

Original Research Article

Intestinal parasitosis among primary school pupils in coastal areas of the Cape Coast Metropolis in Ghana

ABSTRACT

Background: Intestinal parasitosis remains a major public health burden in developing countries such as Ghana. The burden of disease is heaviest among vulnerable populations and yet epidemiologic data from these populations are limited.

Objectives: The present study aimed at assessing the prevalence and risk factors of intestinal parasitosis among primary school pupils in coastal communities of the Cape Coast metropolis in the Central Region of Ghana.

Methods: A cross-sectional survey of primary schools in coastal areas of the Cape Coast metropolis in the Central Region of Ghana was undertaken. Single stool samples were collected and examined using wet mount and formol-ether concentration techniques. Data on socio-demography, environmental and hygiene behaviour was obtained through the administration of a structured questionnaire.

Results: Out of the 230 samples examined, 44 (19.1%) were positive for a least one intestinal parasite. The most predominant parasite in this study was *Giardia lamblia* (6.5%). Hookworm was the most common (3.9%) intestinal helminthes seen in this study. The prevalence of *Ascaris lumbricoides*, *Trichuris trichiura*, *Schistosoma mansoni* and *Strongyloides stercoralis* were 3.0%, 2.2%, 1.7 % and 1.7% respectively. Pit latrine toilet facility emerged as a risk factor for infection in this study.

Conclusion: Intestinal parasitosis is high in basic schools in coastal communities in Cape Coast. The provision of better and hygienic toilet facilities may be a significant boost to control measures.

Keywords: *intestinal parasitosis, primary school, pupils, prevalence, risk factors, Cape Coast*

1. INTRODUCTION

Intestinal parasitosis continue to be a major public health problem with high prevalence and widespread distribution in several developing countries [1,2]. The global estimate for human intestinal parasitosis is around 2 billion and more than half of these of infections occurs in children of school going age [3].

Intestinal parasitosis still affects many communities in spite of a general improvement in the health status of people worldwide. A combination of several factors including climatic, environmental, behavioral, and socioeconomic have ensured that the transmission of these intestinal parasites is sustained in some communities, especially deprived rural areas and the urban slums [4]. The burden of disease is particularly high in school children who are more likely to handle infested soils through their play, eat with soiled hands, and have unhygienic toilet practices [5]. The heavy burden of infection this population makes them more susceptible to conditions associated with intestinal parasitosis such as malnutrition, anaemia and stunted growth [6,7,8]. The consequence of intestinal parasitosis in endemic

communities and vulnerable populations are serious and therefore warrants continuous monitoring to ensure prompt identification and action by health authorities.

Ghana continues to record cases of intestinal parasitosis. Ghana Health Service (GHS) reports suggest that soil transmitted helminthes are endemic in 138 districts of the 10 regions in Ghana even though the actual prevalence of intestinal parasitosis is yet to be properly assessed [9]. Data on disease occurrence collected by the GHS come as aggregates of hospital records on specific diseases and is reported per district. This method of data collection and presentation often obscures the actual burden of disease in vulnerable populations since these populations are not always delimited by district boundaries. Thus, compared the district, regional or national averages, the prevalence of intestinal parasitosis in vulnerable populations such as school pupils or children and pregnant women may be disproportionately higher. The identification of such vulnerable populations often requires focal epidemiological studies that are specifically designed to assess the burden of disease in the population of interest. This study aims at determining the prevalence of selected intestinal parasitosis among primary school pupils in some coastal communities of the Cape Coast metropolis. It will also investigate the risk factors associated with intestinal parasitosis in the study population.

2. MATERIAL AND METHODS

2.1 Study design and area

This was a school-based cross sectional study involving 230 pupils from coastal areas of the Cape Coast Metropolis in the Central Region of Ghana. The metropolis has a population of 169,894 people [10]. It is situated geographically within latitudes $5^{\circ}.07'$ to $5^{\circ}.20'$ north of the Equator and between longitudes $1^{\circ}.11'$ to $1^{\circ}.41'$ west of the Greenwich Meridian covering a total land area of approximately 122 sq. km. The climate is tropical with wet rainy and dry harmattan seasons. The main occupation of the inhabitants of the coastal communities in Cape Coast is fishing and fish mongering.

