SURVEY OF INTESTINAL SCHISTOSOMIASIS AND SOIL-TRANSMITTED HELMINTHIASIS AMONG PUPILS IN IFELODUN, KWARA STATE NIGERIA.

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ABSTRACT

Schistosomiasis and Soil Transmitted Helminths (STHs) are among the mainly prevalent suffering of human who live in areas of poverty in the developing world. The diseases caused by STHs and *Schistosoma mansoni* are most commonly associated with poor hygiene practice and improper excreta disposal. This study aimed to determine the prevalence of infections with STHs, *Schistosoma mansoni* and the associated risk factors among school children in Ifelodun, Kwara State. It was a cross sectional study that recruited school children from 3 randomly selected primary schools in the Local Government Area aged from 3 to 18 years. A well structured questionnaire was used to collect information on socio-demographic data and possible associated risk factors. A single stool sample was processed using Kato Katz thick smear technique and examined for eggs of geohelminths and *S. mansoni* infections.The only prevalent helminth seen was *Ascaris lumbricoides* 6.3% (n=160). In all, female pupils had more infestation with prevalence of 4.4% (7/160) than their male counterpart 1.9% (3/160). Eighty percent of the infected pupils had heavy infection while 20% had light infection (P< 0.05). Thus, none of the infected pupils had moderate infection. The study confirmed absence of Intestinal Schistosomiasis among pupils in the study area.

***KEYWORDS*:** Intestinal Schistosomiasis, other Soil- Transmitted Helminthiasis, Pupils, Nigeria.

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INTRODUCTION

Intestinal parasites are highly prevalent causing serious health problem in the tropics. School children carry the heaviest burden of morbidity due to intestinal helminths and schistosomiasis infections. The public health significance of Schistosome and Soil Transmitted Helminths (STH)/geohelminths continue because of their high prevalence and their effects on humans, particularly those living in the tropical and subtropical areas (Leykun, 2001). Diseases due to the parasites are among the most prevalent human infections affecting approximately one quarter of the world's population, mainly school children due to their poor sanitary conditions and their voracious eating habits (WHO, 1987; Bundy *et al.,* 2004). Out of the people suffering the severe morbidity of the infection, more than 150,000 results in deaths annually (Crompton 1999; Montresor *et al.,* 2002).

Numerous helminthes inhabit the intestinal tract of human and those of great health importance include nematodes (roundworms) such as *Ascaris lumbricoides, Trichuris trichiura,* hookworms (*Ancylostoma duodenale and Necator americanus*) and *Strongyloides stercoralis, trematodes* (flukes) such as *Schistosoma mansoni, Clonorchis sinensis*, *Opisthorchis viverrini* and *Fasciola spp*. (*F. hepatica* and *F. gigantica*) and cestodes (tapeworms) such as *Taenia solium*, *T. saginata, Diphyllobothrium latum, Hymenolepis nana and Echinococcus granulosus.* The most common intestinal helminthes of humans throughout Nigeria are *A. lumbricoides, T. trichiura,* hookworm, *S. stercoralis* and *Schistosoma mansoni* (Odening, 1976). Others that have been reported but not very common include *Taenia spp, H. nana, Dicrocoelium traspes* and *E. vermicularis* (WHO, 1994).Helminth infections caused by soil-transmitted helminthes (STHs) and schistosome are among the most prevalent afflictions of humans who live in areas of poverty in the developing world. The morbidity caused by STHs and schistosome is most commonly associated with infections of heavy intensity. Infection and transmission are propagated by poor hygienic habits such as indiscriminate disposal of human and animal faeces, which permits contact of faeces and its accompanying microbial load with soil or water. In Nigeria, a considerable amount of human and animal wastes are discharged into the soil daily leading to the contamination of the soil with STH eggs and larvae (Adeyeba and Tijani, 2002). Generally, STH infections are associated with poverty, lack of sanitation, impaired hygiene and overpopulation (Ojurongbe, 2013). Infection may be direct or indirect through secondary sources such as food, water, vegetables and fruits since most STH infections are acquired through the faecal-oral route. Observations in Zaria, Northern Nigeria showed that 70% of the soil samples collected in a school compound was contaminated with STH eggs showing the level to which the soil can be contaminated with faeces (Nock *et al.,* 2007).

The life cycles of *Ascaris lumbricoides, Trichuris trichiura,* and hookworms follow a general pattern. The adult parasite stages, inhabit the gastrointestinal tract (*Ascaris lumbricoides* and hookworms in the small intestine; *Trichuris trichiura* in the colon), reproduce sexually, and produce eggs, which are passed in human feces and deposited in the external environment. STH infections rarely cause death. Instead, the burden of disease is related less to mortality than to the chronic and insidious effects on the hosts' health and nutritional status (Stephenson *et al.,* 2000; Stoltzfus *et al.,* 1997). Hookworms have long been recognized as an important cause of intestinal blood loss, leading to iron deficiency and protein malnutrition. The iron deficiency anemia that accompanies moderate and heavy hookworm burdens is sometimes referred to as *hookworm disease* (Hotez *et al.,* 2004).

