbing on the eyeballs can be alleviated through trichiasis surgery. However, prevention of Trachoma is better than cure and this is achievable through good personal hygiene and improved sanitation (MOPHS, 2008).

Having highlighted literature studies on prevalence and risk factors for trachoma infections among children aged 1-9 years old, it can be concluded that socio-demographic factors, water, sanitation and hygiene related factors, practice of keeping animals and health seeking behaviors of the care givers influences the prevalence of trachoma. This study therefore sought to undertake empirical investigations to understand prevalence and risk factors for trachoma infection among children aged 1-9 years old in Oldonyonyokie Location, Magadi Division, Kajiado County, Kenya.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter presents the study variables, study population, sampling techniques, pretesting of the study, validity of study tools and reliability, data collection techniques, data analysis and ethical consideration.

3.1 Study Design

This study used a descriptive cross sectional design employing both qualitative and quantitative survey techniques. Qualitative approach included a combination of focus group discussions (FGDs) and key informant interviews (KIIs). Quantitative approach employed semi structured administered questionnaire. County and Community Health Committees were consulted to help on data collection. Sampled individuals were approached for interviews. FGDs came from a sub-set of villages within the intervention areas, one was held with women, men and CHWs. KIIs were administered to Health facility in-charge and the division public health officer.

3.2 Study Variables

3.2.1 Independent Variables

Independent variables were derived from the following constructs; socio-demographic factors, water sanitation and hygiene, practice of keeping animals, health seeking behaviors among caregivers of children aged 1-9 years of Oldonyonyokie location on trachoma control in order to reduce the prevalence of trachoma.

3.2.2 Dependent Variables

The dependent variable was the prevalence of trachoma in the community.

3.3 Study Area

The study was conducted in Oldonyonyokie Location, Magadi Division, Kajiado County, Kenya (Figure 3.1). Kajiado County is located in the Rift valley and is made up of three political constituencies (Kajiado North, Kajiado South and Kajiado Central). The study site is about 80 kilometers south of Nairobi, along Nairobi-Arusha highway. It has a total human population of about 539,816 people inclusive of men, women and children according to Kenya Population and Housing Census of 2009 released by KNBS. The inhabitants of the area are predominantly of the Maasai tribe (KDHS, 2008-9).

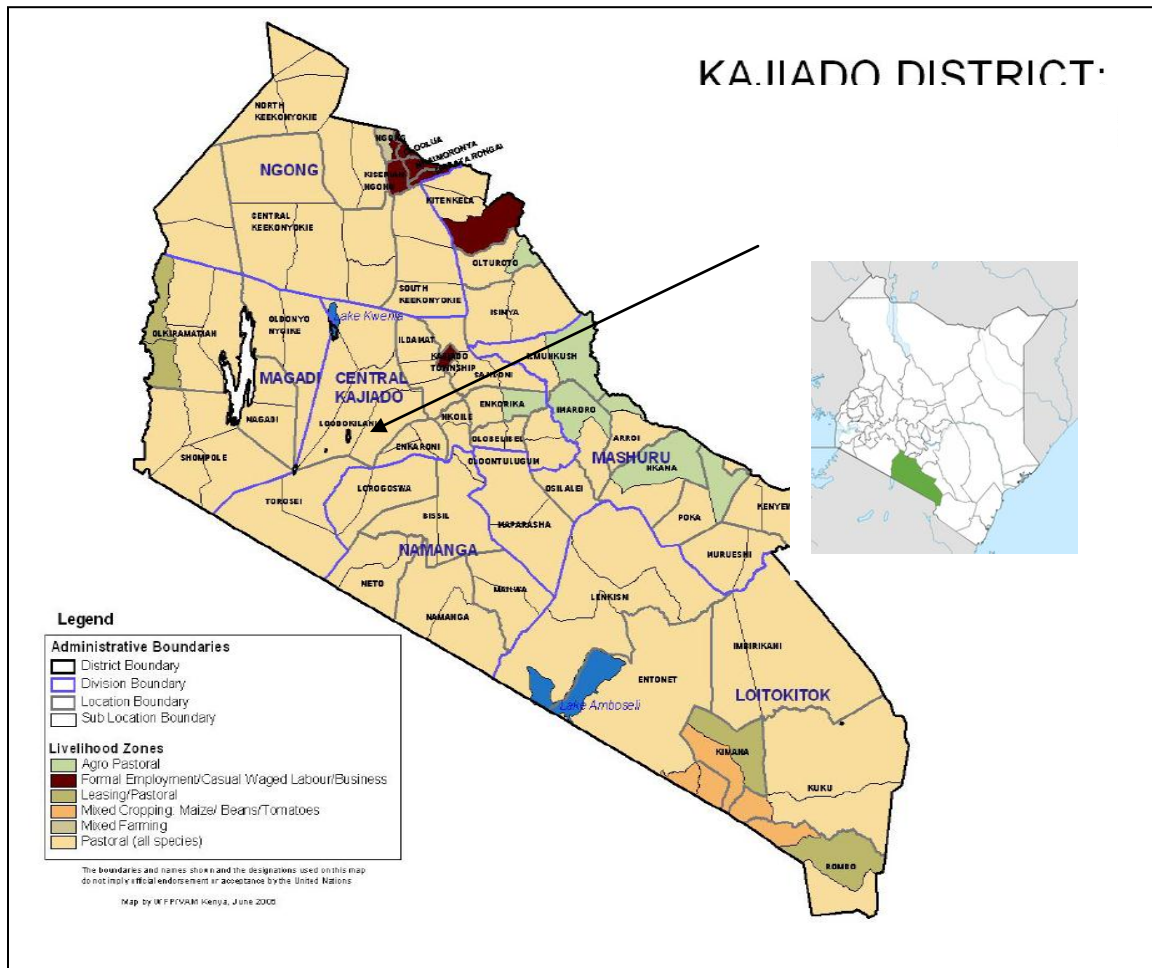


Figure 3.1: Map of Kajiado district showing Oldonyonyokie Location

Source: (Google Map, 2015)

3.4 Study Population

The target population was mothers or caregivers of children aged 1-9 years who were at their homes at the time of the study.

Data collection was done at household level. Usually, a number of households (≥ 3) exist in one compound. Most of the population in the county is made up of pastoralists whose major economic activity is cattle rearing. A small percentage of the population, however, relies on small-scale businesses and farming for income.

3.5 Sampling Technique and Sample Size Determination

3.5.1 Sampling Technique

Kajiado County was sampled using multi stage sampling method. First Kajiado County and Magadi division were purposively selected because of their high prevalence of active trachoma and proximity to Kenyatta University (KU). Secondly, cluster random sampling of locations was conducted in which Oldonyonyokie location was randomly selected in Magadi division. At the same time, a total of 16 villages were randomly sampled in Oldonyonyokie location. Thirdly, snow ball sampling was used to select all households with children aged 1-9 years as guided by CHWs in the selected locations which were included in the final sample.

3.5.1.1 Inclusion Criteria

- Any caregiver of a child aged 1-9 years who was at her home at the time of the study and gave consent.
- Mothers / caregivers who have lived in Oldonyonyokie for the past six months before the study.

3.5.1.2 Exclusion Criteria

- Any child aged below one year or above nine years.
- Mothers / caregivers who fail to consent to be interviewed.

3.5.2 Sample Size Determination

Sampling was done in compliance with the WHO adopted ITI standardized protocol, taking into account the local population dynamics.

Sample size for this research was determined using the formula by (Fisher *et al*, 1998) as given in the equation 1 below:

$$n = z^2 pq / d^2 \quad 1$$

Where:

N=the desired sample size when target population is over ten thousand people.

Z=the standard normal deviate corresponding to 95% confidence interval (z=1.96).

P=the proportion of the target population estimated to have the characteristics being investigated, hence p=0.281

In this case, the sample is estimated to be 0.281 of active trachoma in Kajiado County (ICTC , December 2013).

Q=the proportion of the target population without the characteristics being investigated (q=1-p) where q= 1-0.28=0.72

D=the degree of accuracy at 95% confidence interval (0.05)

$$N = 1.96^2 \times 0.281 \times 0.72 / 0.05^2 = 310.892$$

The figure was adjusted for non-response and incomplete questionnaires to 350.

