SOIL TRANSMITTED HELMINTHS, PREVALENCE AND PRE-DIPOSING FACTORS AMONG PRESCHOOL AGE CHILDREN IN ELBURGON MUNICIPALITY, KENYA.

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Abstract
The present study is a cross-sectional survey of soil transmitted helminthes among pre-school children in Marani District, Kenya. Children in rural villages/resource poor communities and families harbor STHs infections in high intensity with a high prevalence. The aim of this study was understanding the current STHs prevalence, intensity and risky factors among pre-school children in the study area and recommend effective strategies to control these infections in the rural community set ups. The present study utilized a cross-sectional survey that involved administration of a structured questionnaire and laboratory stool analysis using Kato Katz technique. One hundred and eight (108) children below five years were recruited in the study, whose data was analysed to the end. The overall prevalence of STHs among children in the study area was 35.80%. infection with Ascaris lumbricoides had a predominant prevalence rate of 19.8% among preschool age children in Marani district followed by Ancylostoma duodenale infection with a prevalence rate of 7.8% and the least prevalent worm species was Trichuris trichiura (2.8%). Single species and co-infection prevalence rates tended to have a higher rate in males than in females. Prevalence distribution of helminth infection tended to decrease with increasing education standards amongst parents. Compromised sanitary environment, gender, and education are the main risk factors for STHs transmission in the study area. National data for the prevalence of STHs among preschool age children is required in order to design mass deworming campaign programs targeting this age group.

Key words: Soil Transmitted Helminths, Pre-school children, intestinal helminths, Kato-katz

INTRODUCTION

Kenya is on of soil transmitted helminthes (STH) endemic countries. A serious problem exists in rural villages where children are at a particularly high risk of illnesses associated with parasitic infections (van Eijk et al., 2009). In such locations, preschool children account for 10% to 20% of more than two billion people worldwide who are affected with STHs infections. One of the most important risk factors for children and intestinal helminth infection is attributed undeveloped immunity in this age group (Riesel et al., 2010). Although the Kenyan government’s current strategy in providing mass drug administration to school going children has been very successful in mitigating control against such infections (Kenya National School-Based Deworming Program, 2013), preschool children have been largely left out, yet they are the most vulnerable population group for these infections.

Children in rural villages/resource poor communities and families harbor STH infections in high intensity with a high prevalence. When STHs are not controlled in young children, the entire community is at risk of re-infection. Children defecate in the open as compared to sanitary designated places such as toilet and latrines. Helminth eggs in the environment develop and contaminate water and edibles consumed by the community including the already treated school going children giving a strong reason to protect and treat the preschool children against STH.

Contrary to WHO guidelines on deworming of high risk groups where preschool children fall (WHO; 2013), Kenyan health policy continues to ineffectively manage the issue of STH infection prevention and control. In rural Kenya, deworming is still performed at the individual level rather than community level, this does not take charge of the preschool children in the community who are considered a high risk group and may harbor the STH infections in high intensity.

Aims and Objectives
The aim of this study was understanding the current STHs prevalence, intensity and risky factors among preschool children in Marani district Kenya and recommend effective strategies to control this infections in the rural community. The objectives of this study were as follows:

1) To determine the prevalence rates and the common soil transmitted helminthes among preschool children in households of Marani district.
2) To identify the factors influencing the prevalence rates of soil transmitted helminthes among preschool children of Marani district.

STUDY AREA
This study was conducted in Kisii County, Marani district, shown in fig(1). The county is densely populated with a population of 37,531 people and a density of 1295 people/km². Marani district covers approximately 383km². Temperatures range from 10°C to 30°C with relative humidity of 88% (CBS/GoK, 1999). This study area is a highland at an altitude of 1660 m above sea level. The area receives an average rainfall of 1500 mm per annum with characteristic uniform distribution throughout the year but with two distinct rainy seasons (March-May and October-November). The soils around the homes in Kisii are mostly damp and warm, providing ideal conditions for hatching of helminthes eggs.