2.1 Study population

Study participants were recruited from five (5) basic schools in the Metropolis namely Ekon M/A primary A, Ekon M/A primary B, Archbishop Amissah Attah primary, Wilson-Sey primary and Philip Quaye Boy's primary in Cape Coast. A list all schools in the Cape Coast Metropolis was obtained from the Metropolitan Education office. Five schools along the coast were selected by random sampling and included in the study. School pupils enrolled in the study were also sampled randomly using the class registers.

2.2 Ethical considerations

The study was approved by The Institutional Review Board of the University of Cape Coast and permission was sought from the Metropolitan directorate of Ghana Education Service in Cape Coast. Only pupils whose parents gave consent for their participation in the study were recruited.

2.3 Questionnaire administration

75 A pretested structured questionnaire was administered to study participants. The
76 questionnaire had common risk factors associated with intestinal parasitosis such as
77 demographic, environmental and hygienic and behavioral factors.
78

79 2.4 Sample collection

80 Samples were collected in February and March, 2014. A total of 230 stool samples were
81 obtained from study participants. Participants were educated on how to produce and handle
82 specimens to avoid contamination before being provided with the sample containers. Stool
83 specimens were collected in a clean, wide mouth, screw capped and dry plastic containers.
84 All containers were labeled with a sample number and school's name. The sample collection
85 took place early in the mornings. All samples were sent immediately to the laboratory of the
86 School of Medical Sciences, University of Cape Coast for processing and examination.

87 2.6 Sample processing

88 After gross examination of sample characteristics, duplicate samples of each stool specimen
89 were examined microscopically after direct wet faecal preparation and by staining in Lugol's
90 iodine. Each sample was also concentrated by the formol-ether sedimentation technique for
91 microscopic examination [11].

92

93 2.7 Statistical analysis

94 Survey and parasitological examination data were analyzed using and SPSS software
95 version 16.0. The Mann-Whitney U test and Kruskal–Wallis test on ranks were used for all
96 comparisons. Odds ratios (OR) were estimated for association of risk factors with intestinal
97 parasitosis using linear regression models. Differences and associations were deemed
98 significant at $p < 0.05$.

99

100 3. RESULTS AND DISCUSSION

101

102 Table 1 shows the prevalence of various intestinal parasites in the five (5) schools. Out of
103 230 samples examined, 44 were positive for at least 1 intestinal parasite giving an overall
104 prevalence of 19.1% in the study. EA recorded the highest prevalence of 24.4% (10/41)
105 followed by WS with the prevalence of 21.4% (9/42). EB recorded the lowest prevalence of
106 14.3% (6/42).

107

108 **Table 1: Prevalence of intestinal parasites among the Five schools**

Schools	Number Examined	Number Infected	Prevalence (%)
<i>EA</i>	41	10	24.4
<i>EB</i>	42	6	14.3
<i>AAA</i>	47	8	17
<i>PQ</i>	58	11	19

WS	42	9	21.4
Total	230	44	19.1

EA= Ekon M/A primary school A EB= Ekon M/A primary school B AAA= Archbishop Amissah Attah primary school WS= Wilson-Sey primary school PQ= Philip Quaye boys primary school.

Table 2 shows the distribution of intestinal parasites among all five schools. The most predominant intestinal parasite in this study was *Giardia lamblia* with a prevalence rate of (6.5%) which was recorded in all five schools. Hookworm was the most predominant helminth with the prevalence rate of (3.9%) followed by *Ascaris lumbricoides* (3.0%); both were recorded in four out of the five schools studied. *Schistosoma mansoni* infection was highest in EA 7.3%. The lowest prevalence recorded (1.7%) were that of of *S stercoralis* and *T trichiura*.

Table 2: Distribution of intestinal parasites among pupils in different schools

PARASITE	SCHOOL					Total [n=230]
	EA [n=41]	EB [n=42]	OK [n=47]	PQ [n=58]	WS [n=42]	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
<i>Giardia lamblia</i>	3 (7.3)	2 (4.8)	3 (6.4)	5 (8.6)	2 (4.8)	15 (6.5)
<i>Ascaris lumbricoides</i>	2 (4.9)	0 (0.0)	1 (2.1)	2 (3.4)	2 (4.8)	7 (3.0)
<i>Hookworm</i>	0 (0.0)	2 (4.8)	2 (4.3)	3 (5.2)	2 (4.8)	9 (3.9)
<i>Schistosoma mansoni</i>	3 (7.3)	0 (0.0)	0 (0.0)	1 (1.7)	1 (2.4)	5 (2.2)
<i>Strongyloides stercoralis</i>	0 (0.0)	2 (4.8)	0 (0.0)	0 (0.0)	2 (4.8)	4 (1.7)
<i>Trichuris trichiura</i>	2 (4.9)	0 (0.0)	2 (4.3)	0 (0.0)	0 (0.0)	4 (1.7)

EA= Ekon M/A primary school A EB= Ekon M/A primary school B AAA= Archbishop Amissah Attah primary school WS= Wilson-Sey primary school PQ= Philip Quaye boys primary school.