This study used both qualitative and quantitative methods. Administered questionnaires were used to gather quantitative in nature information. Since more information was vital, probing techniques were employed to gather qualitative data, which were used to elicit more elaborate answers.

3.6 Pre Test Study

A Pre Test Study was conducted before onset of the main study. The pre-test was undertaken in the neighboring Magadi Location, which had the same characteristics as Oldonyonyokie and it was not part of the study sample. The data collection tool was pre-tested among children aged 1-9 years in Kajiado to ensure that the data collection tools tested what they were intended to (validity) and that they consistently measured the variables in the study (reliability). The necessary corrections, adjustments and rephrasing of questions were done to give clearer meaning and understanding to the questions.

3.6.1 Validity

Validity of the research instruments was ensured through use of a well-designed and pre-tested questionnaire together with trained research assistants. Data was checked for completeness and accuracy every day they submitted, any blanks, misplacement of information and number of questionnaires per day. Questionnaires were numbered in a sequential order before field and confirmed from the field. Data was entered twice into access data base to facilitate data cleaning, spot checked 10% and back check 15%. Informed consent was obtained from respondents before data collection. Data was analyzed using robust statistics to eliminate biasness.

3.6.2 Reliability

Various data quality measures were adopted in this study. First and foremost research questions were designed to ensure that consistent results were achieved. The fieldwork manual and check list for the research team were prepared to ensure no stressful moments in terms of number of interviewers per day and payment mode. Guidelines were also

prepared on how to ask certain questions and how to record answers provided. Secondly reliability was ensured through thorough selection of research assistants who were knowledgeable about the topic, the study area, form four level of education, and understand the local language and topography. They were explained on the purpose and procedures of the study as well as guidelines on sampling procedures. They were trained on interview techniques and on how to record answers as precisely as they were provided. They were engaged in the pre-testing of research tools and supervised during data collection.

3.7 Data Collection Techniques

Data collection was carried out by research assistants using the structured interviewer-administered questionnaires. The study employed the interview guide to collect information from the key informants pertaining determinants of trachoma control among caregivers of children aged 1-9 years. FGDs were used to get the knowledge on determinants of trachoma control among caregivers of children aged 1-9 years. Sampled individuals were approached for interviews, FGDs came from a sub-set of villages within the intervention areas and KIIs were administered to the health facility in charge, which was the only one in Oldonyonyokie location and the division public health officer. Qualitative data was transcribed and analyzed by content analysis and presented verbatim. Observation technique was also used to observe signs and symptoms of trachoma on children aged 1-9 years.

Risk-Factor Measurement

Structured interviews with mothers of children as principal household respondents and direct observations were used to measure personal and environmental (household) risk

factors. Interviews were conducted by community health workers experienced in conducting household health interviews. Standard questionnaires were printed and pre-coded in English, and interviews were conducted in Maasai local language. Prior to the survey, the questionnaire was translated and then back-translated in the field by two interviewers who were familiar with both English and the local language to ensure its accuracy. Interviewers were trained to standardize translation and completing of the questionnaire. The survey tool was then piloted in each study site in two villages that had not been sampled, to validate questions and observations.

Personal Factors

Age and sex

The age and sex of each eligible child were recorded. Reported age was verified by health record cards when available, historical events calendar, or the mother's birth history.

Unclean faces

Prior to screening for signs of trachoma, faces of children were briefly inspected for cleanliness and defined as "not clean" if nasal and/or ocular discharge were present. All other possible criteria were ignored.

Household Factors

Household crowding

An index was derived on basis of the total number of individuals residing in the household: 1–5 members; 6–10 members; and > 10 members.

Face washing frequency

Frequency of washing children's faces was determined by asking the mother or caregivers the number of times children's faces were washed in a day and categorized as not washed, washed once, twice or more times daily.

Access to water

The person responsible for water collection reported on how long it took for a return journey to collect water from the main water source, including time spent in the queue. Water accessibility was analyzed in two categories in terms of time taken to fetch water: ≤ 30 minutes, and > 30 minutes.

Pit latrines

Each household head was asked if there was a latrine in the household. The presence and usage of latrines were confirmed by visual inspection.

Garbage disposal

The distance from the house to where the solid waste was disposed of was estimated and classified as ≤ 20 minutes or > 20 minutes.

Cattle ownership

The household head was asked if the family owned cattle.

3.8 Data Analysis

All the quantitative data from household surveys were entered in Statistical Package for Social Scientists (SPSS) version 20 data base twice. Data cleaning was done simultaneously during data collection. At the end of every field day, completed

questionnaires were checked for completeness and exported by the SPSS software. Data analysis was explored using descriptive statistics. Data were edited and analyzed using SPSS II statistical package. Multiple logistic regression models were used to estimate independent contributions of the risk factors to the outcome. Inferential statistics included parametric and non-parametric tests depending on abnormalities in the condition of the eyes and scale of variables to be analyzed. FGDs and KIIs were in content analysis and presented verbatim. Qualitative data was used to triangulate quantitative data.

3.9 Ethical Considerations

The study proposal was presented in the Dept of Community Health of Kenyatta University and permission sought from KU Ethical Committee in Graduate school. The proposal was also presented to National Council for Science and Technology (NCST) for scientific review and ethical approval. The relevant local administration from Kajiado County were informed and approval sought and gotten before data collection. For participating respondents, a verbal explanation was given after which they were requested to sign the consent form. Since most of the county population is largely illiterate, consent was translated into Kiswahili and Maasai languages. Data collected was used for the purposes of research and nothing else. The guardians of participants gave consent before data collection began. All respondents were considered and treated anonymously. Confidentiality was assured throughout the process.

CHAPTER FOUR: RESULTS

4.0 Introduction

This chapter presents details the results of the study as obtained from the various tools that were employed to collect and analyse both quantitative and qualitative data. Quantitative data collection was achieved through a semi structured interview schedule while qualitative data was collected using information obtained from focus group discussion and key informant interview schedules.

4.1. Socio-Demographic Characteristics of the Respondents

As described in Table 4.1, a total of 354 mothers / guardians participated in this study. Of these, 67 participants (19%) were aged 35-39 and > 50 years, while 62 participants (17.5%) were aged 25-29. A further 46 participants (13%) were in the age bracket of 30-34 years, whereas 40 (11.3%) represented the age bracket of 20-24 years. The youngest group was represented by 10 respondents (2.8%) in the age bracket of 15-19 years. This shows that the study covered all age groups of the respondents.

Table 4.1: Demographic information of mothers / caregivers respondents

Demographic information items	Frequency	Percentage
Age ranges:		
15-19	10	2.8
20-24	40	11.3
25-29	62	17.5
30-34	46	13.0
35-39	67	19.0
40-44	31	8.7
45-49	31	8.7
≥ 50	67	19.0

Education levels:		
None	267	77.2
Primary	59	17.1
Secondary	15	4.3
Graduate	5	1.4
Marital status:		
Single	14	4
Married	301	85
Divorced	4	1.1
Widowed	35	9.9
Employment status:		
Unemployed	280	79.1
Civil servant	1	0.3
Self employed	69	19.5
Other	4	1.1
Religion:		
Muslim	1	0.3
Christian	341	96.3
Traditional	12	3.4
Relationship with the children:		
Guardian	38	10.7
Parent	316	89.3
Total	354	100

Further, the results presented in Table 4.1 show that majority of the respondents (267 [77.2%]) had no formal education compared with 59 (17.1%) who had attained primary school level of education. The proportion of respondents who reported attaining secondary level of education was 15 (4.3%) with a further 5 (1.4%) having attained tertiary (diploma) level of education.

The study results also indicate that majority of the respondents (301 [85%]) were married, followed by 35 participants (9.9%) who were widowed, and 14 (4%) who were single or never married at all. However, the least proportion of respondents were those who were separated or divorced (4 [1.1%]).

