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IMPACT OF SOCIO-ECONOMIC FACTORS ON STH INFECTION AMONGST PSAC IN ELBURGON MUNICIPALITY, KENYA

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ABSTRACT

Socio-economic factors have been associated with high prevalence of soil transmitted helminthes infection in endemic areas. STH studies have been extensively conducted among school age children but non-school going children mostly those below five years and who actively play with soil are not common. In this study, 120 households in Elburgon Municipality were accessed using a structured question to determine the impact of these socio-economic factors on STH infection among pre-school age children. Kato Katz technique was used to determine the evidence of helminthes infection in 179 children who provided stool sample. The result from this study revealed that there was a general high prevalence 154 (86%) of STH infection with any of *Trichuris trichura*, *Ascaris lumbricoides* and hookworm or a combination of any two. The overall mother's and father's educational level and father's occupation showed significant difference ($p<0.05$) in PSAC STH infection. Mother's occupation and head of family revealed no significant difference ($p>0.05$) in this children age group infection. In Elburgon Municipality, households are crowded in living conditions that can be termed as semi urban slums and children often play together in common play grounds. Regardless of both parent's educational level and occupation STH infection in young children remained high because of common hygienically compromised environments. This study suggest that it might be difficult to improve the socio-economic status of populations living in semi-urban slum like households but frequent health education programs for both parents about these intestinal worms can be effective tool that will help in control STH infections in PSAC.

Keyword: Socio-economic, Soil Transmitted Helminthes, Pre-School Age, Kato Katz

1.0 INTRODUCTION

Soil transmitted helminthes (STHs) are unpopular infections grouped under neglected tropical diseases (NTDs) (Saboya *et al*, 2011). These infections attract little attention from health stakeholders but they have significant effects in the development of children. Their combinations cause synergistic effects and have demonstrable impact of child morbidity. Intestinal helminthes are widespread and their high prevalence are always studied from developing countries of the tropics (Gunawardena *et al*, 2008; Saboya *et al*, 2011). While approximately 2 billion people harbor these infections, children under five years of age account for 122, 86, and 21 million infections worldwide for *Ascaris lumbricoides*, *Trichuris trichura* and hookworm (*Nacator americanus*/*Ancylostoma duodenale*) respectively (Albonico *et al*, 2008; Belizario *et al*, 2013). 33% of these children live in developing countries which are reportedly endemic areas. Although STH prevalence is widely studied in school going children, there are reliable evidences that indicate the burden of these infections in pre-school going children (Vera *et al*, 2005; Belizario *et al*, 2013). From a clinical perspective, these infections have chronic characteristics and they compromise healthy growth due to malnutrition, physical health, cognitive development and hookworm is responsible for ironic deficiency hence effects on the child's immune system (Pullan and Brooker, 2008).

In Africa, the notable tropical countries endemic to STH include Nigeria, Kenya, Ivory Coast, New Guinea, Angola and Zimbabwe. The prevalence of STH in pre-school age children in Kenya alone on the lower side has been 20%, 15%, and 29% *A. lumbricoides*, *T. trichura* and hookworm respectively (Ezeagwuna *et al*, 2005). The general trends of high prevalence of STH in endemic areas are due to the climate and the socio-cultural/socio-economic statuses of the populations living in this area. The conducive climatic conditions for STH eggs and larvae survival include relative atmospheric humidity, significant soil moisture and $20\text{-}30^0$ temperature range (Basanez *et al*, 2012). The socio-economic conditions that are reported in high prevalent STH endemic areas include, low family income, low education levels, living in overcrowded households such as slums in urban and semi urban areas and the general unhygienic environment compromised with raw sewage disposal (Quihui *et al*, 2006; Mehraj *et al*, 2008; Mwinzi *et al*, 2012). Most semi urban areas in this country have both physical

environmental and socio-economic conditions that facilitate the presence of STH infection including Elburgon. Apart from the above mentioned conditions, knowledge of STH infections and treatment among children carers especially mothers has a significant influence in worm infections in children.

Elburgon Municipality is a virgin area in STH prevalence study especially in PSAC. Although numerous studies have been conducted in Kenya in school going children, PSAC and semi urban slum areas have limited data. This study was undertaken to document the general trends of socio-economic impact on STH infections amongst PSAC who need equal attentions from programs designed for these infection's treatment and control.