Table 3 show associations between the various risk factors and intestinal parasitic infections among the school pupils in the Cape Coast metropolis. Among all the potential risk factors explored, the type of toilet facility used (pit latrine) was significantly associated with intestinal parasitosis OR = 4.18, CI (1.03 -17.02) ($P=0.046$).

No significant association were found between variables such as sex, age group and educational levels of pupils and intestinal parasitic infection though male pupils and those in age group 9 to 11 appear to have higher risk of infection ($P > 0.05$).
Similarly, no significant associations were found regarding the hygiene behavior of pupils such as washing hands before eating, after visiting the toilet, eating unwashed fruits sucking fingers and biting nails. While pupils who walk on barefoot appeared to have higher risk of infection with intestinal parasites, it was not statistically significant ($P > 0.05$).

Risk factors		Intestinal parasites		P-value
		No. infected	(%)	
Sex				
	Male (ref)	28 (18.9)	1	
	Female	16 (19.5)	1.04 (0.52-2.05)	0.91
Age group				
	6-8 (ref)	5(16.7)	1	
	9-11	22 (26.8)	1.83 (0.62-5.38)	0.27
	12-17	16 (14.8)	0.87 (0.29-2.61)	0.80
	15-17	1 (10.0)	0.56 (0.06-5.42)	0.61
Educational level				
	Class 1-3 (ref)	19 (19.2)	1	
	Class 4-6	25 (19.1)	0.99 (0.51-1.93)	0.98
Drinking water source				
	Tap	39 (20.1)	1	
	Sachet	5 (14.3)	0.66 (0.24 – 1.82)	0.64
	Well	0 (0.0)	3.1	-
Type of toilet facility used				
	Water closet (ref)	11 (19.3)	1	
	Pit latrine	5 (50.0)	4.18 (1.03 -17.02)	0.046*
	Nearby bush	5 (20.0)	1.05 (0.32 – 3.40)	0.94
	Beach	22(18.8)	0.97 (0.43 -2.17)	0.34
	Public toilet	1 (5.3)	0.23 (0.03- 1.93)	0.18
Washing hand before eating				
	Yes	41 (36.6)	1.7 (0.45-2.50)	0.88
	No (ref)	3 (33.3)	1	
Washing hands after visiting toilet				
	Yes			
	No (ref)	38 (40.7)	0.68 (0.28-1.64)	0.39
		6 (27.3)	1	
Eating unwashed fruits				
	Yes	17 (40.1)	1.06 (0.37-3.08)	0.91
	No (ref)	27 (18.6)	1	
Sucking fingers				
	Yes	18 (20.2)	1.12 (0.57-2.19)	0.74
	No (ref)	26 (18.4)	1	
Biting nails				
	Yes	26 (19.4)	1.03 (0.53-2.01)	0.93
	No (ref)	18 (18.9)	1	
Walking on bare foot				
	Yes	38 (20.3)	1.57 (0.62-4.00)	0.34
	No (ref)	6 (14)	1	

Table 3: Risk factors and intestinal parasitic infections among school pupils

* Statistically significant at $P = .05$; OR =odds ratio; CI =confidence interval

144 DISCUSSION

145 This study identified eight different intestinal parasites and found the overall prevalence
146 among school pupils in the Cape Coast Metropolis to be 19.1%. This value is high compared
147 to the estimated prevalence of intestinal helminthes (6.82%) in the Cape Coast metropolis as
148 reported by the Ghana Health Service. The vast difference in the prevalence of intestinal
149 parasitosis in these children and the general population is not surprising because children
150 are more vulnerable to infections due to a number of factors. Firstly, children may have an
151 under developed immune system due to their limited exposure to environmental pathogens.
152 Children are also more susceptible to pathogen because of their play environment. The third
153 and perhaps the most important factor are their poor hygiene habits. Finding a higher
154 prevalence of intestinal parasitosis in school pupils than the general population in the Cape
155 Coast metropolis suggests district level prevalence can sometimes obscure important
156 surveillance data in vulnerable population such as school pupils and pregnant women. This
157 disparity could also result from under reporting by health authorities. Whiles this study
158 surveyed basic schools; the Ghana Health Service (GHS) relies on hospital data and
159 therefore may miss cases that do not get to the hospitals.

