East African Medical Journal Vol: 94 No. 8 August 2017
FACTORS ASSOCIATED WITH INTESTINAL PARASITES AMONG SCHOOL GOING CHILDREN IN LODWAR MUNICIPALITY, TURKANA COUNTY, KENYA
B. N. Lowoko, Jomo Kenyatta University of Agriculture and Technology, B. Ngugi, Kenya Medical Research Institute, A. Malai, Kenya Medical Research Institute, J. K. Mutai, Kenya Medical Research Institute

FACTORS ASSOCIATED WITH INTESTINAL PARASITES AMONG SCHOOL GOING CHILDREN IN LODWAR MUNICIPALITY, TURKANA COUNTY, KENYA

B. N. LOWOKO, B. NGUGI, A. MALAI and J. K. MUTAI

ABSTRACT

Background: **Infection by intestinal parasites is a serious health problem affecting an estimated 400 million school age children worldwide. The main objective of the study was to determine the prevalence and factors associated with intestinal parasites among children in 10 schools within Lodwar Municipality in Turkana County, Kenya.**
Methods: **This was a cross-sectional study carried out amongst a sample size of 310 school going children randomly selected from 10 schools. The data collection included background data of participants and laboratory procedures on faecal specimens collected to determine the various intestinal parasites. The data collated was analysed using SPSS for windows version 13.0.1. Chi square was used to determine associations between the various variables.**
Results: **This study recruited 529 participants, of which 43.5% were women and 56.5% were men. Cyst of Entamoeba histolytica was found to be the most common parasite in the samples tested with a prevalence of 76.6%, followed by trophozoites of Giardia lamblia with prevalence of 13.1%, ova of Taenia spp with a prevalence of 5.5% whereas trophozoites of Entamoeba histolytica, ova of Ascaris lumbricoides, cyst of Giardia lamblia, and ova of Taenia saginata had a prevalence of below 5%. This current study found no strong association between the source of water and the occurrence of intestinal parasites.**
Conclusion: **Helmithes infections is still a public health concern in Turkana County which, if unchecked, could affect child growth and development. There is need for both the National and County governments to mount series of campaigns and interventions to deworm all children of intestinal infections especially at the family level among the nomadic Turkana community whose environments and lifestyles are fertile grounds for helmithes.**

INTRODUCTION

Intestinal parasitic infections, regarded as a serious public health problem, are amongst the most common infections affecting human beings in the world. It is estimated that 3.5 billion people are affected with additional450 million being ill as result of these infections, the majority being children [1]. The infections have been reported to have serious consequences such as causing iron deficiency anaemia, growth retardation and other physical and mental health problems [2]. According to WHO, an estimated five million children were reported to be infected with intestinal parasitic worms in Kenya [3]. Studies have shown that a heavy burden of Ascaris and Trichuiris are found in children of aged between 6 and12 years. Heavy infections cause malabsorption and large blood

and protein losses which are compounded in the context of poor nutritional status. Trichuiris infection also peak in early life and then generally remains steady, whereas hookworm prevalence peaks in adolescence [4, 5].Intestinal parasites have a worldwide distribution, some are known to cause malabsorption in human, abdominal pain, severe diarrhoea, vomiting, weight loss, dermatitis or proritis and chronic urticeria [6]. According to some studies, the major groups of parasites include protozoan and parasitic worms (helminthes).

Protozoa are unicellular eukaryotes that constitute the flagellates like the giardia lamblia, the amoeboids like entamoeba histolytica, the sporozoans like isospora belli and the ciliates like balantidium coli [7]. Protozoa and helminthes are intestinal parasites that parasitize the bowel producing varying degrees of injury to the intestinal lining.

The most invasive protozoan, Entamoeba histolytica erodes and penetrates into the intestinal sub mucosa and produce ulcerative lesions. One ciliated protozoan, Balantidium coli also induces ulcerative lesions, but these are usually not deeply erosive. Some species of amoeba and flagellates live as saprophytes in the bowel inducing no injury [8].

The hookworm (acquired through larval penetration of the skin) is a notable example of a helminth adult that parasitizes the body from an intestinal site, attaching itself to the mucosa with a cutting mouth through which it infests the host blood. This situation is debilitating and can lead eventually to severe anaemia if many worms are involved [4].Many intestinal roundworms and tapeworms live saprophytically in the bowel. Some attach with hooklets and suckers but derive nutrient from bowel contents, not from living tissue.

Some have no means of attachment but their activities or products may cause local injury. If they are numerous and large enough, they can create intestinal obstruction. The small intestinal round worms that are not equipped for holding on like the pin worm (Enterobius) or whip worm (Trichuris) often find their way or are pushed into the appendix. This seldom causes difficulty but may be an incidental finding in appendixes that have been surgically removed for some other reason [9].

