ACCURACY OF TRACHOMATOUS TRICHIASIS CASE IDENTIFICATION BY COMMUNITY HEALTH VOLUNTEERS IN EAST POKOT, BARINGO COUNTY

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A Dissertation Submitted to the University of Nairobi
Ophthalmology Department in Partial Fulfillment for the Award of Degree of Master of Medicine in Ophthalmology - M.Med(Ophth)
DECLARATION
I declare that this dissertation is my original work and has not been presented for award of degree in any other university.
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<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHVs</td>
<td>Community Health Volunteers</td>
</tr>
<tr>
<td>CTAs</td>
<td>Community Treatment Assistants</td>
</tr>
<tr>
<td>CO</td>
<td>Corneal Opacity</td>
</tr>
<tr>
<td>KNH</td>
<td>Kenyatta National Hospital</td>
</tr>
<tr>
<td>MDA</td>
<td>Mass Drug Administration</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Program for Social Sciences</td>
</tr>
<tr>
<td>TT</td>
<td>Trachomatous Trichiasis</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
**ABSTRACT**

**Introduction:** Trachoma is the leading infectious cause of blindness and a public health problem globally and in Kenya. Repeated infections cause trachomatous conjunctival scarring leading to trachomatous trichiasis (TT), which left untreated results in visual impairment or blindness.

East Pokot in Baringo County is a trachoma endemic area. Community health volunteers in this area play a central role in identification and referral of TT cases to existing health care systems. Their ability to correctly identify people with TT ensures that no cases are left in the community thus reducing the backlog of cases. Correctly identifying people without TT reduces overload on the health care system and saves time and resources.

**Objective:** Broad objective was to assess the accuracy of TT case identification by community health volunteers in East Pokot, Baringo County.

**Study design:** Cross-sectional community based study.

**Study setting:** East Pokot sub-County in Baringo County.

**Study population:** All persons who turned up for screening during community TT surgical camps in East Pokot, Baringo County within the study period.

**Data collection and analysis:** Selected participants were first examined by the CHVs then confirmed by the principal investigator. Data was collected using a pre designed questionnaire to record all the information needed. Descriptive statistics were used to summarize the data.

**Ethical approval:** Permission and authority to conduct the study was obtained from the Ethics and Research Committee of University of Nairobi/ Kenyatta National Hospital.

**Results:** This study revealed that the ability of community health volunteers to identify people with or without TT had a sensitivity of 85.9% for all grades of TT and a specificity of 82.4%. The positive and negative predictive value for identification of cases was 80.3% and 87.5% respectively. Sensitivity for identifying minor and moderate/major TT was 61.5% and 95.0% respectively. The prevalence of TT was 46.0% (38.0% - 53.7%).

**Conclusion:** The community health volunteers in East Pokot can identify people with TT and those without TT with a high level of accuracy. The accuracy of diagnosing moderate/major TT was higher than for minor TT. CHVs can therefore be relied upon to identify and refer TT cases to the health care system.

**Recommendation:** CHVs in East Pokot can be used as the main personnel to identify and refer TT cases to health care system. Training of CHVs to increase accurate diagnosis of minor TT.
1.0 INTRODUCTION

Trachoma is the leading infectious cause of blindness and a public health problem globally. It is caused by an obligate intracellular bacterium called *Chlamydia trachomatis* and is commonly found in areas with hot, dry and dusty climates(1). The World Health Organization (WHO) is leading a global campaign to eliminate blinding trachoma by the year 2020 (GET2020) through the implementation of the SAFE Strategy: Surgery for trichiasis, Antibiotic distribution to control chlamydial infection, Facial cleanliness, and Environmental improvements to reduce its transmission(2). East Pokot in Baringo County is a trachoma endemic area in Kenya. Community health volunteers in this area play a central role in identification and referral of TT cases to existing health care systems. As much as their role is important, their ability to correctly identify people with or without TT is unknown. Correct identification of TT cases ensures that no cases are left in the community thus reducing the backlog of cases. Correctly identifying people without TT reduces overload on the health care system and saves time and resources.

As an infective agent for trachoma, Chlamydiae has a unique reproduction cycle in that it lacks cytochromes and so cannot synthesize their own ATP(1). They are therefore obligate intracellular organisms, requiring energy-rich metabolic intermediates from host cells in order to complete their replication cycle. To permit egress from infected cells and entry of new ones, a metabolically inert, extracellular infectious form known as the elementary body alternates with the metabolically active, dividing, intracellular form, the reticulate body(4).

TT as a disease process begins in early childhood with recurrent *Chlamydia trachomatis* (Serovars A, B, B1, and C) infection of the conjunctival epithelium, which provokes a follicular conjunctivitis, known as active trachoma(5). This is characterized by an inflammatory cell infiltrate and a pro-inflammatory cytokine response. In endemic communities children are repeatedly infected, and this causes chronic inflammation. This leads to conjunctival scarring, cicatricial entropion, and trichiasis. Although episodes of *C. trachomatis* infection become shorter and less severe as individuals get older, inflammation still occurs, and scarring worsens over many decades. Eventually, the abrading lashes or secondary microbial keratitis cause corneal opacification. Severe microbial keratitis can ultimately result in phthisis. The visual loss is both painful and irreversible, as keratoplasty is rarely available and is at high risk for failure in trachoma-endemic countries(5)(1).