The findings of the study reveal that majority of the respondents (280 [79.1%]) did not have many formal employment alternatives compared with 69 participants (19.5%) who reported being self-employed, while 4 participants (1.1%) were engaged in other forms of employment. However, only 1 participant (0.3%) reported being in the civil service employment.

The study also points that majority of the respondents (341 [96.3%]) were Christians. Other religions observed were traditional with 12 respondents (3.4%) and with only 1 participant (0.3%) reported being Muslim. With regard to relationships between respondents and the enrolled children, it is further observed that majority of the respondents (316 [89.3%]) were parents to the children as compared with only 38 respondents (10.7%) who were guardians to the children.

4.2 Prevalence of Trachoma

The study used trained Trachoma monitors to assist with field diagnosis of Trachoma. Generally, the TT is defined as either any lash touching the globe or showing evidence of epilation. Epilation is a common traditional practice of intermittent plucking of lashes touching the eye, however, its long-term effectiveness in preventing visual impairment is unknown

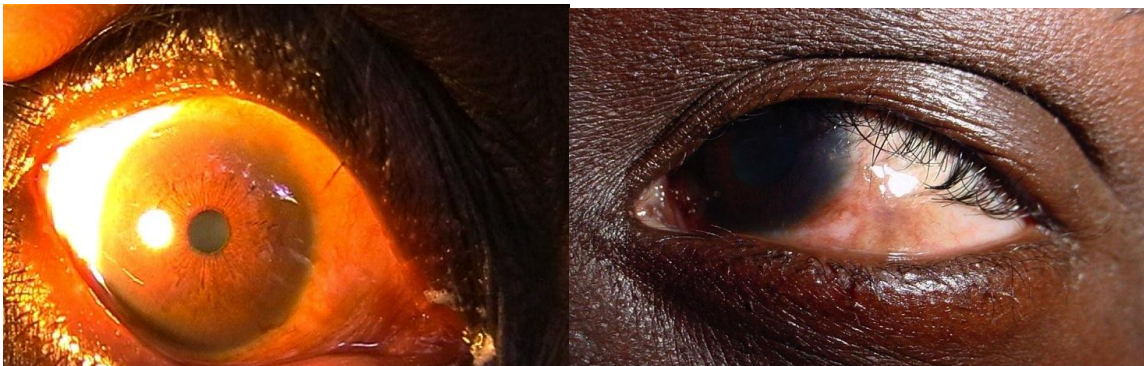


Plate 4.1: Eye infected with Trachoma, Photo by Researcher (2016)

The monitors are able to correctly diagnose presence of TT using WHO grading systems with additional assessment of entropion grading, location and number of trichiatic lashes, and evidence of epilation. Results presented in Table 4.2 on field diagnosis of Trachoma indicate presence of TT at Oldonyonyokie location (in Magadi) at a prevalence of 18.7%. This can be attributed to the fact that the study surveyed a rural population where health service facilities are poor and lower environmental and personal hygiene.

Table 4.2: Field diagnosis of Trachoma

TT diagnosis	Frequency	Percent
TT present	66	18.7
TT absent	272	76.8
Not applicable	16	4.5
Total	354	100.0

4.3 Water, Sanitation and Hygiene factors influencing prevalence of Trachoma

4.3.1 Households' main sources of drinking water

Findings on households' main sources of drinking water indicate that the *Silanga* (also known as earth pan) was the most common source of drinking water for majority of the study respondents (55.4%) followed by water tracking by tankers (31.4%), while open shallow wells accounted for 7.9% as a source of drinking water. Other less important water sources as reported by the study participants include dams / ponds (balley) (3.4%) and rooftop rain water (2%).

Table 4.3: Main sources of drinking water

Source	Frequency	Percent
Water tracking	111	31.4
Rooftop rainwater	7	2.0
Silanga (earth pan)	196	55.4
Dam / Pond (Balley)	12	3.4
Open shallow well	28	7.9

4.3.2 Household's main reasons for non-accessibility to protected water sources

Respondents gave various reasons for not accessing protected water sources where available (Table 4.4). Among the most important reasons for non-accessibility of protected water sources were non-availability of protected water sources, long distances, and unaffordability as reported by 170 (47.9%), 109 (30.9%) and 60 (16.9%) of the respondents respectively. Other minor reasons given for not accessing protected water sources included long queuing time and security concerns.

Table 4.4: Reasons for non-accessibility to protected water sources

Reasons	Frequency	Percent
Not available	170	47.9
Distance – too far (5km)	109	30.9
Security concerns	6	1.7
Cannot afford (water has to be purchased where available)	60	16.9
Queuing time is too long	9	2.6

4.3.3 Making water safe for drinking

When respondents were asked about whether they do anything to make their water safe for drinking, majority of them 234 (66%) reported that they do nothing as compared with 120 respondents (34%) who indicated treating their drinking water to protect it for their household (Figure 4.1).

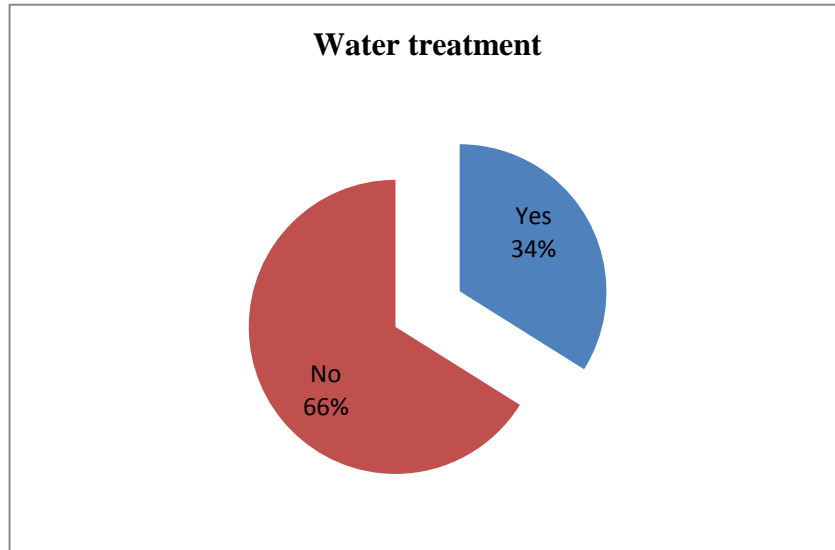


Figure 4.1: Making water safe at household level

4.3.4 Households' methods of water treatment

Apparently respondents who treated their drinking water were observed to be using various methods (Table 4.5). Results presented in Table 4.5 show that most respondents (35.8%) treated their drinking water by chlorination as compared with 103 (29.2%) who reported employing decantation / settling method of water treatment. A further 53 (15%) and 50 (14.2%) respondents reported that they treated their water for drinking by sunning and boiling respectively. However, a small number of about 10 respondents (5.8%) reported treating their water by straining / filtering.

Table 4.5: Methods of water treatment at household level

Water treatment methods	Frequency	Percentage
Chlorination	127	35.8
Decantation / Sedimentation	103	29.2
Sunning	53	15.0
Boiling	50	14.2
Straining / Filtering	10	5.8
Total	343	100

4.3.5 Households' time taken to fetch water per trip

Respondents were asked to estimate how much time, on average, it takes them in one return trip (including waiting and water collection time) to fetch water from main water sources. Observations from the results of this inquiry point that majority (230) of the respondents (65%) took more than one hour to collect water, while another 104 respondents (29.4%) indicated that it takes approximately 30 to 60 minutes to collect water. A small number of 20 respondents (5.6%) took less than 30 minutes to collect water (Table 4.6).

Table 4.6: Time households take to fetch water from main water sources

Times taken	Frequency	Percent
< 30 minutes	20	5.6
30 – 60 minutes	104	29.4
> 1 hour	230	65.0
Total	354	100

In one of the FGD discussions, one discussant on times taken to fetch water narrated that:

... We normally walk long distances to fetch water from the rivers. Some of us have developed backaches and other health problems. We need support from NGOs and governments to construct water tanks close to our door steps so that we have more time to concentrate on other social errands and related activities; and also take care of our families ... *Female CHW, 30 years old.*

4.3.6 Ownership of latrines by households

Inquiries into latrine ownership by households indicated that majority (313) of the respondents (88.4%) did not own a latrine within their household compounds, while only about 20 respondents (11.6%) owned a latrine (Table 4.7).