2.0 MATERIAL AND METHODS

2.1 Study area

Elburgon Municipality is a small town of Nakuru County located approximately 38 kilometers west of Nakuru town. The commercial prosperity of this town is lumbering, trading and mixed farming. Majority of households are built of wood and planks due to massive investment of timber processing. The main health facility in this area is Elburgon Nyayo Ward. It is a level four sub-district hospital with a 72 bed capacity and has a serving doctor, clinical officers and nurses.

2.2 Sample population

120 Semi urban households were selected for this study. The sample units were households with a child or children below five years. Households in crowded residents within Elburgon town were considered for this study because: (i) they live in the most hygienically compromised environment, (ii) children are most likely playing in groups in large play grounds and (iii) semi urban slums population are likely to neglect personal hygiene.

2.3 Questionnaire distribution and data collection

The study protocol was explained to children carers of the sample households. Informed consent was sought from parents who agreed to participate in the study. Simple structured questionnaires were read to parents inform of verbal interview to capture the socio-demographic and socio-economic statuses of participating household parents, number of household members by age group, parents awareness of STH infection and treatment strategies currently in place for STH control in this area. Carers were educated about the causes and importance of their children being free from STH infections. After filling the questionnaire and educating participants, carers were given plastic bags and stool sample collection cap and instructed how to safely collect fresh stool sample from children in their first health break of the day. Using a cooler box with ice packs, the stool sample was transported to Elburgon Nyayo Ward parasitological laboratory for analysis. Kato Katz technique was used to process samples and prepare slides for microscopy examination to determine evidence of STH through the presence of eggs in stool samples (WHO 2000). The prepared slides were immediately examined under x10 and x40 objectives for hookworm egg identification and egg counting for *T. trichura* and *A. lumbricoides* was done the later but same day.

2.4 Ethical approval

Ethical approval for this study was given by Egerton University Ethics Research Committee through the Division of Research & Extension. Conditions for ethical approval were confidentiality and professionalism observation during research. The research study was explained to the study participants and informed consent sought before beginning the questionnaire interview and data collection.

2.5 Statistical analysis

Analysis of variance (ANOVA) statistical method in Microsoft Excel 2007 program was used to obtain the differences in distribution of helminth prevalence within socio-economic factors. $p<0.05$ was significance level was used to draw conclusions.

3.0 RESULTS

A total of 120 households were sampled for this study. Socio-economic independent variables analysed for this study included mother's level of education (informal education, primary, secondary and tertiary), mothers occupation (formal employment, self employment, casual laborer or farmer), head of household, head of household's level of education, head of household's employment and size of the household. The dependent

variable was the presence or absence of any of the three STH infections (*T. trichuris*, *A. lumbricoides* and hookworm) for children who provided samples from the household. Prevalence of STH infection within socioeconomic variability was generally high as characterized in table 1**.** Maternal education, father's education and father's occupation showed significant differences ($p<0.05$) in PSAC STH infection. Mother's occupation and head of household did not show significant difference ($p>0.05$) in PSAC STH infection in Elburgon Municipality as shown in table 1. The number of children in the households was recorded into five grouping as 1 child, 2 children, 3 children, 4 children and 5 children as shown in table 2. The specific STH prevalence within these groups was evenly distributed with no significant difference ($p>0.05$). Households with one child had the highest STH infection cases followed by households with four children. The lowest prevalence of STH infection with regard to the number of children in the household was recorded from household with five children as shown in table 2.

Parents or children carers who participated in the study were accessed on their knowledge of STH infections in children. All participants who were interviewed 120 (100%) knew about STH except that they could not identify specific parasites. They generally called the helminthes in this study, intestinal worms. 71 (59%) of parents who were interviewed as shown in figure 1 would not know if their children were infected with intestinal helminthes and mention the following conditions: large stomach, rumbling stomach, too much eating and rough face skin.