The infection is transmitted through contact with eye and nose discharge of infected people. It is also spread by flies which have been in contact with eyes and noses of infected people. After years of repeated infection, the inside of the eyelid becomes severely scarred (trachomatous conjunctival scarring) that it turns inwards and causes the eyelashes to rub against
the eyeball (trachomatous trichiasis) resulting in constant pain and light intolerance. Left untreated, this condition leads to formation of irreversible corneal opacities with resulting visual impairment or blindness(1)(5).

Participants presenting for assessment and intervention are usually symptomatic and may be seen occasionally by ophthalmologists elsewhere other than in endemic areas(6). They may report eyelashes touching their eye or have less-specific symptoms such as foreign body sensation, tearing, pain, or photophobia(4). Many participants self-epilate and should be asked about this to help gauge the severity of the trichiasis, although in some settings they may be reticent about admitting to this(7). Other improvised or traditional treatments, such as cutting eyelashes or using hot ash to burn away lashes, may have been tried. It is important to ask about previous lid surgery, including operations performed by traditional healers, as repeat surgery is usually more difficult. A family history can be informative: _C. trachomatis_ infection and the disease it causes tend to cluster, with some families more severely affected than others. An individual's risk of developing scarring is a complex interaction between the lifetime exposure to _C. trachomatis_ infection and the human immuno-fibrogenic responses.(8)

Trachoma clinical signs are graded according to the World Health Organization (WHO) based on clinical findings as follows: TF - Trachomatous follicular inflammation, TI - Intense trachomatous inflammation, TS - trachomatous conjunctival scarring and TT - trachomatous trichiasis and CO- corneal opacity due to trachoma(9). TT is defined as one or more lashes touching the eye or clear evidence of epilation (broken/ re-growing lashes), without another obvious cause for the trichiasis, such as trauma, malignancy, involutional changes or severe blepharitis.

The recommended treatment of TT is lid surgery(10). The World Health Organization advocates for either Bilamellar Tarsal Rotation (BLTR) or Posterior Lamellar Tarsal Rotation (PLTR or ‘Trabut’ procedure) . TT surgery can prevent or reduce progression of corneal opacity, improve vision and relieve pain(1). Mass drug administration is also recommended in endemic regions. The drug of choice is Azithromycin(11).
2.0 LITERATURE REVIEW

Trachoma is hyper endemic in many of the poorest and most rural areas of 42 countries of Africa, Central and South America, Asia, Australia and the Middle East(3). It is responsible for the blindness or visual impairment of about 1.9 million people. It causes about 1.4% of the global total of blind individuals(3)(12). In Kenya, trachoma is suspected to be in 17 of its 73 districts and estimated 7.3 million people at risk of infection and blindness(13).

2.1 Prevalence of TT and elimination threshold

Globally, the number of people estimated to be living in endemic areas who are at risk of trachoma blindness has declined from 317 million in 2010 to 200 million in 2016. The WHO attributes this to a combination of improved data and implementation of SAFE Strategy (Surgery, Antibiotic treatment, Facial cleanliness, Environmental improvement). 185,000 people received operations for TT in 2015, and 56 million people received antibiotics for trachoma(2).

Trachoma is currently endemic in 57 countries, most of which are in sub-Saharan Africa and Asia. The highest disease prevalence estimates come from countries in the Sahel belt and East Africa. Areas of Ethiopia and Sudan report active disease in 60% of children and trichiasis in 10% of adults. The economic impact of blinding trachoma on individuals and communities is high, particularly as affected communities are already poor(3). It is estimated, is US$ 5.3 billion per year and significantly more if other debilitating symptoms of the disease, such as photophobia and pain, are taken into account(2).

A trachoma survey done in 2011 in East Pokot showed that the prevalence of TT was 19% in over 40 years age group(14). The study also found the prevalence of TF to be 34.3%. This was the basis of initiating trachoma elimination activities in the district.

Elimination of TT as a public health problem is defined as prevalence of TT “unknown to health system” of less than 1 case per 1000 total population(2). In 2015, in the 29 countries of WHO’s Africa region in which trachoma is known to be a public health problem, nearly 176,000 people with TT were given operations accounting to 95% of the global total operated(7).

2.2 Community based interventions

In Kenya, trachoma is mainly endemic among the pastoralist communities(15). The people in these communities constantly migrate and hence pose a challenge in carrying out community based interventions for TT. Studies done have shown great impact in community based
interventions compared to hospital based(11). A study done in Egypt showed that a community based screening with door to door health education increased the uptake of TT surgical services(16).