Table 4.7: Latrine ownership by households

Owning a latrine	Frequency	Percent
Yes	20	11.6
No	313	88.4
Total	354	100.0

A male discussant in one of the FGD said that:

... Many people here do not own toilets because we keep on migrating from time to time in search of pastures for our livestock; so we don't see a need of constructing a latrine because that can be a waste of resources. Male 35 years.....

4.3.7 Types of toilets used by household members

Types of latrines used by household members varied. Given that majority of respondents did not have latrines, the results on types of latrines used indicated that majority (313) of the respondents (88.4%) did not actually have a toilet / latrine and thus used open pits or grounds as latrines. However, some small number of respondents (7.9%) owned a household latrine, while a few others (3.7%) used communal and/or public latrines (Table 4.8).

Table 4.8: Types of toilet used

Type of toilet	Frequency	Percent
No toilet (open pit / ground)	313	88.4
Household latrine	28	7.9
Communal / public latrine	13	3.7
Total	354	100.0

4.3.8 Households' reasons for not having toilets

Respondents provided varied reasons for not having latrines within their households. Pastoralism or frequent movements was given as the most important reason for not constructing toilets by 156 respondents (48.2%), while 118 respondents (36.4%) reported limited resources as the main constraining factor for not constructing toilets / latrines. A further 48 respondents (14.8%) however indicated that they did not see any need to have a latrine and only two respondents (0.6%) reported lacking space to construct a toilet (Table 4.9).

Table 4.9: Reasons for not having latrines

Reasons	Frequency	Percentage
Pastoralism / frequent movements	156	48.2
Limited resources for constructing toilets / latrines	118	36.4
Did not see the need to have a toilet	48	14.8
Lack of space to construct a toilet	2	0.6
Total	324	100

4.3.9 Hand washing practices in households

As listed in Table 4.10, various hand washing regimes were observed being practised by households in the study area. Interestingly, many respondents (121 [34.2%]) reported washing their hands before eating food, while 99 of them (28.12%) reported washing hands after visiting toilets where available. Other 84 respondents (23.73%) reported washing hands before preparing meals and a further 49 respondents (13.95%) indicated that they washed hands after changing baby nappies.

Table 4.10: Hand washing times

Time	Frequency	Percentage
Before eating food	121	34.2
After visiting the toilet	99	28.1
Before preparing meals	84	23.7
After changing baby nappies / clothing	49	14.0
Total	353	100

With regard to hand washing practices, an FGD participant with mothers said that:

“.....AMREF has facilitated us with water before but we no longer have enough water for our cows; we therefore cannot wash our hands as expected.... FGD participant from Nkeek pusi village.

While on the other hand, some KII discussants said the following in regard to hand washing:

“One of the major challenges is lack of awareness; most people don’t have a better understanding of how trachoma can be controlled. A great challenge is shortage of water, but lack of understanding is a corresponding problem. In my opinion even if there is more water the people will not use it properly. Thus, I feel that creating awareness prior to improving the water supply is crucial.”

Another KII discussant narrated that, “If excess water is here maybe in my opinion I cannot see change in the community. Majority of the community members let us say 60% maybe may take time to change, and the other 40% can be difficult to change because of lack of capacity and awareness.”

Both of the KII discussants thought that water was the main challenge in preventing trachoma as water supply was not adequate since the people had to travel for more than an hour to get water. It is possible to maintain proper hygiene with enough water supply.

4.3.10 Garbage Disposal

While good garbage disposal practices are desirable, the findings of this study indicate that majority of the respondents (106 [39%]) of the study area disposed of their garbage anywhere within the compounds, while 71 respondents (26.1%) indicated disposing of their garbage in the surrounding bushes. A further 32 respondents (11.7%) disposed of their garbage in the available dust bins as illustrated in Table 4.11.

Table 4.11: Garbage disposal practices

Disposal places	Frequency	Percentage
Anywhere in the compound	106	39.0
Surrounding bushes	71	26.1
Dust bins (available)	32	11.7
Other	63	23.2
Total	272	100

4.4 Practices of Keeping Animals and their Effect on Trachoma Infection

The study respondents were asked whether they slept with their animals and/or lived within the same compound with animals (cows, goats, sheep, chicken, dogs and camels). On the basis of that question, the study findings show that majority of the respondents (289 [82.6%]), followed by 201 respondents (57.4%) and 178 respondents (50.9%) consented living in the same compound with goats, sheep and cows respectively. Other domestic animals living in the same compound include chicken, dogs, and camels as reported by 106 participants (30.3%), 11 (3.1%) and 5 participants (1.4%).

Table 4.12: Animal keeping practices

Animals	Yes Living rooms / compounds (%)	No Living rooms/ compounds (%)
Cows	178 (50.9)	172 (49.1)
Goats	289 (82.6)	61 (17.4)
Sheep	201 (57.4)	149 (42.6)
Dogs	11 (3.1)	339 (96.9)
Chicken	106 (30.3)	244 (69.7)
Camels	5 (1.4)	350 (98.6)

4.5 Personal Hygiene Factors Associated with Trachoma Infection

4.5.1 Washing hands after defecation

When respondents were asked whether they practiced hand washing after defecation, majority of them (203 [57.3%]) indicated that they did not wash their hands, while about 151 respondents (42.7%) reported practicing hand washing after defecation (Figure 4.2).

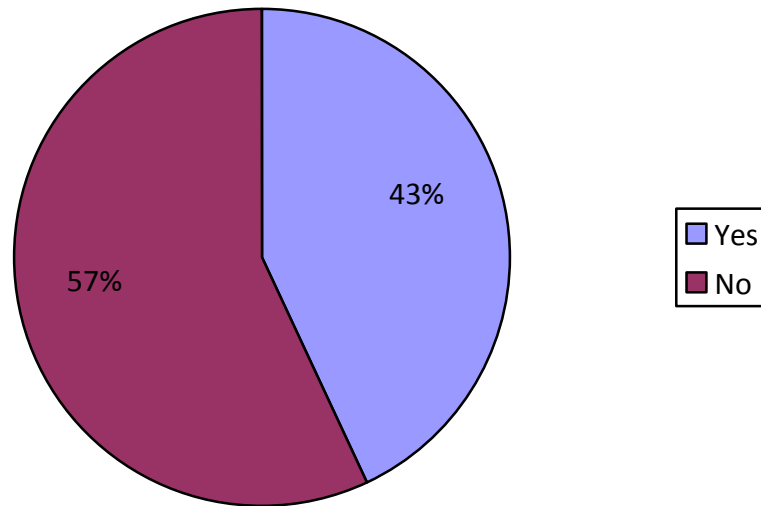


Figure 4.2: Hand washing after defecation

It was also observed that among the respondents who reported washing their hands after defecation, majority (64%) of them used plain water without soaps. However, there is also a reasonable number of respondents who reported washing their hands with water and soap.

4.5.2 Face washing with clean water

Respondents were posed with the question on whether they wash their face with clean water (free from particles). The results of the study show that majority of the participants (187 [52.8%]) did not practice face washing with clean water, while 167 respondents (47.2%) reported washing their face with clean water (Figure 4.3).

When asked whether respondents washed their faces with soap every morning, most of the respondents (47.2%) reported that they only washed their faces with soap sometimes, while 33.5% of them indicated that they never washed their faces with soap. But

interestingly, only about 19.3% of the study respondents reported washing their faces with soap every morning.