MATERIALS AND METHODS
The present study utilized a cross-sectional survey that involved administration of a structured questionnaire and laboratory stool analysis using Kato Katz technique.

1) Target participants
The target population for this study were categorized into two: participants for questionnaires and participants...
ii) Sample size determination
The sample size of 106 children targeted for this study was determined using the Fisher’s sample size determination formula using the prevalence of 8.7% from a study conducted in Webuye, Kenya in 2013, (Obala et al., 2013).

iii) Laboratory fecal sample analysis
The MiniParasep concentration microscopic technique was used to process, identify and quantify target helminthes eggs. Tally counting was used to quantify helminthes eggs among prepared slides.

ANALYSIS
Prevalence of helminth infection among preschool children
The overall prevalence of STHs among children in the study area was 35.80%. The overall prevalence indicate that children testing positive of STHs had either *Ascaris lumbricoides*, *Trichuris trichiura* or hookworm, see fig (2).

Parasite specific and combination prevalence
In this study, infection with *Ascaris lumbricoides* had a predominant prevalence rate of 19.8% among preschool age children in Marani district followed by *Ancylostoma duodenale* infection with a prevalence rate of 7.8% and the least prevalent worm species was *Trichuris trichiura* (2.8%), see fig (3). Combination infection of helminthes was observed with *Ascaris lumbricoides/Trichuris trichiura* having a prevalence rate of 4.7% followed by *Ascaris lumbricoides/hookworm* (0.9%). Parasite pairing with *T. trichura* and Hookworm was not reported.

Fig (2) Overall prevalence of STHs among preschool children in Marani district.
With regard to the overall prevalence of STHs infection reported here, studies elsewhere have documented varied prevalence of these helminthes infection in children below five years. A recent study done in Nairobi, Kibera slums, Kenya, and published in 2014 reported a slightly higher prevalence of 40.7% infection with any of the three common STHs (Davis et al., 2014). These results suggest that the problem of STHs in the study area pose significant public health challenge. The World Health Organization recommends treatment of STHs when the prevalence is above 10% in a given target population and Marani requires frequent STHs treatment, (WHO, 2012).

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Fig (3) Prevalence of single parasitic infection
These findings are consistent with different studies undertaken in Nigerian in the same age group in different years (Nmorsi et al., 2009 and Chijioke, 2011). In addition, studies elsewhere and STHs prevalence reports from endemic countries indicate that ascariasis is more prevalent as compared to other helminthes (Hotez et al., 2008 and de Silva et al., 2011). Qualitative studies conducted by Albonico et al., (2008) to determine the number of STHs prevalence studies published for the same age group across endemic countries reveals that, *Ascaris lumbricoides* is undisputedly the most dominant infection with the highest prevalence ranging from as low as 3% (in Phillipines rural area) to as high as 88% (in Madagascar). In the same study, *Ascaris lumbricoides* prevalence among preschool children was 20% in Kenya (Albonico et al., 2008). The high prevalence of *Ascaris lumbricoides* among preschool children and its dominant trend across endemic countries suggests that it is the most common helminthiasis infecting humans of all age groups.

In this study, STHs infection in Marani showed dominating prevalence of *Ascaris lumbricoides* as compared to other two parasites. While the prevalence of this parasite is common among STHs studies in endemic areas (Albonico et al., 2008), there are always noted differences. A study from a Southern Ethiopia village by Nyanteki et al., (2010) found that *Trichuris trichiura* was
African Journal of Science and Research, 2015, (4)6:01-04