4.0 DISCUSSION

Several studies have investigated STH infection with regard to socio-economic statuses in endemic areas. These studies have generally revealed that STH prevalence has a general trend in which it is high in households with lower socio-economic statuses and low in those with high socio-economic statuses (Anuar *et al*, 2013). Lower socio-economic statuses in Elburgon Municipality are associated with living in semi-permanent, overcrowded and slum like households. The general low family income, unemployment or unpredictable casual jobs such as farm casual laborers, lower educational level especially maternal education are associated with high prevalence of STH infection in children of all age groups (Ostan *et al*, 2007). In this study, maternal education was low and stratified into four categories: no formal education, primary school education, secondary education and tertiary education. There was no tertiary educated parent in this study because educated parents of more than secondary are not living in semi slum areas of the study area and are associated with better socio-economic statuses. The three remaining categories of maternal education had significant differences $p<0.05$ in STH infection prevalence among PSAC. Additionally, there was significant different $p<0.05$ in infection among the three categories of education as pertains to the head of household.

Socio-economic status investigation in regard to STH prevalence in endemic areas have always documented results that indicate reduction of STH infection with higher maternal education because these mothers have an awareness of STH infection in children and will tend to deworm their children at least after three months voluntarily without external influence such as media, health worker's campaign or even waiting to have the medication from health facilities (Mehraj *et al*, 2008; Ezeagwuna, 2009). Although the head of the family in most cases is a father, most studies have reported no differences in father educational level and STH prevalence in children because they hardly care for children and mothers tend to assume full responsibility of child health. Nevertheless, regardless of the educational status of the mother or the head of the family, households in similar environment in endemic areas will generally have a high infection rate because of living in the same environment with high rate of STH transmission (Ostan *et al*, 2007). Parent with higher educational status might be deworming their children appropriately but the reinfection is always high because of same risky environment. Children living in similar location will not choose different environments whether their parents have high education or not (Halpenny *et al*, 2013). With the common playing ground (Halpenny *et al*, 2013) that harbor STH eggs from previous stool with eggs, all children remain at risk of infection hence the high prevalence of STH infection is Elburgon Municipality slum households.

Parental occupation has been reported to have an influence in STH prevalence in children (Anuar *et al*, 2013). Father's occupation has been associated with the choice of living environment such as slums, semi slums and estate housing because their income dictates the family lifestyle. Father or head of the family with low pay will definitely choose cheaper housing hence end up living in slums, which are associated with high STH transmission and their children or entire family constantly, remain at risk. A part from housing choice, farming among other occupations for fathers has been associated with high worm infection with almost 100% infection rate with hookworm (Uneke *et al*, 2006). In this study, fathers who are farmers revealed a low infection rate in all STH contrary to what was expected perhaps because the young children do not accompany their parents to the farm to work.

Mother's occupation has been associated with low children worm infection. Mother with formal employment of those that earn higher will tend to have worm free children even though they have little time to attend to children (Nash *et al*, 2004). These mothers are knowledgeable and have financial capability to put their children in better health programs. On the other hand, mothers whose occupation is causal laborer such as in farms will always tend to move with their children around. Farming has been associated with high hookworm infection because of the risk of working in the farm barefooted whilst night soil is common in these farms (Nash *et al*, 2004; Ostan, 2007; Quihui, 2006).

The distribution of STH infection according to the number of children in the household was accessed in this study. Households used in this study were categorized into having 1 child, 2, 3, 4 and 5 children. Helminth prevalence rate was significantly different $p<0.05$ across the number of children in the households. Those with 2 children had the highest prevalence of 33.5% followed by households with 3 children (20%), 4 children (17.9%), 1 children (13.4%), and 5 children (1.7%) respectively as shown in table 2. While households other than those with five children reported high infection rate, this result was observed because of the general high prevalence of STH infection in PSAC in the study area. Often households with a higher number of children was expected to have high prevalence because of overcrowding and because *T. trichura* in particular tends to have a transmission in crowded homes because of sharing or coming into contact with household items such as clothing and bedding (Ostan *et al*, 2007).

In this study revealed that parents in Elburgon Municipality had general knowledge of intestinal worms although they could not mention specific specifies even in their mother tongue. Even though they had knowledge of worm infection in children, majority will take a step to deworm their children until they visit the health facility. This shows that even parents are stakeholders in neglecting intestinal worms (Coulibaly, 2012). Perhaps their little understanding of the source, transmission mechanism and impact of intestinal helminthes made them to be reluctant in searching for medication. Regardless of the level of parent's education and socio-economic factors, health education at community level is significant in helping control STH infection in endemic areas. Community health education does not require those learning to have any education but regular programs will help in checking the prevalence level of preventable diseases (Asaolu, and Ofoezie, 2003).