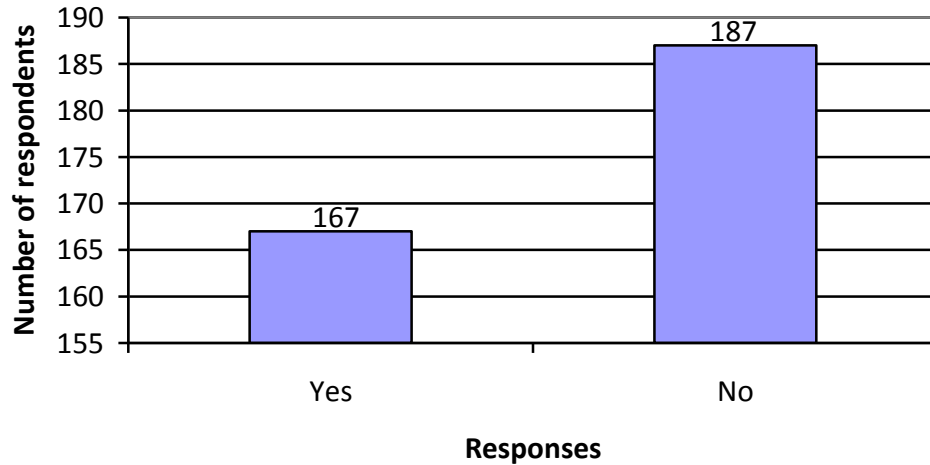


Figure 4.3: Face washing with clean water

4.5.3 Bathing

When the respondents were asked how often they took baths within a week, majority of the respondents (183 [51.6%]) reported bathing once in a week, while 142 respondents (40.2%) bathed twice a week. A further 29 participants (8.2%) indicated they could not tell how many times they bathed in a week.

On the type of water used for bathing, most respondents (171 [48.3%]) used water in a basins followed by those (164 [46.4%]) who bathed in flowing water or taps (Table 4.13).

Table 4.13: Nature of bathing water

Nature of bathing water	Frequency (n)	Percent (%)
Flowing water (tap)	171	48.3
Water in basins	164	46.4
Other (specify)	19	5.3

4.6 Health Seeking Behavior influencing Trachoma Infection

The respondents were posed with a variety of questions regarding factors influencing health seeking behaviors that influence Trachoma infection. The results of the questions are tabulated and presented in Table 4.14. What appears interesting in these results of health seeking behaviour is that about 183 respondents (51.8%) indicated experiencing itchiness and/or watery eyes in the past two weeks. As important was the acts of epilation in which about 181 respondents (51.2%) practised the epilation. Further a reasonably good number (111) of respondents (31.3%) reported to have heard some relationships between environment and Trachoma.

Table 4.14: Health seeking behavioral factors that influence Trachoma infection

Questions (n=354)	Answers	Frequency	%
Itchiness or watery eyes in the past 2 weeks	Yes	183	51.8
	No	171	48.2
Follicles, watery discharge, painful eyes and swollen eyelids	Yes	85	23.9
	No	269	76.1
Heard about relationship between face washing and Trachoma	Yes	101	28.6
	No	253	71.4
Heard about relationship between environment and Trachoma	Yes	111	31.3
	No	243	68.7
Practicing epilation	Yes	181	51.2
	No	173	48.8
Previous history of TT surgery (Right eye)	Yes	40	11.3
	No	314	88.7
Previous history of TT surgery (Left eye)	Yes	38	10.8
	No	316	89.2

A rapid investigation was undertaken on some socio-demographic characteristics and their influence on Trachoma infection. As a result of this investigation, trachoma prevalence was estimated among different socio-demographic categories. Along the prevalence estimations, chi-square (λ) tests of significance at $p < 0.05$ were also performed in which only the relationship of educational levels and Trachoma infection was found statistically significant, as illustrated in Table 4.15.

Table 4.15: Socio-demographic characteristics and their influence on Trachoma infection

Variable	Frequencies and percentages	Chi square (λ)
Age of mother / guardian	15-21=29 (8.3)	$\lambda=1.451$
	22-28= 6 (21.7)	df=3
	29-35=65 (18.6)	P=0.694
	36-42=84 (24)	
	43-49=33 (9.4)	
	$\geq 50=67$ (19.1)	
Marital Status	Single / never married=14 (4)	$\lambda=12.501$
	Married=298 (85)	df=9
	Divorced / separated=4 (1)	P=186
	Widowed=35 (10)	
Level of education	Primary=59 (16.9)	$\lambda=29.851$
	Secondary=15 (4.3)	df=18
	Post graduate=9 (2.6)	P=0 .039
	Other=8 (2.3)	
	None=267 (76.3)	
Occupation	Unemployed=280 (80)	$\lambda=3.248$
	Self-employed=69 (19.7)	df=3
	Civil servant=1 (0.3)	P=0.355
	Other=4 (1.1)	
Religion	Christian=341 (97.4)	$\lambda=16.828$
	Traditional religion=12 (3.4)	df=12
	Muslim=1 (0.3)	P=0.156

On the animal keeping practices and their relationships with Trachoma infection, this research found that goats, sheep and cows were critical in that descending order of importance in positively influencing Trachoma infections. This was confirmed with statistically significant λ tests at the $p < 0.05$ significance level (Table 4.16).

Table 4.16: Animal keeping practices and Trachoma infection

Animal or bird	Responses		Chi Square (λ)
	Yes – in living rooms / compounds n (%)	No – not in living rooms / compounds n (%)	
Cows	178 (50.9)	172 (49.1)	$\lambda=29.851$ df=18 P=0.039
Goats	289 (82.6)	61 (17.4)	$\lambda=22.237$ df=9 P=0.008
Sheep	201 (57.4)	149 (42.6)	$\lambda=14.392$ df=6 P=0.026
Dogs	11 (3.1)	339 (96.9)	$\lambda=4.964$ df=4 P=0.291
Chicken	106 (30.3)	244 (69.7)	$\lambda=4.758$ df=4 P=0.313
Camels	5 (1.4)	350 (98.6)	$\lambda=11.497$ df=8 P= 0.175

4.7 Regression Analysis

Regression analysis was applied to obtain an equation, which describes the dependent variable in terms of the independent variables based on a regression model. Various regressions were undertaken using the basic regression model. A basic regression model

on the washing of hands after defecation, face washing with clean water, and bathing against trachoma infection index is specified in equation 2.

$$\text{TRI} = \beta_0 + \beta_1 \text{WH} + \beta_2 \text{FW} + \beta_3 \text{BA} + e \quad 2$$

Where:

WH is the washing of hands after defecation; FW is the face washing; BA is the bathing; B_0 is a constant, which is the value of dependent variable when all the independent variables are 0; β_{1-n} are the regression coefficients or changes induced by WH, FW, and BA on TRC. The coefficients determine how much each independent variable (WH, FW and BA) contribute to the dependent variable (TRI); and e is the error of prediction.

While various regressions on personal hygiene factors as they influence trachoma infection were conducted, the one on the washing of hands after defecation, face washing with clean water, and bathing against trachoma infection index is described in Table 4.17.

Table 4.17: Results of regression analysis on hand and face washing, and bathing on trachoma infections

Model	Unstandardized Coefficients		Standardized Coefficients	T	Significance levels
	β	Std. Error	Beta		
(Constant)	0.512	0.160		3.2	0.022
Washing hands after defecation	1.237	0.541	0.52	2.29	0.00
Face washing	0.8593	0.368	0.40	2.34	0.02
Bathing	1.281	0.471	0.411	2.72	0.01

Dependent variable=Trachoma infection

Hence, the resultant regression model as computed in Table 4.17 is:

$$TRI=0.521 + 1.237WH + 0.8593FW + 1.281BA + e$$

A summary of Table 4.17 shows the regression analysis that seeks to establish the relationship between trachoma infection, washing of hands after defecation, face washing and bathing. It is shown that washing of hands after defecation was a statistically significant factor at the 5% level influencing Trachoma infections with a p-value of 0.00. Bathing was also observed to be positively related to trachoma infection and was also statistically significant as indicated by a P value of 0.01, which is statistically significant at 5% level. Similarly, face washing was also statistically significant as indicated by a p=0.02, which is statistically significant at 5%.

With an adjusted R-squared of 0.76, it implies that washing of hands after defecation, face washing and bathing explain up to 76% of the variations in trachoma infection. The Durbin Watson of 2.09 showed absence of serial correlation.

The statistical significance of the overall regression model was computed by conducting an analysis of variance (ANOVA). The results of this analysis are presented in Table 4.18.

