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Research Paper

Co-Infection of Soil-Transmitted Intestinal Helminth Infections among School Children in Abeokuta, Ogun State, Nigeria.

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Abstract: The study was conducted to determine the prevalence and intensity of soil transmitted helminthiasis, and also to reveal the co-infection status among school children, in Abeokuta town, Ogun-state, Nigeria. Clean stool Sample bottles were used to collect early morning stool. Stool samples were preserved using sodium acetate acetic acid Formalin (SAAF), FLOTAC method was used, to examine and count parasite load using the compound microscope. a well Structured pre-tested questionnaire was used to collect socio-demographic data, including the knowledge, attitude and practices of the children, in relation to the disease transmission, as well as its control. These study was conducted between June and July, 2016; out of 198 children that was examined, 69 (36.3%) was recorded for one or more soil transmitted helminthiasis. Most of the children tested positive for Hookworm, with a prevalence of 46 (24.4%), followed by Ascaris lumbricoides, which had a prevalence of 37 (19.5%), while only one of the pupil tested positive for Trichuris trichiura. Multiple infections was observed, Out of which, co-infections between Ascaris and Hookworm, recorded the greatest, with a prevalence of 15 (7.9 %), and only one pupil, 1 (0.5 %) was recorded for a co-infection of Ascaris and Trichuris.

Keywords: Soil-transmitted helminthiasis, Epidemiology, Prevalence, Co-infection, Nigeria.

1. Introduction

Soil-transmitted helminth infections (STH) is among the widely spread chronic infections in the world (WHO, 2002). Infections caused by STHs includes; hookworm (Necator americanus, Ancylostoma duodenale), roundworm (Ascaris lumbricoides), whipworm (Trichuris trichiura) (Sam-Wobo et al., 2013). Globally, two billion individuals are infected with helminths, out of which majorities are found living in resource-poor settings (Pullan et al., 2014). A research conducted by pullan et al., in 2010 showed that globally, an estimated 438.9 million people were infected with hookworm, 819 million people were infected with Ascaris lumbricoides, while 464.6 million people were infected with Trichuris-trichiura. The occurrence of helminth infections is associated with socio-economic, environmental factors such as tropical climates and low altitudes. Other factors include ignorance of simple health hygiene, overcrowding, limited access to clean water, (WHO, 2002).

In Nigeria, soil transmitted helminth infections continue to constitute a major public health and developmental challenge especially among school-aged children, within sub-Saharan Africa, (Hotez and Kamath, 2009). Similar and recent studies on intestinal helminthiases from Nigeria, include those of Ameachi et al., (2013), Odu et al., (2013) and Ekpeyong et al., (2008), however current prevalence of STH and co-infection status was either not well addressed or not properly documented in different parts of Nigeria including our present study area. As a result, this study aims to determine the prevalence, intensity, and co-infection of soil-transmitted helminth infection among school children, in Abeokuta, Ogun-state. Findings from these investigation, is therefore hoped to contribute immensely towards achieving an effective disease control planning and implementation, within this study area, in Nigeria as a whole, as well as neighboring countries burdened with similar disease conditions.

2. Materials & Method

2.1. Study site

Ogun state is situated at the south-western part of Nigeria and is made up of 20 administrative local government areas (LGAs) with Abeokuta as the capital city. The state has a land mass of 16,085km2. It is located within longitude 20451 E and 30551 E and latitude 70011

N and 70181N. It is bordered by the Republic of Benin on the west, by Ondo State, on the east and by Oyo and Osun State on the North. And bordered in the south by Lagos State and Atlantic Ocean. Ogun state is highly urbanized, with a population estimated at about 5 million inhabitants, and a population growth rate estimated at 2.83% annually (NPC, 2006). About 95% of the inhabitants, are Yoruba by tribe. Ogun sate covers a wide range of vegetation zones. Vegetation includes; freshwater swamp, with mangrove forest in the southeast, Rain forest. Annual rainfall ranges from 900mm in the northern parts, up to 1600mm along the coast. The major occupation of the population is farming, timber logging and trading. Primary schools exist in most communities but in some cases, two or more communities share the same school.