Poverty, illiteracy, poor hygiene, lack of access to portable water and a hot and humid tropical climate are some of the factors which have been attributed to intestinal parasitic infection [4, 10]. Although many studies regarding intestinal parasites focus on establishing the prevalence and intensity of these infections in different populations, fewer studies have examined the social-cultural factors that contribute to transmission of intestinal parasite. Some studies have shown that the lack of education, lack of latrines, occurrence of diarrhoea, lower socio-economic status, inadequate disposal of human excreta and sanitation in households are related to parasites [11].

Intestinal parasitic infections are a public health concern both in urban and rural areas in Kenya like in Lodwar Municipality, Turkana County where the poverty level is 95% and illiteracy index is high. Although studies have shown that many groups in society are affected by these infections, school going children especially in the rural areas are the prime victims of intestinal parasitism that affect their physical development, school attendance and ability to learn [12].

This has subjected children to myriad of problems caused by malabsorption in their intestines, abdominal pain, severe diarrhoea, vomiting, weight loss, dermatitis or pruritis and chronic urticeria [2]

MATERIALS AND METHODS

This was a cross-sectional study which was conducted in selected primary schools in Lodwar Municipality, Turkana County. Data collection was undertaken using collection of stool samples and administration of questionnaire to mothers of the sampled children. Spatula and plastic bag were given for proper stool scooping into the container to avoid contamination of soil helminthes in order to avoid un- realistic results.

The stool samples were collected in clean containers (polypots) and transported in cool ice boxes to Lodwar District Hospital laboratory for examination. The stool samples were given a laboratory reference numbers which were recorded together with the age and sex of the student. The samples were then processed using both the direct and concentration methods.

The direct method involved direct macroscopic observation where the appearance of the specimen was reported and any parasitic worm or tapeworm segments identified. Then the specimens were observed microscopically for motile parasites such as trophozoites of Entamoeba histolytica and helminth eggs. The concentration method was used where faeces were emulsified in formal saline, the suspension strained to remove large faecal particle added and the mixed suspension centrifuged. Eggs, cysts and larvae were then fixed. Sediment and the faecal debris were separated in a layer between the ether and formal saline. Faecal fat was dissolved.

The questionnaire which captured issues such as prevalence of intestinal parasites and risk factors associated with intestinal parasites was translated and administered to parents of the children in Turkana language. Data from the laboratory procedures was entered in parasitological forms, transferred to excel spreadsheet and exported together with data from the questionnaire to SPSS version 20 for analysis. Chi square was used to analyse categories for proportions and prevalence, intensities of parasitic infections between schools and was analysed using one-way ANOVA statistical package.

This study was presented to the Scientific Steering Committee and Ethical Review Committee at the Kenya Medical Research Institute for scientific and ethical approvals, respectively. Permission to access and undertake the study in the primary schools and the laboratory (at Lodwar County referral hospital) was obtained from the County Directors of Education and Health.

The consent was obtained from the parents of the selected children in Turkana language.

RESULTS

This study recruited 529 participants, of which 43.5% were women and 56.5% were men. Age distribution showed that 18.2% of the respondents were aged between 6 and 9 years, 59.5% were aged between 10 to 13 years and 20.9% were aged between 14 and 18 years.

The respondents' parent's level of education showed that 23.5% of them attended primary school, 33.7% of them attended secondary school, 6.4% of them attended a tertiary institution and 33.5% of them never attended school. Majority of the parents were married (74.1%) followed by21.1% who were single and 4.8% were divorced. The housing distribution also showed that 46.9% of the respondents lived temporary houses, 47.3% lived in semi-permanent houses and 5.3% lived in permanent houses. In addition, 95% were Christians while 4.6% were Muslims. Regarding the occupations, 13.7% were farmers, 29.3% were businessmen or businesswomen,9.2% were pastoralists and 39.6% were in the formal employment.

Lodwar mixed primary school had the highest number of respondents with 21.15%, followed by Bishop Mahon primary school with 13.73%, Nakwamekwi Primary School with 12.99%, AIC Napuu primary school with 11.50%, Canaan primary school with 10.58%, St. Michael Kawalase primary school with 9.46%, St. Mary primary school with 6.49%, St. Perpetua primary school with 5.57%, Monti primary school with 5.19% and Kakwanyang primary school having the least number of respondents with 3.34%.30% of the male respondents and 27.1% of the female respondents tested positive for intestinal parasites using the direct method technique.