Table 4.18: Analysis of Variance (ANOVA)

Model	SS	df	MS	F	Sign.
Regression	58.366	23	14.5915	34.974	0.00 ^b
Residual	37.548	83	0.4172		
Total	95.9346	106			

Notes: SS=Sum of squares, df=degree of freedom, MS=Mean square; Sign=Significance level, ^b=statistically significant at p=0.00

Given that the F critical at 5% significance level was 2.472 and the calculated F (34.974) is greater than F critical, the overall regression model was significant (Table 4.18).

A summary of the regression model is presented in Table 4.19 in which it is shown that the regression had a correlation coefficient (R^2) of about 0.6084 and an adjusted R^2 of 0.76. This means that washing of hands after defecation, face washing and bathing explain 76% of the variations in trachoma infection.

Table 4.19: Regression Model Summary

R	R-Squared	Adjusted R-Squared	Std. Error of the Estimate	Change Statistics			Durbin-Watson
				F Change	df1	df2	
0.78	0.6084	0.76	0.64593	34.974	23	83	2.09

The F test statistic is used to test the significance of R^2 , which is the same as testing the significance of the model as a whole with a probability of 0.00 at 5% significance level indicating that the joint contribution of the independent variables was significant in predicting the dependent variable.

4.8 Testing of Hypotheses

- (a) H_0 : There is no relationship between personal hygiene and keeping animals in controlling trachoma infection.

Table 4.20: Chi-square analysis of responses on personal hygiene, keeping animals and controlling trachoma infection

		Trachoma infections		
		High	Low	Total
Personal hygiene and keeping animals	Effective	91	88	179
	Ineffective	100	75	175
	Total	191	163	354

5% level of significance = $P < 0.05$

Chi-square critical value

Where $\alpha = 0.05$ and $n = 354$ $\chi^2_{\alpha} = 3.841$

Chi-square computed

The sum of the last column gives $(\chi^2_c) = 1.558$

At the 95% confidence level and a degree of freedom of $= (2-1) (2-1) = 1$, $\chi^2_{\alpha} = 3.841$.

Since $\chi^2_c < \chi^2_{\alpha}$, we reject the null hypothesis H_0 and accept the alternate hypothesis and conclude that there is evidence to suggest that personal hygiene and keeping animals do influence infection of trachoma. There is therefore need to put into place mechanisms to govern personal hygiene and keeping animals in order to control trachoma infection.

(b) H_0 – There is no relationship between socio-demographic characteristics and trachoma infection in Kajiado County.

Table 4.21: Chi-square analysis of responses on socio-demographic characteristics and trachoma infection

		Trachoma infection		
		High	Low	Total
Socio demographic characteristics	Effective	46	120	166
	Ineffective	119	69	188
	Total	165	189	354

5% level of significance = $P < 0.05$

Chi-square critical value

Where $\alpha = 0.05$ and $n = 354$

$\chi^2_{\alpha} = 3.841$

Chi-square computed

The sum of the last column gives $(x^2_c) = 1.348$

At the 95% confidence level and a degree of freedom of $= (2-1) (2-1) = 1$, $x^2_a=3.841$.

Since $x^2_c < x^2_a$, we reject the null hypothesis H_0 and accept the alternate hypothesis and conclude that there is evidence to suggest that socio-demographic characteristics do influence trachoma infection. There is therefore need to put into place mechanisms to govern socio demographic characteristics in order to control trachoma infection.

(c) H_0 – There is no relationship between community involvement in access and utilization of water to control trachoma infection in Kajiado County.

Table 4.22 Chi- Square Analysis of response regarding Community involvement in access and utilization of water and trachoma infection

		Trachoma infection		
		High	Low	Total
Community involvement in access and utilization of water	Effective	57	201	258
	Ineffective	43	53	96
	Total	100	254	354

5% level of significance = $P < 0.05$

Chi-square critical value

Where $\alpha = 0.05$ and $n=354$

$$x^2_a=3.541$$

Chi-square computed

The sum of the last column gives $(x^2_c) = 1.743$

At the 95% confidence level and a degree of freedom of $= (2-1) (2-1) = 1$, $\chi^2_a=3.541$. Since $\chi^2_c < \chi^2_a$, we reject the null hypothesis H_0 and accept the alternate hypothesis and conclude that there is sufficient evidence to suggest that community involvement in access and utilization of water does influence trachoma infection. There is therefore need to put into place mechanisms to govern community involvement in access and utilization in order to reduce trachoma infection.

CHAPTER FIVE: DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The summary and overview from this study draws from the socio-demographic as well as water, hygiene and sanitation (WASH) characteristics and practices that were deemed potentially relevant to effective Trachoma control and prevention. The study set out to establish barriers to effective Trachoma control in Oldonyonyokie location of Magadi division, Kajiado County and as can be deduced from the study findings, the research objectives were met.

5.1 Prevalence of Trachoma

The results indicate that the prevalence of TT in Oldonyonyokie (Magadi) is 18.6%. This can be attributed to the fact that the study includes only the rural population where the health service facilities are poor and lower environmental and personal hygiene.

5.2 Socio-Demographic Characteristics and Trachoma Infections

A Chi-square test was employed to assess whether there was any association between the various socio-demographic variables like age, marital status, levels of formal education, employment status and religion and Trachoma infection. According to the findings, there was no significant association between the measured socio-demographics factors and adherence to CPT except for the levels of formal education ($p < 0.001$).

The results indicate that 67 respondents (19.0%) were aged between 35-39 and above 50 years, while 62 respondents (17.5%) were aged between 25-29 years. A further 46 respondents (13.1%) were in the age bracket of 30-34 years, with the age bracket 20-24

years representing the least proportion of respondents of 40 respondents (11.3%). These findings are consistent with a study by Congdon (1993), which showed that children under 9 years are the major reservoirs of the bacteria for the infective trachoma; and children under this age cannot take care of themselves and are therefore affected more because this group is characterized by unclean faces, nasal discharges, foods on the faces and dust that attract eye-seeking flies, which are the bacteria carrier.

The results further indicate that a majority of 267 respondents (75.4%) had no formal education since they had not attended schools as compared with 59 respondents (16.7%) who had attained primary school level of education. The proportion of respondents who reported attaining secondary level of education was 4.2% with a further 1.4% having attained postgraduate level of education. As such, many children from illiterate households were more likely to have active trachoma than from literate household. This result is consistent with a study conducted in Tigray region of Ethiopia by Mesfinet *et al.* (2006) with similar findings reported from Tanzania (Harding-Esch *et al.*, 2010). The likelihood of children being infected by active Trachoma may be due to the effect of illiteracy of the fathers / mothers, which is especially important because the parents are responsible for the caretaking of the children. As compared with uneducated mothers, educated mothers may be more aware of the benefits of hygiene practices to the health of their children.

The findings of the study further show that majority of 280 respondents (79.1%) did not have any employment as compared with 69 respondents (19.5%) who reported being self-employed, while only 4 respondents (1.1%) were engaged in other forms of employment.

Children from households getting low monthly incomes are more likely to have trachoma infections than those from households getting high incomes. A similar scenario was reported in Ethiopia by Negussie (2008). The possible explanation to this could be due to effects of poor hygiene, high chance of sharing tools and utensils, low immunity status and limited information leading to poor health care – all because of poverty.

It is also observed that overcrowding as a result of living in large extended families has been identified as an important factor contributing to spread of Trachoma. In addition, some studies in Africa (see for example, West, 1996) have indicated that pre-school children living in families with more than nine members in a household are four times more likely to be affected than those with less than four members.

5.3 Water, Sanitation and Hygiene Factors Associated with Trachoma Infections

Improvements in community and household sanitation, such as provision of household latrines, help control fly breeding grounds and thus their populations. Increased access to water facilitates good hygiene practices and this is critical to achieving sustainable elimination of the disease. Separation of animal quarters from human living spaces as well as safe handling of food and drinking water are important environmental measures that affect communities and can be incorporated into a trachoma control program. The study also reveals there exists relationship between active trachoma and non-accessibility to protected water sources. This result is similar with previous work in Ankober, Ethiopia reported by Golovaty *et. al.*, (2009) in which it is shown that due to inaccessibility to protected water sources and frequently exposed water surfaces, risk factors for contamination as well as presence of high number of eye flies lead to high

chances of trachoma transmission. As Schémann *et al.* (2007) also found through a national disease prevalence survey in Mali, families with easy access to a water source tended to use more water for bathing and other hygienic purposes such as laundry, hence reducing chances of trachoma infections.