Another study done in Tanzania also showed improved uptake of surgical services for trachoma trichiasis by using village based promotion efforts. It observed that even with free surgery at the health clinics, indirect costs and social support barriers limited the uptake of TT services, hence the need for community based approach.(22)

The results of Bowman et al in their study strongly suggest better surgical uptake when surgery is provided in participants' villages due to lower cost to the participant, time saved and less fear of the operation(17).

2.3 Mass Drug Administration and TT
A study in central Tanzania, Kongwa District which is a trachoma-endemic area evaluated the use of Community Treatment Assistants (CTAs) during Mass Drug Administration (MDA) to increase identification and referral of TT cases(18). The study found use of CTAs to have a sensitivity of 34% and specificity of above 90% in identifying TT cases. It concluded that use of CTAs appeared to be a viable resource for the identification of TT cases. The study also noted that additional training and use of a TT screening card significantly increased the ability of CTAs to recognize and refer TT cases during MDA, however, further efforts also needed to be put to improve case detection and reduce the number of false positive cases(18).

2.4 Role of community Health Volunteers in diagnosis of TT
A pilot study done in Ghana on the use of community health volunteers involved four day training of the CHV on trachoma assessment using the WHO screening card and on the use of Azithromycin and side effects when distributing. The volunteers’ diagnostic sensitivity for active trachoma was 63%; their specificity was 96%(11). At the household level, their “decision to treat” was correct in 83% of households. They concluded that trained community health volunteers have a potential role in identifying active trachoma and distributing azithromycin.

A systematic review done in sub Saharan Africa over emphasized the importance of the role of community health workers in the management of tropical diseases like trachoma(17).

2.5 Surgical recurrence of TT
Recurrence of TT after surgery can be caused by a number of factors including re-infection, surgeon factors, severity of the TT and the surgical technique used. A study done in Ethiopia found high recurrence rates of 16.9% in the first six post-operative months despite highly trained surgeons(19). They attributed this to the surgical technique and post-operative lid position. Female gender, older age group, severe grade of TS and past history of lid surgery were also
associated with recurrences(19). STAR study showed a recurrence of 22% in participants on Azithromycin 3 years after surgery(20).

2.6 TT Surgical services in Kenya
Trachoma elimination in Kenya is under the ministry of health (MOH) in the department of neglected tropical diseases. The MOH together with partners in eye health have been carrying out TT surgeries in mapped out endemic areas in Kenya(13).

Trachoma trichiasis elimination projects are carried out in form of outreach camps led by teams of qualified TT surgeons. The process involved includes community mobilization, screening for TT and treatment of positive cases. Different stakeholders play specific roles in this process. Community health volunteers play a vital role of identifying cases and mobilizing them to attend the camps where surgery can be provided.

In Baringo County which includes East Pokot, the TT backlog by September 2013 was 7,018. By June 2016, the County had done 2,791 surgeries leaving a balance of 4,227 as summarized in the table below.

<table>
<thead>
<tr>
<th>County</th>
<th>Starting backlog</th>
<th>Surgeries done</th>
<th>Remaining backlog</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkana</td>
<td>9,017</td>
<td>9,078</td>
<td>61</td>
</tr>
<tr>
<td>West Pokot</td>
<td>7,335</td>
<td>3,501</td>
<td>3,834</td>
</tr>
<tr>
<td><strong>Baringo</strong></td>
<td><strong>7,018</strong></td>
<td><strong>2,791</strong></td>
<td><strong>4,227</strong></td>
</tr>
<tr>
<td>Samburu</td>
<td>3,241</td>
<td>1,330</td>
<td>1,911</td>
</tr>
<tr>
<td>Laikipia</td>
<td>1,512</td>
<td>594</td>
<td>918</td>
</tr>
<tr>
<td>Marsabit</td>
<td>1,015</td>
<td>688</td>
<td>327</td>
</tr>
<tr>
<td>Isiolo</td>
<td>226</td>
<td>170</td>
<td>56</td>
</tr>
<tr>
<td>Meru</td>
<td>2,451</td>
<td>1,299</td>
<td>1,152</td>
</tr>
<tr>
<td>Embu</td>
<td>193</td>
<td>74</td>
<td>119</td>
</tr>
<tr>
<td>Kitui</td>
<td>2,406</td>
<td>1,224</td>
<td>1,182</td>
</tr>
<tr>
<td>Kajiado</td>
<td>2,980</td>
<td>1,845</td>
<td>1,135</td>
</tr>
<tr>
<td>Narok</td>
<td>4,147</td>
<td>1,364</td>
<td>2,783</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41,541</strong></td>
<td><strong>23,958</strong></td>
<td><strong>17,583</strong></td>
</tr>
</tbody>
</table>

*In Baringo County, TT is mainly found in East Pokot sub-County
2.7 Justification
A large backlog of TT cases remains unidentified and untreated in East Pokot, Baringo County. To increase identification and referral of TT cases, community health volunteers have been utilized. This study was important because its findings will impact greatly in the fight towards elimination of TT through task shifting whereby the community health volunteers are relied upon to identify cases of TT and refer them. The ability of community health volunteers to correctly identify people with TT means that no cases are left in the community therefore reducing the backlog of cases. Correctly identifying people without TT reduces overload on the health care system and saves time and resources. Community TT case identification increases uptake of TT surgical services and contributes towards elimination of trachoma in line with WHO’s VISION 2020.