2.2. Study design/selection of participants

The study was conducted between June and July, 2016. Pupils within the age range of 3-16 years from four schools in Abeokuta, were selected at random. The pupils were invited to participate after which they have been properly sensitized and the purpose of the study was made known to them. Full informed consent was also gotten from their parents. In other to ensure that the research is bias free, we made sure that all the pupils attending the selected schools available for the study were all examined. Majority of the pupils are residents. However, it is gathered that no mass anthelminthic program has been conducted in these schools in recent times before this study. Table 1 summarizes the composition of study population by school and sex. Pupils who took part in this research were selected using WHO guideline (WHO, 2002) for the sampling of school children for helminthiasis intervention programme. It is stated in the guideline that a total of 50 pupils should be sampled per school. Pupil's participation was strictly by random sampling method which depended on their educational level (primary 1 to 6).

2.3. Ethical consideration

Ethical clearance for this study, was given by the Department of Pure and Applied Zoology, FUNAAB. An Ethical Approval was also issued by the state Ministry of Health. Permission to carry out the study was also given by the P.T.A forum of the respective schools, used for the study.

2.4. Collection of stool samples and parasitological examination

Pre-labelled wide-mouthed screw capped universal sample bottle for stool collection was given to the children, with good explanation on how to handle faecal samples. These stool samples were then taken to the laboratory at Federal university of Agriculture Abeokuta, Department of Pure and Applied Zoology, for microscopic examination. Stool in sample bottles were preserved with 10ml of sodium acetate acetic acid (SAAF) each, and afterwards examined by a simple FLOTAC technique.

Table – 1: Composition of study population by age and gender

Age(years)	Male	%	Female	%	Total
7-8	1	0.5	0	0	1
9-10	15	7.9	7	3.7	22
11-12	36	18.9	48	25.3	84
13-14	50	26.3	27	14.2	77
15-16	05	2.6	1	0.5	06
Total	107	56.3	83	43.7	190

Table – 2: Prevalence and Intensity of Soil-Transmitted Helminths

Parasite	Male(n=107)	Female(n=83)	Both sexes	P-value
Soil – transmitted Helmith				
Ascaris lumbricoides	22(0.454 ± 0.089)	15(0.423 ± 0.08)	37(0.44 ± 0.06)	0.81 (ns)
Hook warm	34(0.689 ± 0.104)	12(0.348 ± 0.09)	46(0.54 ± 0.07)	0.02(ns)
TrichurisTrichuira	00(0.00 ± 0.00)	01(0.211 ± 0.23)	01(0.01 ± 0.01)	0.25(ns)

** ns = not significant, S= Significant *** Mean intensities, are significantly different at p values ≤ 0.05.

Table - 3: Prevalence and intensities of intestinal Helminths in relation to gender and schools attended by the pupils among school children in Abeokuta, Ogun – state.