In the present study, it was found that there existed significant association between active trachoma and unclean faces. This finding is similar to studies (Emerson *et. al.*, 2004; Ngondi, 2008) that identify the presence of ocular and nasal discharge as risk factors for the presence of fly on eyes and active trachoma in Ethiopia and Tanzania. The presence of more flies on faces was associated with more chances of having active trachoma. This finding is also consistent with different investigations in Tanzania, Gambia and Ethiopia (Emerson *et. al.*, 2006; Taylor 2010; Cumberland, 2007). The possible explanation of all this could be the role of eye-seeking flies in trachoma transmission, which have still remained common and high. Available water increases the likelihood of good sanitation and good personal hygiene. It is therefore very important to improve both personal hygiene within families and environmental sanitation. This advice, given to both young and old, will considerably influence the transmission of trachoma infections and thus reduce acute and chronic inflammation, which if they persist for over 10 to 20 years can cause scarring of the eyelids and corneas, with consequent blindness.

5.4 Animal Keeping Practices and their Influence on Trachoma Infections

More than half of the respondents in the study area keep animals either in the living rooms or within their compounds. Literature reviewed for this study show that flies breed in and are likely to be attracted to rubbish dumps, bins, excreta including cow dung,

decaying food and rotting carcasses. In this study, keeping of animals in the houses is significantly related with the number of trachoma infections in the households, and in the community in general. This may be related to the animal dung as the breeding sites for the flies and also the dung increases the exposure of children to the flies. Flies are normally attracted to red eyes with discharges, and they carry the organism *Chlamydia trachomatis* to the eyes of other people within a family or a community, both children and adults.

Another environmental factor associated with transmission is the presence of animals kept near dwellings and piles of animal dung that provide breeding places for flies. As already mentioned, flies are attracted to red eyes with discharges, and carry the organism *Chlamydia trachomatis* to the eyes of others within a family or a community, both children and adults. Overcrowding in homes is yet another environmental factor associated with trachoma transmission. Overcrowding results in great transmission amongst family members. Additional environmental and social variables that have been shown to be risk factors for trachoma sustainability include heat and aridity, considerable distances from water sources and scarcity of water as discussed in the results of this study (Subsection 5.2), rural residences, lack of latrines, crowded living conditions, and keeping cattle or other animals close proximity to homes. Emerson *et. al.*, (2005), however, suggests that such correlations might simply be proxies for poverty, and that trachoma is not just a disease of hot and arid locations.

5.5 Conclusions

The prevalence of trachoma is high (18.6%) in Oldonyonyokie location of Magadi division in Kajiado County. Although lower than the greater Kajiado, it is still an issue of public health concern.

Formal education levels were observed as the main socio-demographic characteristic influencing the prevalence of trachoma.

Majority of the respondents displayed poor hygiene practices with only 12% of the respondents having some latrine coverage, while only about 28% of the respondents washing after toilet use for those who use latrines.

Majority of the respondents keep cows (50.9%), goats (82.6%) and sheep (57.4%) in the households hence increasing the risks of trachoma transmission.

Health seeking behaviors of majority of respondents is poor with only about 23% of the respondents visiting the health center.

5.6 Recommendations

The Ministry of Health, at both County and National levels, should come with effective, tailor-made and sustainable ways and implementable policies of curbing the trachoma infections.

There is need to integrate concerted efforts for promoting understanding of TT prevention and management among affected communities. This could be through localized behaviors change communications using IEC materials that can be understood.

The affected communities should be empowered on trachoma risk factors through capacity building to enhance prevention and control of trachoma transmission.

There should be special programmes aimed at improving the negative hygiene practices in the communities.

Traditional practices of keeping animals in houses should be addressed towards their proper management.

The CHWs in the endemic areas should be empowered and encouraged to promote good health seeking practices surrounding TT as well as conducting referrals to the health facilities for early diagnosis and management of TT.

5.7 Recommendations for Further Research

The study could be scaled to cover other TT endemic counties in Kenya.

A study addressing the socio-cultural issues of communities with increased risks of TT could be undertaken.

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APPENDICES

APPENDIX 1.1: CONSENT FORM

My name is _____, and I am a master's of public Epidemiology and disease control student in Kenyatta University. I am carrying out a study to find out the barriers affecting trachoma control among children aged 1-9 years in Kajiado County.

PURPOSE OF THE STUDY

The aim of this study is to determine the Prevalence and Risk factors for trachoma infection among children 1-9 years old in Oldonyonyokie location, Magadi Division, Kajiado County. Trachoma is an eye infection caused by *Chlamydia trachomatis*. This disease remains the main cause of preventable blindness and the second leading cause of blindness globally.

STUDY PROCEDURES

The principle investigator will recruit mothers of children aged 1-9 years old for interviews. During the interviews, you will be asked questions pertaining to your children's demographic characteristics as well their health status particularly in relation to active trachoma. You will also be requested to give any relevant information about the risk factors of trachoma. If therefore, you wish to participate, the principle investigator requests that you give permission by signing the consent form.

RISKS / DISCOMFORTS

This study will consume some time which may not have been budgeted for by the respondent. 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. 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 questionnaires 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 the following:

Christine Nyamwaro, Principle Investigator

Cell No: 0723101576; Email: christinenyamwaro@gmail.com

or

The Director; KU Research Ethics

Kenyatta University

P.O. Box 43844; Nairobi; Tel-;8710901/12

Relation to the child.....

Thumb print/Signature of the guardian of the participant (above 18 years) -----

Date.....

Researcher's signature

Date

APPENDIX 1.2: Household questionnaire

Prevalence and risk factors for trachoma infection

Identification	
Cluster Number	
Household Number	
Village Name	
Name of Supervisor	

Interview date	___/___/___ day/month/year	<i>For Supervisor</i>			
		Day			
Name of Interviewer		Month			
		Year			

A. Socio demographic information of parent/guardian

1. How old are you? (Years).....
2. What is your relationship with the children?

1. Parent	
2. Guardian	

3. If parent, how many children of your own do you have?
4. If guardian, how many children do you care for?
5. What is your level of education?

0. No formal education	
1. a) Primary complete	
b) Primary incomplete	
2. Secondary	
3. College	
4. University	

6. What is your employment status?

0. Unemployed	
1. Civil servant	
2. Self-employed	
3. Other (specify)	

7. What is your religion?

1. Muslim	
2. Catholic	
3. Protestant	
4. Traditional	
5. Other (specify)	

B: Children's details and disease status

No	Sex 0-M 1-F	Age (yrs)	Level of education			Signs and symptoms				
						Itching eyes 0-no 1-yes	Follicles 0-no 1-yes	Watery discharge 0-no 1-yes	Painfu l eyes 0-no 1-yes	Swollen eyelids 0-no 1-yes
			0	1	2					
1.										
2.										
3.										
4.										
5.										
6.										
7.										