People living in slum like areas always have low income and their environment is a risk factor of STH transmission and trying to change both the living conditions and their socio-economic statuses is difficult to change and unforeseeable in the near future because endemic areas are always found in countries that have constant difficult economies. Nevertheless, STH control programs have been effective regardless of socio-economic statuses of families in endemic areas through mass deworming programs, which have been perfected in school going children and the same programs should be replicated to pre-school age children who are also in constant risk with high risk of morbidity. While changing socio-economic statuses of residents residing in Elburgon Municipality is difficult, STH knowledge and community programs that will educate, administer and monitor STH control in PSAC children will be effective in reducing or eliminating STH infection in this age group in this areas and in similar municipalities in Kenya and other endemic countries.

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TABLES

Table 1: Summary of the five socio-economic variability of parents of PSAC in Elburgon Municipality

Demographic variability

Demographic variability	N	n (%)	P. value
Mothers education			
No education	34	26(14.5)	0.00091
Primary	64	112 (62.6)	
Secondary	22	16 (8.9)	
Tertiary	-	-	
Mothers Occupation			
Formal employment	14	28 (15.6)	0.033393
Self employed	29	42(23.4)	
Casual laborers	46	49(27.4)	
Farmer	31	35(19.6)	
Head of household			
Father	110	144 (80.4)	0.91529
Mother	10	10 (5.6)	
Level of education of head of the house			
No education	-	-	0.0035
Primary	77	100 (55.9)	
Secondary	38	52(29)	
Tertiary	5	2(1.3)	
Occupation for head of the family			
Formal employment	62	61(34.1)	0.001562
Self Employed	32	40 (22.3)	
Casual Laborer	15	40(22.3)	
Farmer	11	3(1.7)	

N = number of study parents participants, n = number of infection cases. (%) = prevalence

Table 2: Characteristics and STH prevalence with regard to the number of children in the households

Children in the household	Households	Infection cases	Infection Prevalence
1	31	24	13.4%
2	51	60	33.5%
3	24	35	20%
4	12	32	17.9%
5	2	3	1.7%
Total	**120**	**154**	**AVG = 17.3%**

FIGURES

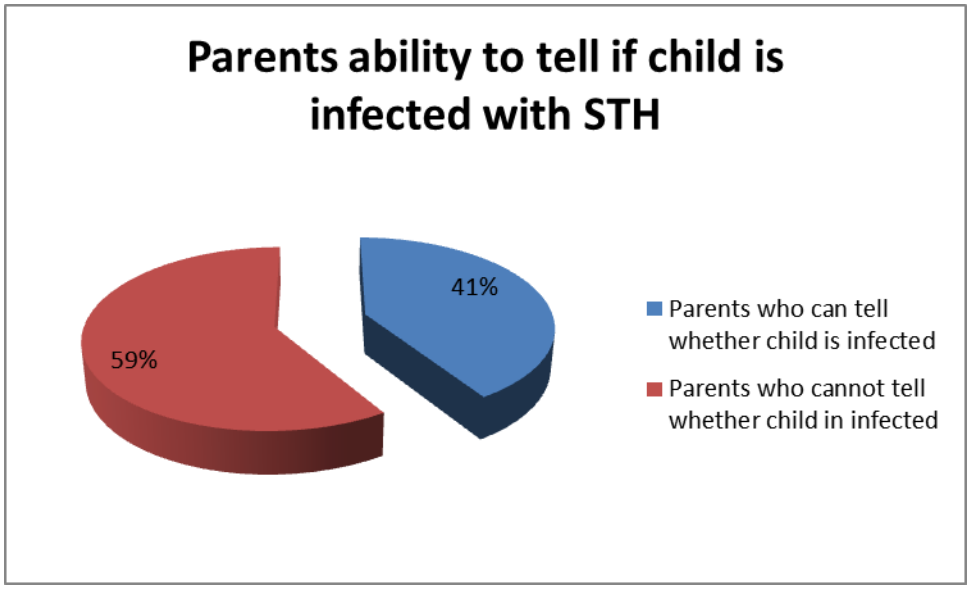

Figure 1: Parent's ability to tell whether child in infected with STH