Fig(4)Distribution of specific and combination helminth among the sampled children

the most prevalent (82.9%) helminth among children below five years of age. In the same country but in a different state Houmsou et al., (2003) found a slightly different result where hookworms were more prevalent followed by Ascaris lumbricoides and Trichuris trichiura. A study in Brazil in a rural community reported as high as 68.2% of Hookworm infection as compared to Ascaris lumbricoides (Fleming et al., 2006). In addition, the published qualitative studies by Abonico et al., (2008) established that hookworm infection in Kenya has an average prevalence of 29% as compared to Ascaris lumbricoides (20%) and Trichuris trichiura (15%). From these studies, the noted comparative differences from many STHs specific parasite prevalence suggest that the surveys were done under different study area environments. Rural villages, semi-urban residential areas and urban slums will tend to show differences in STHs infection. High hookworm prevalence is often reported from rural farming villages where children accompany their parents to the farm as compared to urban or semi-urban areas, which report high prevalence of A. lumbricoides or T. trichiura, (Riesel et al., 2010; Fleming et al., 2006).

i) Predisposing risk factors influencing the prevalence rates of STH

a) Soil transmitted helminthes prevalence across the gender

Single species and co-infection prevalence rates tended to have a higher rate in males than in females. Even though the variation between males and females was statistically insignificant, more males (43.6%) preschool children were infected than the females (27.5%). These results concur with Obala et al., (2013) studies, which found a similar trend in Webuye, Kenya. A significant number of studies elsewhere have documented that STHs infection across gender is more prevalent in male children as compared to female children. The observation of high prevalence of STHs among male as compared to females suggest that the male child is more often engaged in predisposing activities such as barefoot playing and also playing in streams or ponds as compared a female child (Shrestha, et al., 2001). Male children have more outdoor activities than girls hence the reasons for having a higher risk of helminthes infections.

Rural villages have high division of labor and gender roles are separate between boys and girls and this trend has always been a significant reason for high helminthes prevalence in the male gender. Merhraj and colleagues have documented that the general morbidity impact of intestinal helminthes has significant devastating impact on male children than female children (Mehraj, et al., 2008). Whenever STHs prevalence studies are reported, uniform data indicate that males have higher prevalence than females partially suggesting that male children pay more heavily for STHs burden as compared to female children (Mehraj, et al., 2008).

b) Education of parents and STHs distributions in the study area

In Marani district the prevalence distribution of helminth infection tended to decrease with increasing education standards amongst parents, from none educated parents to parents who had post secondary education. Higher educated parent is a factor, which improve the level of hygiene and hence the reason for low prevalence rate of STH among educated parents. In contrast though, a study in northwest Ethiopia (Abate et al., 2013), showed that even though there were slightly higher prevalence rates of STH among the illiterates, there was no significant association between education status and parasitic infections. When parents are given consistent health education especially maternal, it has a positive influence in reduction of the prevalence rates of helminthes based on the STHs isolation. These results suggest that health education has a significant impact in reducing morbidity and infections associated with soil transmitted helminthes not only among preschool age children but also in the community.

c) Toilet use and prevalence of soil transmitted helminthes

This study indicated that the type of toilet does not significantly influence helminth prevalence. However, hookworm (Ancylostoma duodenale) had a higher prevalence rate where preschool children defecate in the open as compared to those who use pit latrine and pots and who tended to show a higher prevalence of Ascaris lumbricoides. Most studies document that parent's occupation and places of defecation can increase risk factors in the transmission of soil transmitted helminthes (Nguyen et al., 2006). Poor sanitary disposal of human feces and indiscriminate defecation are the principal factors in the aetiology of soil transmitted helminthes. A defined infection trend with regard to predisposing factors suggests that open defecation remains popular to children because either the toilets were far or not available in the compound. The use of flush toilets has been reported as an improved means of fecal disposal and environmental hygiene as compared to pit latrines and open defecation because it has a controlled sewerage system but these sanitary strategies are not available in rural villages. On the other hand, the concept of controlled sewage system is costly and is not always considered in resources poor settings where Marani district is a representative.

CONCLUSION AND RECOMMENDATIONS

There is a high prevalence of STH in Marani district rural areas. Ascaris lumbricoides had a high prevalence rate across gender. Compromised sanitary environment, gender, and education are the main risk factors for STHs transmission in the study area.

National data for the prevalence of STHs among preschool age children is required in order to design mass deworming campaign programs targeting this age group.
Reference


