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Original article

Intestinal Parasitic Infections Among Primary School Pupils in Elmina, A Fishing Community in Ghana

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ABSTRACT

Background: Intestinal parasitic infections are common in the developing world, particularly among communities with low socio-economic status. Many of these infections are very often neglected making them a major public health problem. **Objectives**: This study was conducted to determine the prevalence of intestinal parasite infections among primary school pupils in Elmina, a fishing community in the Central Region of Ghana. **Materials and methods**: In this cross-sectional study, stool samples were obtained from two hundred (200) healthy school pupils selected randomly from four different schools in the community. Structured questionnaires were administered to participants to obtain data relating to socio-demographic characteristics and known risk factors. Stool specimens were also examined for parasites using direct smear and formol-ether concentration techniques. **Results**: The overall prevalence of parasitic infection was found to be 12.5%. They included 2 protozoans and 5 helminths: hookworm (4.5%), *Giardia lamblia* (2.5%), *Strongyloides stercoralis* (1.0%), *Trichuris trichiura* (0.5%), *Ascaris lumbricoides* (3.0%), *Entamoeba histolytica* (0.5%) and *Schistosoma mansoni* (0.5%). Intestinal parasitic infection was also significantly higher in pupils who utilise tap water as source of drinking (p=0.019) as well as those who do not wash their hands after visiting the toilet (P=0.004). Sex, age and parent educational status of pupils showed no significant association with infection. **Conclusion:** The present study showed that intestinal parasitic infection is still a problem among primary school pupils in Elmina with poor personal hygiene habits and lack of access to safe drinking water being the main contributory factors.

KEYWORDS: Elmina, intestinal parasitic infection, prevalence, primary school, pupils.

INTRODUCTION

Intestinal parasitic infections are a major public health problem occurring in the developing world especially tropical and subtropical regions. It was estimated that about 3.5 billion people were reported to be infected with intestinal parasites globally[1, 2]. Currently, about 1.5 billion people are infected with soil transmitted helminths with majority of the cases occurring in sub-Saharan Africa, the Americas, China and East Asia [3].

School children are known to bear the heaviest burden of intestinal parasitic infections [4] . These infections have been shown to affect their nutritional status, physical development, mental function, verbal ability and cognitive behaviour [5-8]. Poor school performance and absenteeism have also been reported among infected school children [6, 9].

Generally, high prevalence of intestinal parasitic infection in communities is associated with low socioeconomic status [10] . It is is an undeniable fact that most coastal fishing communities in Ghana lack basic social amenities such as toilets, water supply and proper waste disposal systems. Such insanitary prevailing conditions make inhabitants of these communities especially children prone and vulnerable to infections. Poor personal hygiene and other behavioural factors which promotes infection with these pathogens include children playing with or handling infested soils, eating with soiled hands, unhygienic toilet practices,

drinking and eating of contaminated water and food [11-13]. Previous studies in different regions of Ghana revealed high prevalence rates of intestinal parasitic infection [14-18].

However, to the best of our knowledge, information on the status of intestinal parasitic infection in the coastal regions of the country is hard to come by. The survey of intestinal parasitic infections will inform the community and other stakeholders about the burden of intestinal parasites among the children for appropriate and effective control strategies to be devised. The study therefore aimed to determine the prevalence of intestinal parasites among primary school pupils in Elmina, a fishing community in the Central region of Ghana.

MATERIALS AND METHODS

Study area

Elmina is a coastal town which also serves as the capital of the Komenda-Edina- Eguafo-Abirem Municipality in the Central region of Ghana and is located along the Gulf of Guinea. It has a fishing harbour with fishing and fish mongering as the predominant occupational activities for men and women respectively. The town is a popular tourist centre in Ghana and an urban community with a population of 23,013 inhabitants [19]. However, the housing environment is characterized by poor drainage, surface dumps and poor surroundings. About 18.3 percent of the population in the Municipality has no toilet facilities [19].

Study design, Selection of schools, and sampling techniques

This cross-sectional study was conducted in four basic schools in the town with two hundred (200) healthy primary school pupil's aged 5-17 years between January to March 2014. These children were not under any parasitic medication at the time of the study. The schools involved in the study were Akotobinsin, Etsiapa Memorial, Elmina Municipal Assembly (MA) and St James Anglican primary which were randomly selected among 9 public basic schools in the town.

Collection of Stool samples

Prior to the collection of samples, clean wide mouthed, screw capped plastic stool containers were given to the participating pupils who were further educated on how to collect the samples. The containers were identified by marking with a unique participant identification number.

Processing and examination of stool samples

Early morning stool samples submitted by participating pupils were immediately transported to the laboratories of the School of Medical Sciences, University of Cape Coast for processing and identification of parasites (trophozites, cysts, ova and larvae etc). Two slides were prepared per sample by direct smear (saline and iodine) and another two after formol-ether concentration method as described by cheesbrough [20]. The slides were examined by two parasitologists and a sample was considered positive only when at least one (1) parasite was detected from at least one (1) of the slides.