Of these respondents, 27.3% who kept a cat in their households tested positive for intestinal parasites, 27.9% tested positive for intestinal parasites despite not having a cat in their households, 24.7% respondents who kept a dog

in their households tested positive for intestinal parasites, 30% of the respondents who did not keep a dog in their households tested positive, 24.8% of the respondents who kept chicken in their households tested positive for intestinal parasites, 30.8% of the respondents who did not have chicken in their households tested positive for intestinal parasites, 33.3% of the respondents who kept rabbits tested positive for intestinal parasites and 27.7% of the respondents also tested positive for intestinal parasites despite not having rabbits in their household.

In addition, 27.9% respondents who used borehole water tested positive for intestinal parasites while 27.7% respondents tested positive for intestinal parasites despite not using borehole water. 28.6% respondents who utilized stream water tested positive for intestinal parasites while 26.2% respondents tested positive despite not using stream water.

Of those respondents who used tap water, 26.7% of them tested positive for intestinal parasites while 32.3% of the respondents tested positive for intestinal parasites despite not using tap water. 18.2% of the respondents who used rain water tested positive for intestinal parasites while 27.7% of the respondents tested positive for intestinal parasites despite not using rain water.

Among the respondents who used open wells, 50% of them tested positive for intestinal parasites while 27.3% of the respondents who did not utilize open wells tested positive for intestinal parasites. 40.9% of the respondents who used river water tested positive for intestinal parasites while 26.8% respondents tested positive for intestinal parasites despite not using river water. All of the respondents (100%) who reported to be utilizing water from a dam tested negative for intestinal parasites while 27.6% respondents who did not utilize dam water tested positive for intestinal parasites. Chi square analysis was performed to determine if there was an association between gender characteristics of the respondents, source of water and type of pet they kept with the occurrence of intestinal parasites.

None of these factors showed any evidence of an association with occurrence of intestinal parasites as none was statistically significant ($P < 0.05$).26.3% respondents who reported to be washing their hands daily tested positive for intestinal parasites while 45.2% who did not wash their hands daily tested positive for intestinal parasites.

26.7% respondents who wore shoes tested positive for intestinal parasites while 33.3% tested positive for intestinal parasites despite not wearing shoes. The waste disposal distribution showed that 33.3% respondents who disposed waste through open dumping tested positive for intestinal parasites, 24.4% respondents who disposed waste through closed dumping tested positive for intestinal parasites, 23.5% respondents who disposed of waste through burning tested positive for intestinal parasites and 22.2% respondents who disposed waste at a central municipal location tested positive for intestinal parasites. All respondents who reported to dispose of waste through other means tested negative for intestinal parasites.

26.8% respondents who treated water at the household level tested positive for intestinal parasites while 41.7% tested positive for intestinal parasites despite not treating water in their households. Chi square analysis was performed to determine if there was an association between behavioural prevention practices and the occurrence of intestinal parasites. There was evidence of a relationship between daily hand washing practices and the occurrence of intestinal parasites (Chi square = 3.694, df = 1, $P = 0.023$).27% of the respondents with latrines tested positive for intestinal parasites while 35.5% respondents without latrines tested positive for intestinal parasites The study revealed that 40.7% respondents who lived in permanent houses, 24.9% who lived in semi-permanent houses and 28.3% who lived in temporary houses all tested positive for intestinal parasites.

26.7% respondents who had a pit latrine, 30.6% respondents who had a VIP latrine and 27% respondents who had other kinds of toilets all tested positive for intestinal parasites.

All the respondents who reported to have a flush toilet tested negative for intestinal parasites. Chi square analysis was performed to determine if there was an association between the toilet and housing distribution characteristics and the occurrence of intestinal parasites. There was no evidence that there was a relationship between the housing and toilet distribution characteristics and the occurrence of intestinal parasites as none of the factors was statistically significant.

Regarding the prevalence rates of intestinal parasites is concerned, St. Perpatua Nabulon girls had the highest prevalence rate of 59.3%, followed by St. Mary primaryschool with 48.6%, AIC Napuu primary school with 43.6%, Kakwanyang primary school with 38.9%, Nakwamekwi primary school with 31.8%, Bishop Mahon Primary School with 29.2%, Monti primary school with 17.9%, Lodwar mixed primary school 16.5% and finally St. Michael Kawalase had the least prevalence rate of 15.7%.