2.8 Objectives
Broad:

The broad objective of this study was to assess the accuracy of TT case identification by community health volunteers in the East Pokot trachoma elimination project in Baringo County.

The specific objectives were to:

1. Determine ability of community health volunteers to correctly identify people with TT
2. Determine ability of community health volunteers to correctly identify people without TT
3.0 METHODS

3.1 Study design
This was a cross-sectional community based study.

3.2 Study setting
The study was conducted in the East Pokot trachoma project area in Baringo County. The county is composed of six sub-counties: Baringo Central, Baringo North, Marigat, Mogotio, Koibatek and East Pokot (Baringo East). Below is a map of Baringo County. East Pokot is shown as Baringo East.

![Map of Baringo County](image)

Figure 1: Map of Baringo County
East Pokot is one of the sub-counties in Baringo County. It is bordered by Turkana East to the North, Central Pokot to the North West, Marakwet to the West, Laikipia West and Samburu to the East and Marigat to the south.

East Pokot has a total coverage area of 4524.8 square kilometers with an estimated population of 157,589 and is mainly inhabited by the Pokot community who are entirely nomadic pastoralists. Below is a map of East Pokot sub-county.

![Map of East Pokot](image-url)
3.3 Study period

The study period was from September 2016 to December 2017. Data collection was done in November 2017.

3.4 Study population

All people who turned up for screening during community TT surgical camps during the period of study, in East Pokot, Baringo County were eligible to participate in the study.

3.5 Sample size

The following formula for assessment of a diagnostic test was used to calculate the sample size.(21)

\[ TP + FN = z^2 \times \left[ \frac{\text{Sen}(1-\text{Sen})}{W^2} \right] \]

\[ N(sN) = \frac{TP + FN}{P} \]

Where:

TP= True positive

FN= false negative

Z= Confidence interval normal distribution value ie for 95%, z= 1.96.

P= prevalence of TT in test population, 10%.

Sen= Sensitivity of test, 45%.

W= Accuracy, within 25%.

N(sN)= Sample size powered for sensitivity.

Using the above formula, the minimum sample size required for this study was 152.

3.6 Recruitment procedures

Participants of the study were recruited during the regular TT outreaches in the community in East Pokot during the period of the study. All the participants who turned up for screening during the period of the study were eligible for recruitment. Participants who consented to participate in the study were recruited consecutively and subsequently underwent interviewing
and examination. Participants who declined to give consent were not included in the study. All the participants were screened for TT by the community health volunteers.

Confirmation of whether each participant had TT or not was done by the investigator. This was done for all screened by the CHV. The diagnosis by the investigator was considered the gold standard against which diagnosis by the CHV was compared. All findings were entered in a pre-formulated questionnaire.

3.7 Case definition
TT was defined during the study as one or more lashes touching the eye or clear evidence of epilation (broken/ re-growing lashes), without another obvious cause for the trichiasis, such as trauma, malignancy, involutional changes or severe blepharitis.

3.8 Grading of TT
TT is graded into minor and Major TT. Minor TT means 1 eyelash touching the cornea, Major TT is >5 lashes touching the cornea. Moderate TT is 2-5 lashes touching on cornea.

3.9 Examination methods and materials
Examination was done in adequate lighting conditions or using a torch. A loupe was used to examine both eyes separately starting from eyelids, eyelashes, lid margins, conjunctiva with lid eversion and the cornea.

3.10 Inclusion and Exclusion Criteria
All participants who came for TT screening during the outreaches in the period of the study were included. Participants who refused to go for screening were excluded.

3.11 Data management and analysis
The data collection form in annex IV was used to collect the information needed for the study. Questionnaires were coded and entered in Microsoft 2010 Access Database. Results were analyzed with help of a qualified statistician using Statistical Packages for Social Sciences (SPSS 21). Descriptive statistics such as percentages, proportions, means and frequencies were used to summarize the data and draw conclusions. The relationship between variables was determined using Chi square tests of association. P value < 0.05 indicate significant relationship. Further Analysis was done to determine sensitivity, specificity and predictive values as shown in the table below.
Table 2: Calculation of sensitivity, specificity and predictive values

<table>
<thead>
<tr>
<th></th>
<th>Disease positive</th>
<th>Disease Negative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test positive</td>
<td>A</td>
<td>B</td>
<td>A+B</td>
</tr>
<tr>
<td>Test negative</td>
<td>C</td>
<td>D</td>
<td>C+D</td>
</tr>
<tr>
<td>Total</td>
<td>A+C</td>
<td>B+D</td>
<td>A+B+C+D</td>
</tr>
</tbody>
</table>