Questionnaire administration

Structured closed ended questionnaires were administered to the study participants to obtain data on socio-demographic, behavioural and environmental factors in the community. The development of the questionnaires was also based on the possible risk factors in the community. The questionnaires were pretested before being finalised. Interviewing of the children was done using English or the local Fante language. All questionnaires were checked for accuracy and completeness before data entry.

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Review Board of the University of Cape Coast (UCCIRB). Written permission was also secured from the Komenda-Edina-Eguafo-Abirem (KEEA) Municipal Education Office in Elmina. From the pupils who gave assent to take part in the study, only those whose parents or guardians gave informed written consent were enrolled.

Data analysis

The data collected in the study was analysed using SPSS software for windows version 20.0 and the results were presented using descriptive statistics. The Pearson's Chi-square test ($\chi 2$) was used to measure the significant differences between categorical variables. A P value < 0.05 was considered significant.

RESULTS

General observation: There is a varying prevalence of parasitic infection among school pupils from the participating schools (Table 1). Overall, 25 pupils (12.5%) out of the 200 who participated in the study were infected with parasites. St. James Anglican School recorded the highest prevalence of parasitic infection (5.0%), while the Akotobinsin Primary School recorded the lowest (1.5%).

Table 1: General prevalence of parasitic infection among the participating schools

Name of Primary School	No. Examined	No. of positives	Prevalence (%)
Akotobinsin	50	3	1.5
Etsiapa Memorial	52	7	3.5
Elmina M.A	50	5	2.5
St James Anglican	48	10	5.0
Total	200	25	12.5

The distribution of intestinal parasites among the four participating schools in the current study also showed different patterns (Table 2). Hookworms had the highest prevalence of 4.5%. This was followed by *Ascaris lumbricoides* and *Giardia lamblia* with prevalence of 3.0% and 2.5% respectively. *Trichuris trichiura*, *Entamoeba histolytica* and *Schistosoma mansoni* recorded the least prevalence of 0.5% each.

Table 2: Distribution of intestinal parasites among the four schools in Elmina.

Parasite	School				Prevalence (%) [N=200]
	Akotobinsin	Etsiapa	Elmina MA	St James Anglican	
Giardia lamblia	0	0	1	4	5 (2.5)
Entamoeba histolytica	0	0	0	1	1(0.5)
Ascaris lumbricoides	3	1	1	1	6 (3.0)
Strongyloides stercoralis	0	0	0	2	2(1.0)
Trichuris trichiura	0	0	0	1	1(0.5)
Schistosoma mansoni	0	1	0	0	1(0.5)
Hookworm	0	5	3	1	9(4.5)

The prevalence of intestinal parasitic infection among school pupils was also determined with respect to some socio-demographic characteristics (Table 3). Infection rate was higher in males (7.5%) than in females (5.0%) though the difference was not significant p=0.285. Also pupils within the 9-12 and 13-16 age categories recorded prevalence of 5.0% and 5.5% respectively. With respect to the pupil's educational level and their parental educational status, those in class 4-6 (upper primary level) and parents who are literate recorded higher infection rates of 7.5% and 6.0 % respectively.

Table 3: Socio - demographic characteristics and intestinal parasitic infection

Characteristics	Total (%) [N=200]	Parasite Positive [%]	P-value
Sex			
Male	100(50.0)	15(7.5)	0.285
Female	100(50.0)	10(5.0)	
Age (years)			
<9	31(15.5)	3(1.5)	0.459
9 - 12	97(48.5)	10(5.0)	
13-16	69(34.5)	11(5.5)	
>16	3(1.5)	1(0.5)	
Educational level			
Class 1-3	88(44.0)	10(5.0)	0.667
Class 4-6	112(56.0)	15(7.5)	
Parents educational status			
Illiterate	114(57.0)	12(6.0)	0.255
Can read and write	86(43.0)	13(6.5)	

The results also showed some risk factors contributed to the prevalence of intestinal parasitic infections among the school pupils (Table 4). Infections were significantly higher in pupils who used tap water as source of drinking (10.5%) and also in those who washed their hands after visiting the toilet (10.0%). Higher infection rates were recorded among pupils who used the beach (4.5%) and public toilet (4.5%) as places of convenience, and also among those who washed their hands before eating (12.0%) as well as for pupils who walk bare footed (7.0%) but were not statistically significant.