Cyst of Entamoeba histolytica was found to be the most common parasite in the samples tested with a prevalence of 76.6%, followed by troph of Giardia lamblia with prevalence of 13.1%, ova of Taenia spp with a prevalence of 5.5%, troph of Entamoeba histolytica with a prevalence of 2.1%, ova of Ascaris lumbricoides with a prevalence of 1.4%, cyst of Giardia lamblia with a prevalence of 0.7% and ova of T. saginata 0.6%. Cyst of Entamoeba histolytica and troph of Giardia lamblia parasites were highly distributed across different age groups and gender. Ova of Taenia spp was mainly found (13.8%) in children between the ages of 14 and18 years. Troph of Entamoeba histolytica was only found in the female respondents (4.9%). Samples from school going children between the age group of 6 and 9 years were only found to contain Cyst of Entamoeba histolytica and troph of Giardia lamblia parasites.

DISCUSSION

Majority of the respondents' parents were married and majority had attended school. Most of the respondents lived in either temporary or semi-permanent houses (46.9% and 47.3%, respectively) and majority were Christians (95%).This study found that daily hand washing and distribution of schools were strongly associated with occurrence of intestinal parasites.26.3% of the respondents who reported to be washing their hands daily tested positive for intestinal parasites compared to 45.2% who did not wash their hands daily. These findings tally with that of another study done in Ethiopia (13) which found a strong relationship between children washing their hands and occurrence of intestinal parasites ($P < 0.05$).

The study showed that children who reported washing their hands frequently had a significantly lower prevalence of parasitic infections compared to those who did not. A study done in Thika [14] also revealed a strong relationship between the distribution of schools and the occurrence of intestinal parasites. It found out that slum and rural schools going children had a high prevalence of intestinal parasites. However, the findings of this study differed with other studies such as the one done in South Africa which revealed that the parents' level of education and employment status was significantly associated with occurrence of intestinal parasites among school going children (15). Another study in Nepal found a significant

association between children wearing shoes and the occurrence of intestinal parasites with those who did not wear shoes having a high prevalence of intestinal parasites (46.5%) compared to those wore shoes at 16.2% (16). The difference in this study may be due to geographical differences, environmental factors, socio-economic conditions, cultural practices or society's awareness to intestinal parasites.

Other studies done in Nigeria were consistent with findings in this study as they found an insignificant association between gender and the occurrence of intestinal parasites (17, 18). Taiwo and Agbolade (19) maintained that both genders had an equal chance of contracting intestinal parasites. However, other studies were inconsistent with these results as they revealed a strong association between gender and the occurrence of intestinal parasites (13, 20).

The difference in these results may be due to cultural factors for instance; school going girls in Ethiopia did not have a history of playing or swimming close to water sources which would increase their exposure to these parasites as boys. This current study found no strong association between the source of water and the occurrence of intestinal parasites. These results are inconsistent with findings of a study in Ethiopia which found a strong association between sources of water (rivers and springs) and the occurrence of intestinal parasites ($P < 0.05$) (21).

The difference in results may be due to the sources of water in the study area in Ethiopia being infected with intestinal parasites. The overall prevalence rate of intestinal parasites in the schools under study was 28.9%. This was consistent with findings in South West Nigeria at 28% (22), 27.2% in Eastern Ethiopia (13) and 27.2% in Saudi Arabia (12). St. Perpetua Nabulon girls had the highest prevalence of intestinal parasites at 59.3% while St. Michael Kawalase had the least prevalence rate of intestinal parasites at 15.7%. This disparity may be due to some of the schools being in urban set ups and the others in rural set ups. Similar observations have been made by Muchiri (23) in Busia and Ngonjo (14) in Thika. The two studies revealed that in endemic communities, schools in rural/slum set ups have high intestinal parasites prevalence rates compared to schools in urban/peri-urban setups. They attributed this difference to the socio-economic status of the school's surroundings and the difference in housing and sanitation.

The current study revealed that Entamoeba histolytica was the most common parasite in the samples with a prevalence of 76.6%. The prevalence of Entamoeba histolytica in this study was higher than those revealed in other studies. A study done in Naivasha, Kitui, Machakos, Taveta and Nandi hills had a prevalence rate of 31.8% for Entamoeba histolytica (17). Other studies have also observed high prevalence rates of Entamoeba histolytica, a study in Ondo state, Nigeria observed a prevalence rate of 67.6% of this parasite (24).

The current study found out that Troph of Giardia lamblia had a prevalence rate of 13.1% and ova of Ascaris lumbricoides had a prevalence rate of 1.4%. The prevalence rate of Giardia lamblia in this study was higher than that recorded in Naivasha, Kitui, Machakos, Taveta, Nandi hills and Kiambu which recorded a prevalence rate of 8.3% (14,17). The low prevalence rate of Ascaris lumbricoides in this study was consistent with prevalence rates of 3.6% of the parasite in Machakos (25). However, this was low compared to other studies which revealed high prevalence rates of 32.5% of Ascaris lumbricoides (26).