NB: For level of education: 0 = none, 1 = Pre-primary, 2 = Primary

C: Socio-economic factors**a) Water**

1. Is there adequate water in your compound?

1. Yes	
0. No	

2. What is the source of your water?

Source	0 – No; 1 – Yes
a. Borehole	
b. Shallow well	
c. Dam	
d. Natural spring	
e. River	
f. Other (specify)	

b) Domestic animals and birds

Animal or Bird	0-No	If yes, where?		
	1-Yes	Living rooms 0-No, 1-Yes	In the compound 0-No, 1-Yes	Outside compound 0-No, 1-Yes
Cows				
Goats				
Sheep				
Dogs				
Chicken				
Camels				

c) Personal Hygiene

4. Do you wash your hands after defecation?

1. Yes	
0. No	

5. If yes, what do you use in washing your hands?

1. Plain water	
2. Water and soap	
3. Other (specify)	

6. Do you wash your face with clean water?

1. Yes	
0. No	

7. If yes how often in a week?

1. Once	
2. Twice	
3. Other (specify)	

8. Do you bathe?

1. Yes	
0. No	

9. If yes, how often in a week?

1. Once	
2. Twice	
3. Other (specify)	

10. If yes, what is the nature of the water you use for bathing?

1. Flowing water	
2. Water in a basin	
3. Other (specify)	

11. Do you share bathing water?

1. Yes	
0. No	

d) Latrines and Sanitation

12. Do you have a pit latrine?

1. Yes	
0. No	

13. If yes, do you use it?

1. Yes	
0. No	

14. If no, where do you defecate?

1. Behind the house	
2. In the bush	
3. Other (specify)	

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

1. Yes	
0. No	

16. If yes, what are they?

.....

.....

.....

17. Where do you dispose of garbage?

a. Anywhere in the home compound	
b. In a dust bin	
c. In the bush	
d. Other(specify)	

18. Observe whether there are house flies in the compound.

1. Yes	
0. No	

19. Observe whether there are house flies around children's eyes.

1. Yes	
0. No	

e) **Health care**

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

1. Yes	
0. No	

21. Where do you seek medical attention for eye problems of the child?

a. Alternative medicine (herbalists)	
b. Hospital	
c. Pharmacy	
d. Other (specify)	

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

1. < 1 km	
2. Between 1 and 5 km	
3. > 5 km	

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

1. Yes	
0. No	

24. If no, why?

.....

.....

.....

Thank you

APPENDIX 1.3: Focused Group Discussion

Discuss Procedure / Purpose

During the discussion I will be asking a series of questions that are of interest to my research. Please feel free to respond to any of my questions or to other members in the group without waiting to be called upon. However, I would appreciate it if only one person spoke at a time. I would also like to assure you that there is no right or wrong answer to each of the questions and you are free to disagree or agree with each other. However, out of respect for the other participants I would like to ask you to please keep the information discussed in today's session confidential. It is your opinions and thoughts that are of interest to me. Consequently, I will not be sharing any of my own thoughts. Throughout the discussion _____ will be taking notes. The discussion will also be recorded by your permission so that I do not miss anything that was said. Does anyone have any questions before we begin?

Participant Introduction

Participants will be asked to introduce themselves to the group.

Focused Group Discussion (FGD) Guide (CHWs)

1. Is trachoma a problem in your community?

Probes: Does trachoma frequently interfere with daily activities?

2. What do you think causes trachoma?

Probes: How do you think trachoma is transmitted?

How can you prevent or minimize your risk of getting trachoma?

3. What would you suggest be done to improve the hygiene of the children in your Community

Probes: How can the hygiene of children in your community be improved?

4. What would you suggest should be done to solve or reduce health issues such as trachoma in your community?

Probes: What needs to be done to reduce the risk of trachoma infection?

(Education, water, latrines, health Care)?

5. What are the risk factors influencing active trachoma in your community?

Probes: What prevents the problem of trachoma from being solved now?

6. Is there any other information you feel would be useful for my research or that you would like me to know?

Closure

Thank you once again for participating in this discussion. I appreciate the time each of you has taken out of your day to discuss this topic. Your comments and thoughts on the subject have been very useful. If you have any further questions or concerns you would like addressed before you leave please come and see _____ or myself.

APPENDIX 1.4: Key Informant Interview Guide**(Health facility in charge and Division Public Health Officer)**

1. What are the major health issues in this area?
2. On average, at what stage of trachoma infection do individuals typically seek medical attention (i.e. trachomatous inflammation follicular, trachomatous inflammation intense, trachomatous scarring, trichiasis, corneal opacity)?
3. What factors (if any) do you believe are hampering efforts to prevent / limit the spread of trachoma in this area?
4. How often would you say that you treat individuals with trachoma?
5. As a health care professional is there any resources you lack that you feel would help you to better treat patients with trachoma and/or lower the number of trachoma infections?
6. Do you feel that the water supply in the area is sufficient for community members to maintain the level of hygiene needed to avoid serious trachoma infection?
7. Do you feel that the latrines in the area are sufficient to meet the community's needs?
8. How do you think the education system in your community could be better used to help reduce the number of trachoma infections amongst children in the area?
9. Is there anything else you would like to share from your experience as a healthcare professional?

APPENDIX 1.5: Letter from Kenyatta University



KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE

Email: chairman.kuerc@ku.ac.ke
secretary.kuerc@ku.ac.ke
erck.ku2008@gmail.com
 Website: www.ku.ac.ke

P. O. Box 43844 - 00100 Nairobi
 Tel: 8710901/12
 Fax: 8711242/8711575

Our Ref: KU/R/COMM/51/385

Date: 9th November, 2015

Christine Moraa Nyamwaro
 Kenyatta University,
 P.O Box 43844,
 Nairobi

Dear Moraa,

APPLICATION NUMBER PKU/276/ I 252- "BARRIERS TO EFFECTIVE TRACHOMA CONTROL
 AMONG CHILDREN AGED 1-9 YEARS OLD IN MAGADI DIVISION, KAJIADO COUNTY, KENYA"

1. IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic, "Barriers to effective trachoma control among children aged 1-9 years old in Magadi Division, Kajiado County, Kenya" received on 28th October, 2014 and discussed on 18th November, 2014.

2. APPLICANT

Christine Moraa Nyamwaro

3. SITE
 Magadi Division, Kenya

4. DECISION

The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines, and is of the view that against the following elements of review,

- (i) Scientific design and conduct of study,
- (ii) Recruitment of research participant,
- (iii) Care and protection of research participants,
- (iv) Protection of research participant's confidentiality,
- (v) Informed consent process,
- (vi) Community considerations.

AND APPROVED and that the research may proceed ON CONDITION that you incorporate its advise below.

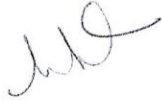
5. ADVICE/CONDITIONS

With respect to matters of scientific design and conduct of study and recruitment of research participants, the following specific conditions must be fulfilled in writing before an approval can be granted. the manner of fulfilling these should be outlined and submitted to ku-erc as soon as possible.

- 1. Recruitment of Participation
 - a) Clarify the recruitment of research participants.
- 2. Protection of research participant's confidentiality.
 - a) Specify how protection of research participant's confidentiality will be assured.
- 3. Informed consent
 - a) Indicate that consent will be sought from KUERC in section 3.9 under ethical considerations.
- 4. Community considerations
 - a) State the community considerations in the research.
- 5. Show how the questionnaires will be administered to participants.

When replying, kindly quote the application number above.

If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.



DR. TITUS KAHIGA
CHAIRMAN: KENYATTA UNIVERSITY ETHICS REVIEW COMMITTEE

I
accept the advice given and will fulfill the conditions therein.

Signature.....Dated this day..... of..... 2015.
cc. Vice-Chancellor

**APPENDIX 1.6: Permit from National Commission for Science, Technology and
Innovation (NACOSTI)**



NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION

Telephone +254-20-2213471,
2241349,310571,318249
Email : secretary@nacosti.go.ke
Website : www.nacosti.go.ke

9th floor utalii house
Uhuru Highway
P.O Box 30623 -00100
Nairobi

Date: 20th November, 2014

NACOSTI/P/14/5930/630

Christine Moraa Nyamwaro
Kenyatta University
P.O box 43844-00100
NAIROBI

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "*Prevalence And Risk Factors For Trachoma Infection Among Children Aged 1-9 Years Old In Oldonyonyokie Location, Magadi Division, Kajiado County, Kenya*". I am pleased to inform you that you have been authorized to undertake research in Kajiado County for a period ending 31st March 2015.

You are advised to report to the **county commissioner, County Director of Health, Kajiado County** before embarking on your research project.

On completion of your research, you are expected to **submit two hard copies and one soft copy in pdf** of the research report

**DR M K RUGGUT, PhD HSC
DEPUTY COMMISSION SECRETARY
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION**

c.c
The County Commissioner
The County Director of Health, Kajiado County