Table 4: Selected risk factors and parasitic infection

Risk factor	Total (%)	Positive (%)	P –value
Source of drinking water			
Tap	182(91.0)	21(10.5)	0.019*
Sachet	18 (9.0)	4(2.0)	
Type of latrine used			
Water closet	55(27.5)	2(1.0)	0.119
Pit latrine	11(5.5)	1(0.5)	
KVIP	4(2.0)	0(0.0)	
Nearby bush	34(17.0)	4(2.0)	
Beach	55(27.5)	9(4.5)	
Public toilet	41(20.5)	9(4.5)	
Handwashing before eating			
Yes	179(89.5)	24(12.0)	0.52
No	1(0.5)	0(0.0)	
Sometimes	20(10.0)	1(0.5)	
Hand washing after visiting toilet			
Yes	178(88.0)	20(10.0)	0.004*
No	8(4.0)	4(2.0)	
Sometimes	14(7.0)	1(0.5)	
Sucking of fingers			
Yes	70(35.0)	8(4.0)	0.737
No	130(65.0)	17(8.5)	
Walking on barefoot			
Yes	131(65.5)	14(7.0)	0.285
No	69(34.5)	11(5.5)	

***** Statistically significant at $P<0.05$

DISCUSSION

The study showed the prevalence rate of parasitic infection in Elmina to be 12.5% and appears to be low compared to work done in Kumasi, Ghana, which reported a prevalence of 42.9% [21]. A similar study in the coastal areas of the Cape Coast metropolis reported a prevalence of 19.1% [22]. The metropolis lies in the same geographic and climatic region with similar environmental features as the current site for this study. In Nigeria, also in the West African sub-region, the prevalence of parasitic infections was observed to be between 30.2% and 67.4% [23-25]. The varying prevalence could be attributed to differences in geographic and varied socio-economic factors, hygiene, availability of clean drinking water, and poverty among others[26].

It is a common knowledge that intestinal parasitic infections abound in developing countries with school children carrying the heaviest burden of the associated morbidity [27, 28]. The diversity of parasites recorded in this study was similar to reports from surveys conducted among pupils in the Jos-North, Plateau State in Nigeria, Gaza in Palestine, Kathmandu in Nepal and Chencha town in Southern Ethiopia [29-32].

Hookworm was recorded as the predominant helminth in this study with a prevalence rate of 4.5 % which is comparable to work done in Nigeria and Ethiopia with similar observations [33, 34] It was noted that Hookworm infection was higher in pupils who were walking bare-footed in this study. Walking bare-footed may be identified to be a major risk factor for hookworm infections among school pupils' especially in the rural areas. While most children usually wear shoes to schools in the community, they sometimes tend to remove their footwear while playing in their environments which predispose them to infection through penetration of their feet by the larval stages of the nematode. This may account for the high prevalence of hookworm infection in the community.

Also *Giardia lamblia* was the most common protozoan parasite with a prevalence of 2.5%. This finding is similar to observations by Dankwa *et al.* and Nxasana *et al.* [22, 35]. It must be noted that the prevalence of human giardiasis in developing countries ranges between 20% to 30% of the general population and 3% to 7% for developed countries [36, 37]. Similar reports have been made of this cosmopolitan parasite which is usually transmitted by the faecal-oral route through contaminated food and water in Ghana and elsewhere.

The low prevalence of intestinal parasites recorded in this study, compared to other studies in Ghana which recorded relatively high rates could be as a result of better hygienic conditions, access to potable water and probably more awareness on the effects of these parasites. Also the mass

drug administration of anthelminthic agents against soil transmitted helminths by the Ghana Health Service (GHS) in schools in the region might account for the low intestinal burdens among the children. According to GHS annual report for 2012, the school based deworming exercise in the KEEA municipality involved 112 of the 145 schools achieving a therapeutic coverage of 86.5% [38].

Age related prevalence was also increased with respect to the different age categories though difference was not statistically significant. This trend was also reported by Dada-Adegbola *et al*. [39] who showed that the prevalence of infection also increased by age. Habits of older age groups such as walking bare-footed when assisting in farms and in fishing activities at the beach, eating from places with doubtful hygienic conditions and not washing hands before eating have been implicated in the high prevalence of soil transmitted infection. This however contradicts studies by other workers [25, 40] who were of the view that the prevalence rather decreases with age, the reason being that the older age group may have a higher level of awareness concerning personal hygiene.

The similar prevalence of parasitic infection in males and females in our study may be in accordance with other studies [41, 42]. It can generally be explained that males in their early ages have work responsibilities in outdoor environments while females are likely to be involved in indoor activities because of social and religious restrictions. The outdoor environment includes the beaches or playing fields visited by males during working or playing hours. Therefore, contamination of soil in these areas would constitute a risk for parasite transmission especially soil-transmitted helminths.

Several studies have reported safe drinking water [42, 43] and washing of hands after visiting the toilet to contributing in reducing the intestinal parasitic infections among children [44] . We are tempted to speculate that tap water is usually hygienic, and will not contributed to the transmission of parasitic infection among children, however the observation was different in this study. It is therefore possible for children to contaminate tap water with hands before drinking. Also the practice of open field defaecation either on the beach or nearby bushes by most of the pupils in this study may contribute to easy infection by the parasites.

CONCLUSION

The results of this study show that intestinal parasitic infection is still a problem among primary school pupils in Elmina area although the prevalence is low. Poor personal hygiene and possible contamination of drinking water may serve as risk factors for the development of these intestinal parasitic infections in this area.

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