Entamoeba histolytica was more prevalent in males (81.3%) than in females (70.5%), consistent with results from a study done in Ethiopia (21) but were not supported with the findings of Teshome et al. (27) who found the parasite being more prevalent in females. Giardia lamblia was found to be more prevalent in females (18%) than in males (8.5%), this was not supported by findings from Central Sudan

that revealed a more prevalence rate in males (37.8%) than in females (28%) (26).In terms of age groups, the findings in this study had a high prevalence rate of Entamoeba histolytica compared to findings from Iseki et al (17) who found out that Entamoeba histolytica had a prevalence of 25.5% for children aged 5 and 9 years, 34.6% for children aged 10 and 14 years and 33.3% for children aged 15-19. That study further found that Giardia lamblia had lower prevalence rates than the current study; 10% for children aged 5-9 years and 8.2% for children aged 10-14 years. The difference in the prevalence rates may be due to the different tests used in the studies and the geographical differences of the study areas.

Table 1

Socio demographic and housing characteristic of participants

Characteristic	Frequency n (%)
Gender of the child	
Male	299 (56.5)
Female	230 (43.5)
Age	
6 - 9	94 (18.2)
10 – 13	307 (59.5)
14 – 18	115 (20.9)
Parent's Level of education	
Primary	129 (23.5)
Secondary	169 (33.7)
Tertiary	35 (6.4)
None	168 (33.5)
Marital status	
Single	105 (21.1)
Married	369 (74.1)
Divorced	24 (4.8)
Housing Status	

Table 2

Characteristics of Housing and Toilet

Characteristics	Positiv en (%)	Negative n (%)	P Value
Toilet/Latrine ownership: Households	120 (27)	324 (73)	P = 0.308
Households	11 (35.5)	20 (64.5)	
Housing Status:	11 (40.7)	16 (59.3)	P = 0.198
Semi-	57 (24.9)	172 (75.1)	
Temporary	64 (28.3)	162 (71.7)	
Type of toilet facility:	95 (26.7)	261 (73.3)	P = 0.236
	22 (30.6)	50 (69.4)	
	0 (0)	6 (100)	
Others	10 (27)	27 (73)	

Table 3

Behavioural practices towards prevention of intestinal parasites and their occurrence

Behavioural practices	Positive n (%)	Negative n (%)	P Value
Daily Hand washing: Those who wash hands	117 (26.3)	328 (73.7)	P = 0.023
Those not washing their hands daily	14 (45.2)	17 (54.8)	
Child Wearing shoe:	119 (26.7)	326 (73.3)	P = 0.479
	8 (33.3)	16 (66.7)	
Waste disposal:	44 (33.3)	88 (66.7)	P = 0.176
	75 (24.4)	232 (75.6)	
	4 (23.5)	13 (76.5)	
At a central dump (Municipal)	2 (22.2)	7 (77.8)	
Others	0 (0)	4 (100)	
Water treatment at household: Households treating	121 (26.8)	331 (73.2)	P = 0.111
Households not using	10 (41.7)	14 (58.3)	

Table 4

Pets kept, water source and gender characteristics and the occurrence of intestinal parasites

		Positive n (%)	Negative n (%)	P Value
Gender:	Male	87 (30)	203 (70)	
	Female	60 (27.1)	161 (72.9)	
Households with Cats:	With Cat	59 (27.3)	157 (72.7)	P =0.894
	Without a Cat	73 (27.9)	189 (72.1)	
Households with Dogs:	With Dogs	21 (24.7)	64 (75.3)	P = 0.508
	Without Dogs	121 (30)	282 (70)	
Households with Chicken:	With	63 (24.8)	191 (75.2)	P = 0.143
	Without Chicken	69 (30.8)	155 (69.2)	
Households with Rabbit:	With Rabbit	2 (33.3)	4 (66.7)	P = 0.753
	Without Rabbit	130 (27.7)	342 (72.3)	
Borehole water:	Households	12 (27.9)	31 (72.1)	P = 0.946
	Households not using	119 (27.7)	315 (72.3)	
Stream Water:	Households using	2 (28.6)	5 (71.4)	P =0.947
	Households not using	121 (26.2)	341 (73.8)	
Tap Water:	Households using	111 (26.7)	304 (73.3)	P =0.364
	Households not using	20 (32.3)	42 (67.7)	
Rain Water:	Households Using	2 (18.2)	9 (81.8)	P = 0.485
	Households not using	129 (27.7)	337 (72.3)	
Open Well:	Households using	1 (50)	1 (50)	P = 0.474
	Households not using	130 (27.3)	346 (72.7)	
River:	Household Using	9 (40.9)	13 (59.1)	P = 0.148
	Households not using	122 (26.8)	333 (73.2)	
Dam:	Household using	0 (0)	3 (100)	P = 0.285
	Household not using	131 (27.6)	343 (72.4)	