			% prevaience (Mean ± SEM)		
School	Gender	n	Ascaris lumbicoides	Hookworm	Trichuris trichiura
NUD,Ago-Ika	M	23	14.6(0.57 ± 0.19)	10.4(0.25 ± 0.10)	0(0.00 ± 0.00)
NUD,Ago-Ika	F	25	10.4(0.35 ± 0.14)	2.1(0.05 ± 0.05)	0(0.00 ± 0.00)
NUD,Ago-Ika	P value		(ns)	(ns)	0(0.00 ± 0.00)
NUD,Ago-Ika	Total	48	25(0.45 ± 0.12)	12.5(0.14 ± 0.05)	0(0.00 ± 0.00)
St Johns Primary School,Lafenwa	M	23	12.2(0.61 ± 0.22)	14.3(0.61 ± 0.20)	0(0.00 ± 0.00)
St Johns Primary School,Lafenwa	F	26	6.1(0.25 ± 0.14)	4.1(0.19 ± 0.13)	0(0.00 ± 0.00)
St Johns Primary School,Lafenwa	P value		(ns)	(ns)	0(0.00 ± 0.00)
St Johns Primary School,Lafenwa	Total	49	18.4(0.42 ± 0.13)	18.4(0.38 ± 0.12)	0(0.00 ± 0.00)
Holy Prophet Sch-1,Adedotun	M	26	10.3(0.35 ± 0.17)	28.2(1.00± 0.27)	0(0.00 ± 0.00)
Holy Prophet Sch-1,Adedotun	F	13	12.8(1.11 ± 0.35)	38.5(0.91 ± 0.19)	2.6(0.14 ± 0.14)
Holy Prophet Sch-1,Adedotun	P value		0.03	(ns)	(ns)
Holy Prophet Sch-1,Adedotun	Total	39	23.1(0.60 ± 0.17)	38.5(0.91 ± 0.19)	2.6(0.4 ± 0.4)
Holy Prophet Sch-2,Adedotun	M	35	9.3(0.34 ± 0.14)	20.4(0.78 ± 0.20)	0(0.00 ± 0.00)
Holy Prophet Sch-2,Adedotun	F	19	3.7(0.26 ± 0.18)	9.3(0.70 ± 0.27)	0(0.00 ± 0.00)
Holy Prophet Sch-2,Adedotun	P value		(ns)	(ns)	
Holy Prophet Sch-2,Adedotun	Total	54	13(0.31 ± 0.11)	29.6(0.75 ± 0.16)	0(0.00 ± 0.00)

SEM: Standard error of mean, ns: not significant at 5% level of significance, n: number examined

Table- 4: Age, sex, and prevalence of soil-transmitted helminth parasitic infections among school children, in Abeokuta, Ogun state, Nigeria.

Characteristics	Number examined (%)	Number infected (%)	P value
Overall prevalence by sex	190(100)	69(36.3)	
Male	107(56.3)	44(23.2)	>0.05
Female	83(43.7)	25(13.2)	
Prevalence by age			
7-8	01	00(00)	>0.05
9-10	22	10(5.3)	
11-12	84	31(16.3)	
13-14	77	25(13.2)	
15-16	06	01(0.5)	
Single infection			
7-8	01	00(00)	>0.05
9-10	22	01(0.5)	
11-12	84	08(8.7)	
13-14	77	06(3.2)	
15-16	06	01(0.5)	
Double infection			
7-8	01	00(00)	>0.05
9-10	22	01(0.5)	
11-12	84	08(8.7)	
13-14	77	06(3.2)	
15-16	06	01(0.5)	
Prevalence by parasite single infection			
Ascaris	190	23(12.1)	>0.05
Hookworm	190	27(14.2)	
Trichuris + Trichiura	190	01(0.5)	
	Co-infections		
Ascaris + Hookworm	190	15(7.9)	>0.05
Ascaris + Trichuris	190	01(0.5)	

Table -5: Assessment of respondents Knowledge and factors associated with Helminths transmission.

Assessment of respondents knowledge and factors associated with Helminths transmission			
Availability of toilet facility			
Private toilet	133	45(65.2)	
Bush / Dung hill	33	12(17.3)	<0.05
Stream / rivers	24	12(17.3)	
Attitudes and practices			
Washing of fruits before eating	190	69(36.3)	≤0.05
No	111	41(59.4)	
Yes	079	28(40.6)	
Washing of hands before and after eating	190	69(36.3)	<0.05
No	094	29(42.0)	
Yes	096	40(58.0)	
Chewing of finger nails	190	69(36.3)	≥0.05
No	056	23(33.3)	
Yes	134	46(66.7)	
Eating of food that has fallen on the ground	190	69(36.3)	≤0.05
No	079	36(52.2)	
Yes	111	33(47.2)	
How does one get worm infection?	190	69(36.3)	
Don't know	114	45(23.7)	
Through contaminated soil / water	053	19(10.0)	
Its natural	023	05(2.6)	
Do you know worms can be inside of you?	190	69(36.3)	>0.05
No	016	04(2.1)	
Yes	170	65(34.2)	

*Mean intensities are significantly different at p values <0.05.