160 The range and prevalence of intestinal parasites seen in this study differs from studies
161 conducted in other parts of the country, sub region and beyond [12,13, 14,15,16,17,8,19,20].
162 It must be noted that the prevalence of intestinal parasites is often focal and can be high or
163 low depending on a myriad of factors, including geographical location, climate, sanitation
164 situation, behavioral and socioeconomic factors [21,22,23,24]. Our study focused on school
165 pupils in the coastal areas of Cape Coast, which usually has challenges with environmental
166 sanitation. Data from this study and elsewhere suggests that it may be imperative to identify
167 which intestinal parasites are most prevalent in a particular area to better help control it.

168 The present study found the predominant intestinal pathogenic protozoa to be *Giardia*
169 *lamblia* with a prevalence rate of 6.5%. A similar study involving primary school children in
170 urban and periurban areas of Kumasi, in Ghana also reported *Giardia lamblia* as the most
171 predominant parasite but with a higher prevalence of 16.8% [25]. Our finding also conforms
172 to studies in Pinar Del rio in Cuba in which *Giardia lamblia* was found to be the commonest
173 protozoa with a prevalence of 38.5 % [26]. Infection with *Giardia lamblia* especially in these
174 children can lead to malnutrition as it can reduce food intake, produce steathorrhea,
175 maldigestion and malabsorption of carbohydrates and vitamins [27, 28]. The Ghana
176 government has embarked on a school deworming program which appears to have reduced
177 the intestinal worm burden among school. However, *Giardia lamblia* infection which appears
178 to be one of the leading causes of intestinal parasitosis among school pupils in Ghana has
179 not been addressed.

180 Hookworm was the most predominant intestinal helminth with a prevalence of 3.9%. This is
181 consistent with findings of similar studies conducted in Kintampo in Ghana and Akwa Ibom
182 State, Nigeria [29,30]. Although the prevalence of *Ascaris lumbricoides*, *Trichuris trichiura*,
183 *Strongyloides stercoralis* and *Schistosoma mansoni* were relatively low, their detection in the
184 study population indicates they are still being transmitted and the prevalence could surge
185 under suitable conditions. The prevalence of the soil transmitted helminthes was generally
186 low in this study and may also be attributed to the mass chemotherapy undertaken by the
187 Ghana Health Service in 2012 for school pupils[12].

188
189 The varying prevalence of intestinal parasites often reflects certain local factors pertaining to
190 particular areas and so effective control initiatives will have to consider the risk factors
191 peculiar to those areas. Identifying the risk factors helps in a better understanding of
192 transmission of these parasites. The study revealed that among all the risk factors

193 examined, the use of the pit latrine facility was significantly associated with intestinal
194 parasitic infection. This outcome is in line with a similar study conducted in Dharan
195 Municipality in Nepal in which the use of the pit latrine had a significant association with
196 intestinal helminth infection [30].

197
198 While our study showed that pupils within the ages of 9-11 years were most infected (50%)
199 by intestinal parasites which was consistent with most reports, contrary observation from the
200 Akwa Ibom study in Nigeria showed that age group of 3–8 years had the highest infection
201 rate [20,29]. The active playing habits of school pupils usually bring them into contact with
202 the soil and water contaminated with these parasites making them vulnerable to infection.

203
204 A limitation of this study is that single stool samples were obtained from study participants
205 and this might have lead us to underestimate the prevalence of intestinal parasitosis in our
206 study population. Consecutive sampling and improved stool examination techniques such as
207 floatation, cellophane tape method and Modified Ziehl-Neelsen staining would also have
208 increased the recovery of other parasites.

209

210

211 **4. CONCLUSION**

212

213 The present study revealed that infection with intestinal parasites is an important health
214 problem among school pupils in the coastal communities of the Cape Coast metropolis. The
215 provision of hygienic toilet facilities, education and regular deworming of children will help in
216 controlling the transmission of these parasites in the various schools.

217

218 **CONSENT**

219

220 All authors declare that written informed consent was obtained from the participants. .

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223 **ETHICAL APPROVAL**

224

225 Ethical approval was obtained from the Institutional Review Board of the University of Cape
226 Coast (UCCIRB).

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