**Sensitivity**: \( \frac{A}{A+C} \times 100 \)- Ability of test to correctly identify those with disease

**Specificity**: \( \frac{D}{D+B} \times 100 \)- Ability of test to correctly identify those without disease

**Positive Predictive value**: \( \frac{A}{A+B} \) Probability of having the disease if test is positive

**Negative Predictive value** = \( \frac{D}{C+D} \) Probability of not having the disease if test is negative

**Prevalence**: \( \frac{A+C}{A+B+C+D} \times 100 \)

3.12 Ethical considerations
Ethical approval was granted by the Ethics and Research Committee of the University of Nairobi/Kenyatta National Hospital. Permission was also sought from the Baringo County and sub-county health department. The investigator explained the objectives of the study to the participants and obtained informed verbal consent before data collection. All the participants were informed that they were free to withdraw from the study any time they felt so. Anonymity of research subjects and confidentiality was highly maintained. All data was stored under lock and key and with password protected files under the custody of the principal investigator to prevent any illicit access to the data. Use of coded data was done to ensure maximum confidentiality.
4.0 RESULTS

Figure 3 below shows that 162 participants were selected, 6 declined to give consent and 156 were examined.

Figure 3: Flow diagram

The sites where screening was done is shown in Appendix I.

4.1 Socio-demographic characteristics

4.1.1 Age
The ages of study participants ranged between 26 and 80 years. The median was 64 years and inter quartile range was 15 years (49-79 years). The figure below shows population distribution by age.
4.1.2 Sex

Majority of participants, 112 (71.8%), were female.

The figure below shows the distribution of the sample population by sex.

Figure 4: Distribution of the study participants by age
4.1.3 Level of Education
Most of participants, that is 136(87.2%) lacked formal education and only one participant had secondary education. The graph below shows distribution of participants by education level.

The table below summarizes the socio-demographic characteristics of the study population.
### Table 3: Demographic characteristics n=156

<table>
<thead>
<tr>
<th>Demographic characteristic</th>
<th>Category</th>
<th>Participants (n)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>44</td>
<td>28.2</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>112</td>
<td>71.8</td>
</tr>
<tr>
<td>Education level</td>
<td>None</td>
<td>136</td>
<td>87.2</td>
</tr>
<tr>
<td></td>
<td>Primary</td>
<td>19</td>
<td>12.2</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Age group</td>
<td>&lt;30</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>7</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>20</td>
<td>12.8</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>37</td>
<td>23.7</td>
</tr>
<tr>
<td></td>
<td>61-70</td>
<td>62</td>
<td>39.7</td>
</tr>
<tr>
<td></td>
<td>71-80</td>
<td>29</td>
<td>18.6</td>
</tr>
</tbody>
</table>

#### 4.2 History of epilation and TT surgery

A total of 69 (44.2%) participants had history of epilation while 29 (18.6%) had TT surgery before. 23 (14.7%) of participants had history of both epilation and TT surgery as shown below.

![Figure 7: History of epilation/ TT surgery](image)

**Figure 7: History of epilation/ TT surgery**
4.3 Trichiasis

4.3.1 Number of lashes
Table 4 below indicates that 54.5% of the participants who were screened did not have TT. Most (39.1%) of the participants had moderate and major TT as shown figure 8. Classification was based on the worse eye. 3 participants with TT did not have any lashes touching the cornea but were diagnosed based on evidence of epilation.

Table 4: Proportion of participants with and without TT

<table>
<thead>
<tr>
<th>Presence of TT</th>
<th>No. of Participants</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT absent</td>
<td>85</td>
<td>54.5</td>
</tr>
<tr>
<td>TT present (1 eye lash)</td>
<td>7</td>
<td>4.5</td>
</tr>
<tr>
<td>TT present (2-5 eye lash)</td>
<td>32</td>
<td>20.5</td>
</tr>
<tr>
<td>TT present (&gt;5 eye lash)</td>
<td>29</td>
<td>18.6</td>
</tr>
<tr>
<td>Evidence of epilation</td>
<td>3</td>
<td>0.2</td>
</tr>
<tr>
<td>Total N=156</td>
<td>156</td>
<td>100</td>
</tr>
</tbody>
</table>
4.4 Examination of the eye
Trachomatous scarring (TS) and corneal opacity (CO) was present in 37(23.7%) and 21(13.5%) participants respectively. Participants with corneal opacity due to non-trachomatous causes were 11 in number.

The findings of participants examined are as shown in the table below.

Table 5: Examination findings of participants

<table>
<thead>
<tr>
<th>Examination</th>
<th>No. of Participants</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence of Epilation</td>
<td>47</td>
<td>30.1</td>
</tr>
<tr>
<td>TS present</td>
<td>37</td>
<td>23.7</td>
</tr>
<tr>
<td>CO present</td>
<td>21</td>
<td>13.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>156</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 8: Number of lashes  n=156
4.5 Sensitivity, specificity and predictive values for all grades of TT

The table below shows an analysis of findings from screening by the community health volunteers compared to the final diagnosis for all grades of TT.