2.5. Statistical Analysis

Prevalence and Intensities of helminth parasites among pupils of different schools were determined, and variations in mean egg counts with dichotomous variables were analyzed using a student-test, and one-way analysis of variance (One way-ANOVA). This was done for variables with more than two levels. Analysis was performed with SPSS version 20.0.

3. Result

3.1. Prevalence and intensities

At the end of laboratory analysis, an overall prevalence of 69 (36.3%) was recorded for soil transmitted Helminthiasis (STH) among the surveyed pupils (Table 1). Table 1 reveals that 37 (19.5 %) pupils tested positive for A. lumbricoides, 46 (24.4 %) tested positive for Hookworm, while 1 (0.5%) tested positive to whipworm. With corresponding intensities of 0.44 + 0.06, 0.54 + 0.07, 0.01 + 0.01 eggs per 10ml (Table 2). Pupils from Holy Prophet primary school I, had the highest prevalence (11.6%) for intestinal helminth infections which was significantly higher than the prevalence of other schools sampled (x2= 8.380, df= 3, p=0.039), while pupils of Holy prophet School II in Adedotun area of Abeokuta had the lowest prevalence (10.5%) For intestinal helminth. There was a significant difference in the overall prevalence of helminth infection between schools. Likewise, there was a significant difference in the overall prevalence of infection between genders (prevalence in males = 56.3%; Females = 43.7%, $p < 0.05$).

3.2. Sex, age and STH prevalence

An overall STH prevalence of 69(36.3) was recorded. Prevalence in males was higher (23.2%) as compared to that of the females (13.2%). There was a decrease in the prevalence of STH among the sampled pupils as age classes' increases. With the age class 11 – 12 years, being more predominantly infected (16.3%), as compared with that of age class 15 – 16 years (1.6%). Single infections were more predominant among the age classes 11 – 12 and 13 – 14 years (11.5% and 9.5% respectively), meanwhile, age class 11 – 12 years recorded the higher cases of double infection also (8.7%) (Table 4). Among the STH that contributed to single infection, Hookworm (14.2%) emerged the highest followed by A. lumbricodes (12.1%), while T.trichiura recorded the least. Co - infections with A. lumbicoides + Hookworm ranked the highest (7.9%), while double infections with A.lumbricoides + T. trichiura were the least worms recovered. There was no significant difference between sex, age and STH prevalence among sampled pupils (>0.05) (Table 4).

As gathered from this research, there are three major locations where this pupils defecate; 33 (17.3%) use Bush/Dung hill, 133 (70%) out of 190, use private toilet or latrines, while 24 (12.6%) use stream/rivers. However STH parasites was found to be more prevalent amongst pupils that make use of private toilet and latrines,

with a prevalence of 45 (65%), than 12 (17.4%), and 12 (17.4%) for bush/dung hill and Stream/river respectively out of 69 that were infected with STH parasites. This difference was significant at $p < 0.05$. practices such as whether or not if they washed there fruits before eating was also assessed, out of which 40 (58%) of those who said they washed their fruits before eating, were found to be positive for STH parasites, while 29 (42%) that said they don't wash theirs, tested positive for STH parasites. With a significant difference of value at $p< 0.05$. Some other practices assessed were that of if they eat foods that has fallen on the ground. 33 (47.8%) and 36 (52.2%) of those that answered yes and no respectively were positive for STH parasites with no significant differences ($p > 0.05$) between their response and their STH parasite status. Also habits such as chewing of finger nails amongst the pupils was also assessed, and this research showed that 46 (66.7%) and 23 (33.3%) of those that responded to options YES and No respectively were positive for STH Parasites. The difference in response was significant at $p < 0.05$

4. Discussion

Our study found low prevalence with intestinal helminth, this may be due to the fact that, this pupils have been Acquainted with proper health hygiene practices. Suggesting that the health knowledge earlier acquired by the children has in a great way influenced their attitude and practices, thereby reducing the prevalence and intensities of helminth infections. However this probably might also have been due to the Health education introduced by WHO, as one of the tool employed in primary health care systems, communities and schools towards the eradication of soil transmitted Helminth infections (Sam – Wobo, et al., 2011). The low prevalence of intestinal helminth could also be as a result of mass chemotherapy programme which occurred some months in this various schools before this research was conducted which is the reason why majority of the pupils with the help of the pre-tested questionnaire were able to attest to the fact that they had once in recent times been dewormed.