Figure 1

Distribution of participants in schools by percentage

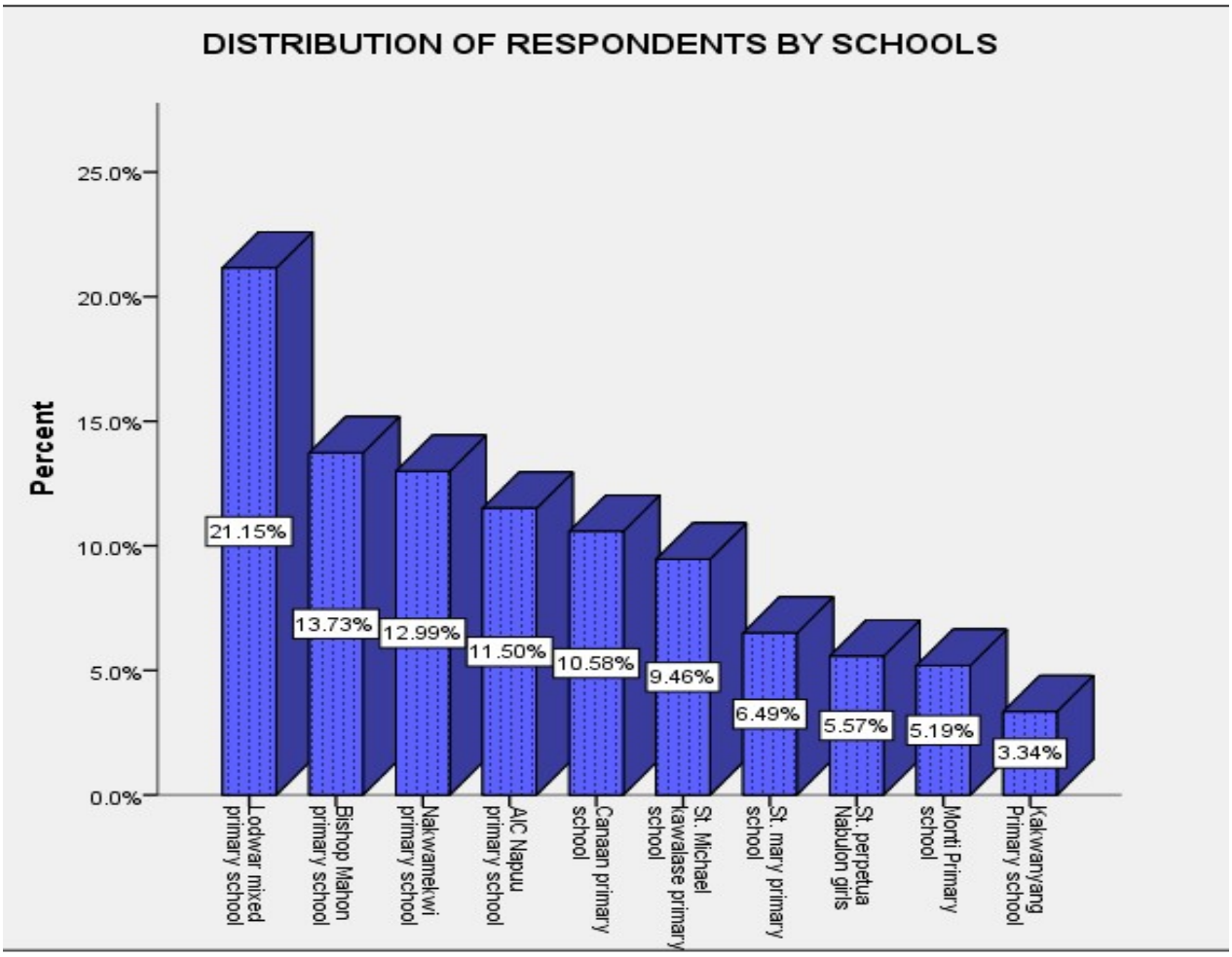

Table 6

Prevalence rates of Intestinal parasites by schools

School	Prevalence rate (%)
Kakwanyang Primary School	38.9
Monti Primary school	17.9
St. Mary primary school	48.6
Lodwar Mixed primary school	16.5
St. Michael Kawalase primary school	15.7
Bishop Mahon primary school	29.2
Nakwamekwi primary school	31.8
St. Perpetua Nabulon girls	59.3
AIC Napuu primary school	43.6
Canaan primary school	21.8
Overall	28.9