Table 6: Sensitivity, specificity and predictive values for all grades of TT n=156

<table>
<thead>
<tr>
<th>Diagnosis of TT by CHVs</th>
<th>TT present</th>
<th>TT absent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT present</td>
<td>61</td>
<td>15</td>
<td>76</td>
</tr>
<tr>
<td>TT absent</td>
<td>10</td>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>71</td>
<td>85</td>
<td>156</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive Predictive Value</th>
<th>Negative Predictive Value</th>
<th>Prevalence of TT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>85.9% (75.6% - 93.0%)</td>
<td>82.4% (72.6% - 89.8%)</td>
<td>80.3% (69.5% - 88.5%)</td>
<td>87.5% (78.2% - 93.8%)</td>
<td>46.0% (38.0% - 53.7%)</td>
</tr>
</tbody>
</table>

4.6 Accuracy of diagnosis for minor TT

Diagnosis of minor TT by CHVs had a sensitivity of 61.5%.
Table 7: Accuracy of diagnosis for minor TT

<table>
<thead>
<tr>
<th>Diagnosis of TT by CHVs</th>
<th>TT present</th>
<th>TT absent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT present</td>
<td>8</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>TT absent</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>1</td>
<td>14</td>
</tr>
</tbody>
</table>

Sensitivity: 61.5% (31.6% - 86.1%)
Positive Predictive Value: 88.9% (51.8% - 99.7%)
Prevalence of TT: 93.0% (66.0% - 99.8%)

4.7 Accuracy of diagnosis for moderate/major TT

The sensitivity for identifying moderate/major TT by the CHVs was 95.0%.

Table 8: Accuracy of diagnosis for moderate/major TT

<table>
<thead>
<tr>
<th>Diagnosis of TT by CHVs</th>
<th>TT present</th>
<th>TT absent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT present</td>
<td>57</td>
<td>1</td>
<td>58</td>
</tr>
<tr>
<td>TT absent</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>1</td>
<td>61</td>
</tr>
</tbody>
</table>

Sensitivity: 95.0% (86.1% - 99.0%)
Positive Predictive Value: 98.3% (90.8% - 100%)
Prevalence: 98.0% (91.0% - 100%)
4.8 Comparison of socio-demographic characteristics between TT positive and TT negative cases.
The table below shows the relationship between TT positive and TT negative cases in terms of socio-demographic characteristics (Age, Sex, Education level).

Table 8: Comparison of Age, sex and Education level between TT positive and TT negative cases.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>TT absent, n=85</th>
<th>TT present, n=71</th>
<th>Total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
<td>&lt;30</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>6</td>
<td>1</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>14</td>
<td>6</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>19</td>
<td>18</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td></td>
<td>61-70</td>
<td>34</td>
<td>28</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>71-80</td>
<td>11</td>
<td>18</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>28</td>
<td>16</td>
<td>44</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>57</td>
<td>55</td>
<td>112</td>
<td></td>
</tr>
<tr>
<td>Education level</td>
<td>None</td>
<td>69</td>
<td>67</td>
<td>136</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Primary</td>
<td>15</td>
<td>4</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

In terms of age, TT positive cases were mostly of older age group. There was no statistically significant difference in either cases between Female or male sexes. Most literate participants were TT negative.
5.0 DISCUSSION

This study revealed that the ability of community health volunteers in East Pokot to identify people with Trachomatous trichiasis had a sensitivity of 85.9% for all grades of TT. This means that out of 100 people with TT, they could correctly identify 86. This finding is higher than what Solomon AW et al found in a pilot study done in Ghana on the use of community health volunteers to identify active trachoma using the WHO screening card. In their study, volunteers’ diagnostic sensitivity for active trachoma was 63% (11). Greene GS et al in their study that evaluated the use of Community Treatment Assistants (CTAs) in central Tanzania during Mass Drug Administration (MDA) to increase identification and referral of TT cases found the use of CTAs to have a sensitivity of 34% (18), a finding which differed from that of this study.

This study also revealed that screening by the CHVs had a specificity of 82.4% meaning they could correctly diagnose no TT in 82 out of 100 people without TT. This finding was comparable to what Greene GS et al found in Ghana—specificity of 90% (11). Solomon AW et al found a specificity of 96% (18) which was similar to this study.

The positive and negative predictive value for identification of cases with or without TT was 80.3% and 87.5% respectively. This means that if the CHVs identified a case as TT positive, they were correct 80.3% of the time for all grades of TT. If they identified a case as TT negative, they were correct 87.5% of the time. No study has been done in Kenya on identification of TT that could be used to compare results of this study.

The sensitivity for identifying minor TT was 61.5% while that of moderate/major TT was 95%. This means that it was easier for the CHVs to identify TT cases that had more than 1 eyelash touching the cornea than those with a single eye lash. The positive predictive value for identifying minor TT (88.9%) was lower than that of identifying moderate/major TT (98.3%). Previous studies done on identification of TT considered all grades of TT and did not narrow down on minor or major TT.