Our findings that hookworm is the most prevalent soil transmitted Helminths agrees with some earlier reports (Babatunde, et al., 2013, Tadesse, 2005, Atting, et al., 2013 :). However, the high prevalence of hookworm among these children depicts that STH infections is still of public health and epidemiological importance among school age children , and therefore calls for the quick intervention of stakeholders in the public health sector to conduct massive health education programs in communities and schools. This will as a result inform the children more better as the children's knowledge, attitude and practices on the transmission as well as the control of STH infections is very low as observed in this study. High prevalence of parasitic infections recorded among male participants in this study is in accordance with report from Ojurongbe et al., (2010). This high prevalence of intestinal Helminths recorded among males could be an indication that the male sex are more prone to infections than the female sex. The males are more active, and are more playful, and as a result, predisposing factors such as; playing of football, less discrimination about where to eat, what and what not to eat, making contact with soil when playing football places them at a higher risk of getting easily infected than females. Hence, children should be encouraged to practice the habit of washing their hands with soap and water after recreation or sporting activities (WASH) often, so as to reduce the risk of getting infected.

There was a decrease in the prevalence of STH infections among the sampled pupils as age classes' increases. The age class 11–12 years, was more predominantly infected (16.3%), as compared with that of age class 15–16 years (1.6%). Increased prevalence among the age class 11–12 years could be as a result of low personal health hygiene practices, as well as poor or lack of proper environmental sanitation. Reduced prevalence within the age class 15 – 16years could be due to the fact that the class constitutes a number of matured individuals, and perhaps with a high level of hygiene as compared to the former (ojurongbe et al., 2010). Also, it has also been discovered that the body immune system increases against infection, as age increases (Odu et al., 2013), hence pupils that falls within the higher age class are more likely to be immune to parasitic infections than children that falls within the lower age class. Bye and large, differences in age and sex in relation to the prevalence of helminth infections, can be associated to factors of demographic importance as well as poor and unhygienic living conditions.

With the help of pre-tested questionnaires, we were able to discover, that majority of the participants in this study had little or no knowledge about helminth infection, its transmission and its possible control. As 119 (60.0%) of the pupils does not have an idea of how one gets worm infection, and this as a result has led to the prevalence of helminth infection among this children. However result showed that some of the pupils who had adequate knowledge, about the disease condition were positive for soil transmitted helminth infection. The cause of this could be attributed to the carelessness of such children towards predisposing factors. Our study confirmed co-infections of Ascaris + hookworm followed by Ascaris + Trichuris with the former being more prevalent among the children than the latter (Table 4). The prevalence of Ascaris + Hookworm among the children over Ascaris +Trichuris could be associated to the fact that, the soil conditions within the study location are favourable to harbour the larva stages (infective stages) of the prevailing parasitic worms, hence making it easier for the children to be susceptible to these infectious disease they come in contact with soil.Indiscriminate defecation and poor hygienic practices also led to spread of single as well as multiple infections, among these children (Table 5). Also, the unawareness of the children about the efficacy and potency of anthelminthic drugs over the use of herbs against helminth infection, as gathered by this study is in accordance with findings of Amaechi (2013) and Hotez (2007).

5. Conclusion

Helminth infection is still very prevalent among school aged children in Nigeria. Morbidities in this age group is as a result of poor hygienic practices, poverty level, unfavorable climatic conditions which as fostered the transmission of these parasitic helminth. Hence it is suggested that governments should put in place policies that will back up control efforts. The baseline information provided from our study together with the high prevalence, affirms the urgent need for proper health education to better improve the pupil's knowledge about STH infections which will enhance the impact of control interventions in these schools.

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