Table 7

Distribution of study participants in schools by numbers

Schools	Gender		Total
	Male	Female	
Canaan Primary School	23	33	56
AIC Napuu Primary School	36	24	60
St. Perpetua Nabulon Girls	0	29	29
Nakwamekwi Primary School	52	17	69
Bishop Mahon Primary School	50	23	73
St. Michael Kawalase Primary School	26	24	50
Lodwar Mixed Primary School	65	46	111
St. Mary Primary School	19	16	35
Monti Primary School	17	11	28
Kakwanyang Primary School	11	7	18
Total	299	230	529

Table 8

Prevalence of parasites by gender and age groups

Parasite	**Overall Prevalence rate (%)**	**Gender**		**Age groups (Years)**		
		Male	**Female**	**6 - 9 (%)**	**10 – 13 (%)**	**14 – 18 (%)**
Cyst of Entamoeba	76.6	81.3	70.5	76.2	77.2	75
Troph of Giardia lamblia	13.1	8.5	18	23.8	15.2	2.8
Ova of Taenia spp	5.5	7.5	3.2	0	3.8	13.8
Troph of Entamoeba	2.1	0	4.9	0	2.5	2.8
Cyst of Giardia lamblia	0.7	1.3	0	0	1.3	0
Ova of Ascari lumbricoides	1.4	1.3	1.6	0	0	2.8
Ova of T. saginata	0.6	0	1.6	0	0	2.8

CONCLUSION

Given the high prevalence of intestinal parasitic infections as found out by this study among the school going children, this study concludes that helmithes infections is still a public health concern in Turkana County which, if unchecked, could affect child growth and development.

The current study has revealed that intestinal parasites are prevalent in differing magnitudes among school going children. Entamoeba histolytica and Giardia lamblia are intestinal parasites with a high prevalence in school going children in Turkana County. In addition, due to various issues such as the environment and the poor socio-economic backgrounds, children are more vulnerable to intestinal infections. Daily washing of hands and geographical location of schools are the main factors associated with occurrence of intestinal parasites.

RECOMMENDATIONS

There is need for both the National and County governments to mount series of campaigns to rid all children of intestinal infections especially at the family level especially among the nomadic Turkana community whose environments and lifestyles are fertile grounds for helmithes.

The Turkana County government should set resources (both financial and personnel) towards continuous support of deworming children and make it a compulsory exercise to all households, among other health interventions, as a deliberate effort of securing the future of children who will be future leaders. It is in this regard that the County can employ more public health officers to give more attention to issues relating to intestinal parasites within the community.

Further, there is need for the County government to engage the public in the sensitization activities in an effort towards making them own, support and take up control measures at all levels at within the community. Health education about these intestinal parasites should be taught in schools through local health workers and teachers who have undergone hygiene education training. Behavioural change campaigns, especially focused on hand washing should be scaled up in the county.

There is an urgent need for both the national and Turkana County government to increase access to sanitation and water facilities, through construction of latrines and provision of hand pumps and water filters in primary schools, as one of the calculated ways of getting rid of intestinal parasites among children. In addition, there is need for school going children with intestinal parasites to be treated periodically using multi drug combinations due to multiple parasitism susceptible to children.

REFERENCES

1. World Health Organization (WHO, 1998): Control of tropical diseases. Geneva.
2. Ngui, R., Ishak, S., Chuen, C.S., Mahmud, R. and Lim, Y.A. (2011). L Prevalence and Risk Factors of Intestinal Parasitism in Rural and Remote West Malaysia. PLoS Neglected Tropical Diseases. 5(3).
3. World Health Organization (2011). World conference on social determinants of health UPDATE.
4. Benenson, A.S. (1995). Control of communicable diseases in man. 16th ed. Washington, D.C: American Public Health Association.
5. Sheahan, S. L. and Seabolt, J. P. (1987. Management of Common Parasitic Infections Encountered in Primary Care. Nurse Pract 12 (8), 19-33. 8.
6. Talley NJ, Shorter RG, Phillips SF, ZinsmeisterAR (1990).Eosinophilic gastroenteritis: a clinicopathological study of patients with disease of the mucosa, muscle layer, and subserosal tissues. Gut. 31(1):54-8.