The median age of the participants was 64 years with an inter quartile range of 15 years (49-79). The ages of participants ranged between 26 and 80 years. Many of the participants were aged between 51 and 70 years (63.4%). Majority of participants with TT were above 50 years. This is consistent with other TT survey studies showing that prevalence of TT is higher in older age groups above 40 years (14). The natural history TT is such that it arises from repeated infections of chlamydia trachomatis, thus this process takes up to several decades to develop and therefore manifests in older age groups (1).

Majority of participants, 112 (71.8%), screened were female. Fewer male participants who were examined in the study can be explained by the low health seeking behavior among male members of the local population. Women and children are known to be the major consumers of healthcare services both at community and facility level in the study area as reflected by the
District Health Records Information System (DHIS). WHO data shows that TT is more prevalent in females and was the case in this study.

The greatest proportion of participants, that is 136(87.2%) lacked formal education. This is consistent with the national population survey statistics showing very low literacy levels among the local nomadic population. The setting is that of an arid hardship area with scarce social amenities like schools(13).

A total of 69(44.2%) participants had history of epilation while 29(18.6%) had TT surgery before. This shows that the participants done TT surgery before and were found to have trichiasis in the operated eye had TT recurrence. 23(14.7%) of participants had history of both epilation and TT surgery.

Of the 71 participants with TT positive, a majority 61 had moderate/major trichiasis, that is two or more lashes touching the cornea. This finding could have contributed to the relatively high identification accuracy of TT positive cases since it is easier to identify several lashes touching the cornea as compared to one. Only 3 participants with TT were diagnosed based on evidence of epilation and did not have any eye lashes touching the cornea.

Trachomatous scarring (TS) and corneal opacity (CO) was present in 37(23.7%) and 21(13.5%) participants respectively. This finding showed a significant proportion of participants with blinding trachoma and points out to a delay in presentation of participants with TT to the health care systems present locally.
6.0 STUDY LIMITATIONS
This was a community based cross-sectional study and had the following limitation:

1. The education status and other demographic characteristics of CHVs was not factored in the study thus its effect on the accuracy of diagnosis of TT is unknown.
7.0 CONCLUSION

1. The community health volunteers in East Pokot can correctly identify People with TT and those without TT with a high level of accuracy.

2. Accuracy of identifying TT cases was higher for moderate /major trichiasis than for minor trichiasis.

3. The CHVs can be relied upon to identify and refer TT cases to the health care system due to high accuracy in identification of TT cases.
8.0 RECOMMENDATIONS

1. Community health volunteers in East Pokot can be used as the main personnel to identity and refer cases of TT in the community in order to reduce back log of cases.
2. Regular skills update training of CHVs to improve accuracy of diagnosis of minor TT.
9.0 REFERENCES


8. Karimurio J, Rono H, Barasa E, Mukiri M, Gichangi M. Active trachoma is an infectious disease, stop treating it administratively.


10.0 APPENDICES

10.1 APPENDIX I: List of Screening sites

<table>
<thead>
<tr>
<th>S/NO</th>
<th>Screening site</th>
<th>Number of participants</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chepkalacha</td>
<td>32</td>
<td>20.5</td>
</tr>
<tr>
<td>2</td>
<td>Churo HC</td>
<td>21</td>
<td>13.5</td>
</tr>
<tr>
<td>3</td>
<td>Chepelow</td>
<td>17</td>
<td>10.9</td>
</tr>
<tr>
<td>4</td>
<td>Kaptuya</td>
<td>14</td>
<td>9.0</td>
</tr>
<tr>
<td>5</td>
<td>Tanguabei HC</td>
<td>13</td>
<td>8.3</td>
</tr>
<tr>
<td>6</td>
<td>Katokon</td>
<td>10</td>
<td>6.4</td>
</tr>
<tr>
<td>7</td>
<td>Kakou</td>
<td>8</td>
<td>5.1</td>
</tr>
<tr>
<td>8</td>
<td>Plesian</td>
<td>7</td>
<td>4.5</td>
</tr>
<tr>
<td>9</td>
<td>Noswo</td>
<td>7</td>
<td>4.5</td>
</tr>
<tr>
<td>10</td>
<td>Amaya</td>
<td>6</td>
<td>3.8</td>
</tr>
<tr>
<td>11</td>
<td>Lomuge</td>
<td>6</td>
<td>3.8</td>
</tr>
<tr>
<td>12</td>
<td>Kokwototo</td>
<td>5</td>
<td>3.2</td>
</tr>
<tr>
<td>13</td>
<td>Komolion</td>
<td>5</td>
<td>3.2</td>
</tr>
<tr>
<td>14</td>
<td>Tepelekwo</td>
<td>5</td>
<td>3.2</td>
</tr>
</tbody>
</table>
10.2 APPENDIX II: Ethical approval certificate