7. Garcia, L.S. and Bruckner, D. A. (1997). Diagnostic Medical Parasitology. 3rd ed. Washington, D.C.: ASM Press.
8. Wolfe, M.S. (1992). Giardiasis. Clinical Microbial Review. 5(4): 93 – 100.
9. Cheesbrough, M. (1998). Medical Laboratory Manual for Tropical Countries. Vol. I 2nd ed. Butterworth-Heinmann, Oxford.
10. Bundy, D. A. P. (1994). The global burden of intestinal nematode disease. Transactions of Royal Society of Tropical Medicine and Hygiene. 88: 259-261.
11. Holland, C.V., Taren, D.L, Crompton, W.T. and Rivera, G. (1990). Intestinal helminthiasis in relation to socioeconomic environment of Panamania children. Social Science and Medicine. 26:209-213.
12. Al-Mohammed H.I., Amin T.T., Aboulmagd E., Hablus H.R and Zaza B.O. (2010). Prevalence of intestinal parasitic infections and its relationship with socio-demographics and hygienic habits among male primary school children in Al-Ahsa, Saudi Arabia. Asian Pacific Journal of Tropical Medicine, 906-912.
13. Tadesse, G. (2005). The prevalence of intestinal helminthic infections and associated risk factors among school children in Babile town, eastern Ethiopia. Ethiopian Journal of Health Development, 19(2), 140-147.
14. Ngonjo T.W., Kihara J.H., Gicheru M., Wanzala P., Njenga S.M. and Mwandawiro C.S. (2012) Prevalence and Intensity of Intestinal Parasites in School age Children inThika District, Kenya. African Journal of Health Science; 21:153-160.
15. Nxasana, N., Baba, K., Bhat, V. G. and Vasaikar, S. D. (2013). Prevalence of intestinal parasites in primary school children of mthatha, eastern Cape Province, South Africa. Annals of
16. medical and health sciences research, 3(3), 511-516.
17. Sah, R. B., Bhattarai, S., Yadav, S., Baral, R., Jha, N. and Pokharel, P. K. (2013). A study of prevalence of intestinal parasites and associated risk factors among the school children of Itahari, Eastern Region of Nepal. Tropical parasitology, 3(2), 140.
18. Iseki, M., Hayashi, K., Gatika, S. M., and Siongok, T. K. (1983). The prevalence of intestinal protozoa in Naivasha, Kitui, Machakos, Taveta and Nandi Hills areas in Kenya., 11(3, 4), 249-
19. Houmsou, R. S., Amuta, E. U. and Olusi, T. A. (2010). Prevalence of intestinal parasites among primary school children in Makurdi, Benue State-Nigeria. The Internet Journal of Infectious Diseases, 8(1), 80-86.
20. Taiwo, A. K. and Agbolade, O. M. (2000). Intestinal helminthiasis among school children in Oru, Ogun State, Nigeria. Nigerian Journal of Science, 34, 283-286.
21. Tsehai, A., Tilahun, W. and Amare, D. (1998). Intestinal parasitism among students in three localities in south Wello, Ethiopia. Ethiopian Journal of Health Development, 12(3), 231-235.
22. Firdu, T., Abunna, F. and Girma, M. (2014). Intestinal Protozoal Parasites in Diarrheal Children and Associated Risk Factors at Yirgalem Hospital, Ethiopia: A Case-Control Study. International Scholarly Research Notices.
23. Salako, A. A. (2001). Effects of potable water availability on intestinal parasitism among rural school children with sewage disposal facilities in the Majidun and Owutu sub-urban community in Lagos state. Nigerian Medical Practitioner, 39(3/4), 30-35.

24. Muchiri, E. M., Thiong'o, F. W., Magnussen, P. and Ouma, J. H. (2001). A comparative study of different albendazole and mebendazole regimens for the treatment of intestinal infections in school children of Usigu Division, western Kenya. Journal of Parasitology, 87(2), 413-418.
25. Simon-Oke, I. A., Afolabi, O. J. and Afolabi, T. G. (2014). The prevalence of soil-transmitted helminthes among school children in Ifedore local Government area of Ondo state, Nigeria. European Journal of Biologcal Medical Science Research, 2(1), 17-22.
26. Chunge, R. N., Karumba, N., Ouma, J. H., Thiongo, F. W., Sturrock, R. F. and Butterworth, A. E. (1995). Polyparasitism in two rural communities with endemic Schistosoma mansoni infection in Machakos District, Kenya. The Journal of tropical medicine and hygiene, 98(6), 440-444.
27. Abdel-aziz, M. A., Afifi, A. A., Malik, E. M. and Adam, I. (2010). Intestinal protozoa and intestinal helminthic infections among schoolchildren in Central Sudan. Asian Pacific Journal of Tropical Medicine, 3(4), 292-293
28. Teshome F, Fufa A, Mekonnen Girma (2014), Intestinal Protozoal Parasites in Diarrheal Children and Associated Risk Factors at Yirgalem Hospital, Ethiopia: A Case-Control Study. International scholarly research volume 2014.