REVISED RESEARCH PROPOSAL – ACCURACY OF TRACHOMATOUS TRICHIASIS CASE IDENTIFICATION BY COMMUNITY HEALTH VOLUNTEERS IN EAST POKOT, BARINGO COUNTY (P371/07/2017)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and approved your above proposal. The approval period is from 13th October, 2017 – 12th October, 2018.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
c) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
d) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (Attach a comprehensive progress report to support the renewal).
f) Submission of an executive summary report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

For more details consult the KNH- UoN ERC website: http://www.erc.uonbi.ac.ke

Protect to discover

29
10.3 APPENDIX III: Budget

M.Med Thesis Budget

**TITLE:** Accuracy of identification of TT by community health workers in East Pokot

**Principal Investigator:** Charles Maswai

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proposal/Ethical approval and ministry of Education approval</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposal writing &amp; printing</td>
<td>6 copies</td>
<td>Ksh 10 per page</td>
<td>4000</td>
</tr>
<tr>
<td>Binding Proposal</td>
<td>6 copies</td>
<td>100</td>
<td>600</td>
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<tr>
<td>Ethics</td>
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<td>2000</td>
<td>2000</td>
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<tr>
<td>Airtime</td>
<td></td>
<td>Ksh. 3 per minute</td>
<td>2000</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td><strong>8600</strong></td>
</tr>
<tr>
<td><strong>Data Collection</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travelling to east Pokot/ accommodation</td>
<td>4</td>
<td>8000 per trip</td>
<td>32000</td>
</tr>
<tr>
<td>Supervision</td>
<td>2</td>
<td>10000</td>
<td>20000</td>
</tr>
<tr>
<td>Typing and Printing of Questionnaires</td>
<td></td>
<td>60 per copy</td>
<td>300</td>
</tr>
<tr>
<td>Photocopy of questionnaires</td>
<td></td>
<td>18 per copy</td>
<td>10000</td>
</tr>
<tr>
<td>Stationary – pens, rubbers etc</td>
<td></td>
<td></td>
<td>2000</td>
</tr>
<tr>
<td>Flash Disc 16GB Hp</td>
<td>1</td>
<td>4500</td>
<td>4500</td>
</tr>
<tr>
<td>Box files for filing questionnaires</td>
<td>10</td>
<td>450 each</td>
<td>4500</td>
</tr>
<tr>
<td>Contracted services</td>
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<td>Subtotal</td>
<td>73300</td>
</tr>
<tr>
<td>---------------------</td>
<td>---</td>
<td>----------</td>
<td>-------</td>
</tr>
<tr>
<td>Statistician</td>
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<td></td>
<td>50000</td>
</tr>
<tr>
<td>Research assistant</td>
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<td></td>
<td>25000</td>
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<td></td>
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<tr>
<td><strong>Subtotal</strong></td>
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<td></td>
</tr>
<tr>
<td>Printing costs and binding of Final book</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Finished book printing( 120 pages approximately)</td>
<td>8 copies- 100 pages</td>
<td>Ksh 10 per page</td>
<td>8000</td>
</tr>
<tr>
<td></td>
<td>8 copies- coloured 20 pages</td>
<td>Ksh 30 per page</td>
<td>4800</td>
</tr>
<tr>
<td>Binding Finished book</td>
<td>2 copies- marking</td>
<td>100 per book</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>8 final copy(black cover)</td>
<td>300</td>
<td>2400</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL BUDGET</strong></td>
<td>172300</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Signature: -------------------------- Date: ……………..
10.4 APPENDIX IV: Data collection tool
Title of Study: Accuracy of identification of trachomatous trichiasis by community health volunteers in East Pokot.

Instructions for filling the Questionnaire

1. Read through carefully to understand range of information required.
2. Do not enter participants name or identification, enter serial number.
3. Fill in required information or tick appropriately in the corresponding box.
4. All information obtained is to be treated confidentially.

Serial number: ___________________ Screening site: ___________________ Date: ________________

DEMOGRAPHIC DATA:

AGE: ___________________

SEX: M [ ] F [ ]

EDUCATIONAL LEVEL: [ ] NONE [ ] PRIMARY [ ] SECONDARY [ ] TERTIARY

PARTICIPANT HISTORY:

History of epilation: Yes [ ] No [ ]

History of TT surgery: Yes [ ] No [ ]

TRICHIASIS ASSESMENT TOOL/MODEL:

[ ] Torch [ ] Loupes [ ] Other
TRICHIASIS DEFINITION FOUND

RE: Lashes (number): 1 0 2 1 3 2-5 4 >5
LE: Lashes (number): 1 0 2 1 3 2-5 4 >5

Evidence of epilation: 1 Yes 2 No

EXAMINATION OF THE EYE

Proper examination technique: 1 Yes 2 No
Use of torch/ adequate lighting: 1 Yes 2 No
Examination of upper tarsal conjunctiva: 1 Yes 2 No
TS present: 1 Yes 2 No
Examination of cornea: 1 Yes 2 No
CO present: 1 Yes 2 No

FINAL DIAGNOSIS OF TT:
1 TT present 2 TT absent

SCREENING BY CHV
1 TT present 2 TT absent