Schistosomiasis is estimated to affect 187 million people worldwide (de Silva *et al.,* 2003). A serious acute illness accompanied by fever and lymphadenopathy, known as Katayama Syndrome, can result from heavy schistosome infections. Chronic disease is mostly due to perforation of blood vessels and entrapment of eggs by host tissues. The host's reaction to entrapped eggs results in granuloma formation. Schistosomiasis also causes chronic growth faltering and can contribute to anaemia (Ross *et al.,* 2002). Five *Schistosoma species* are known to cause infection in human and they include: *S. mansoni*, *S. japonicum, S. intercalatum, S. mekongi* and *S. haematobium*. The morbidity commonly associated with *S. mansoni* infection includes lesions of the liver, portal vein, and spleen, leading to periportal fibrosis, portal hypertension, hepatosplenomegaly, splenomegaly, and ascites. Infection with *S. japonicum* occurs in parts of China and the Philippines (Ross *et al.,* 2002). *S. intercalatum* is known to cause intestinal schistosomiasis in restricted geographical areas found in Central Africa while *S. mekongi* cause intestinal schistosomiasis in Cambodia and the Lao People's Democratic Republic. *S. haematobium* causes urinary schistosomiasis or bladder wall pathology, leading to ulcer formation, hematuria, and dysuria. Granulomatous changes and ulcers of the bladder wall and urethra can lead to bladder obstruction, dilatation, secondary urinary tract infections and subsequent bladder calcification, renal failure, lesions of the female and male genital tracts, and hydronephrosis. *S. haematobium* is also associated with increased risk of bladder cancer.

Helminth infections impair physical and mental growth in childhood, thwart educational advancement, and hinder economic development. Because of the geographic overlap of these afflictions and their impact on children and adolescents, the World Health Organization (WHO); the World Bank; and other United Nations agencies, bilateral, and civil society are working to integrate STH and schistosome control through a program of periodic school-based, targeted antihelminthic drug treatments.

In line with the above, this research work was carried out to examine the prevalence of Intestinal Schistosomiasis and Soil Transmitted Helminths (STH) infections among primary school pupils aged 3 to 18 years in Idofian and Igbo-Owu in Ifelodun Local Government Areas of Kwara State, Nigeria. 160 faecal samples (85 male and 75 female) pupils from 3 primary schools were microscopically investigated for intestinal schistosome and STHs. Helminthiasis in children, especially primary children is poorly reported and therefore not known to permit formulation of intervention strategies by relevant authorities. The lack of focus on primary school age is based on an assumed low prevalence and infection intensity, accompanied by a belief that low intensity infections do not result in significant morbidity (Crompton and Nesheim, 2002). However, the need to expand the focus to include helminth infection in primary school age children is increasing. This situation prevails in Ifelodun LGA of Kwara State. The results obtained will provide information on the prevalence of intestinal helminthiasis among pupils in Idofian and Igbo-Owu; Ifelodun LGA, Kwara State in relation to the associated risk factors from which the need for formulating intervention strategy could be assessed.

MATERIALS AND METHODS

Study Area

This study was conducted in Idofian and Igbo-Owu, ancient towns in Igbomina - Yoruba land of Kwara State. Idofian is a populated place (class P - Populated Place) in Kwara State, Nigeria (Africa) with the region font code of Africa/Middle East. It is located at an elevation of 327 meters above sea level and its population amounts to 139,494 (www.getamap.net/nigeria/nigeria/_(general)/_idofian). Idofian is also known as Idofiyan and its geographical coordinates are 8° 23' 0" North and 4° 43' 0" East (www.getamap.net/nigeria/nigeria/_(general)/_idofian). While, Igbo-Owu is village near Idofian and it is located at an elevation of 345 meters above the sea level with population of about 136,772 (www.getamap.net/nigeria/nigeria/_(general)/_igboowu). Igbo-Owu is also known as Igbowu and its coordinates are 8° 22'60" North and 4° 46'0" East (www.getamap.net/nigeria/nigeria/_(general)/_igboowu). Idofiyan and Igbowu are about 22km and 28km respectively away from Ilorin (the state capital). The climate is a tropical type with distinct dry and wet seasons. The inhabitants are predominantly Yoruba ethnic group with immigrants from Zuru, Togo, Tiv, Nassarawa, Igede, Fulani, Bassa, Hausa and Igbo. Islam is the religion of majority of the people, but few are Christians. There are few health centers with few standard and sub standard primary and secondary schools in the areas. Their major sources of water is bore-hole, but when the bore-hole is faulty or when there is power outage for days or weeks, this forces the inhabitants to take water from other sources such as well, lakes, ponds, and flowing rivers for their domestic use. Their major occupation is farming of yam, maize, guinea-corn, cassava, and vegetables, while quite a number of them engage in garri production, menial businesses, teaching etc.

Study Design

A total of 160 school children (85 males and 75 females) were selected from the 3 representative schools in Ifelodun Local Government Area of Kwara State. This was carried out after the determination of sample size. The respondents were chosen randomly from their grade categories. Data collection was undertaken from November 2015 – January 2016. Specimens were collected on-the-spot. Pupils who were not able to pass stool during sample collection were advised not to bring their friends stool, but to report that they could not do it. Those who reported not able to pass were substituted by other pupils. The 160 samples were processed using Kato- katz thick smear technique (Peters *et al.,* 1980). For each stool sample, only single slide was prepared by well trained expertise.

Ethical Clearance

Before the commencement of the study, approval was obtained from the State Universal Basic Education Board (SUBEB) and the state Ministry of Education after detail explanation of the aim and objectives of the study. Thereafter, with the assistant of the community health workers, consent and cooperation of head teachers, community leaders and parents were sought. Afterwards, bio-data of willing pupils were registered in the epidemiological field book.

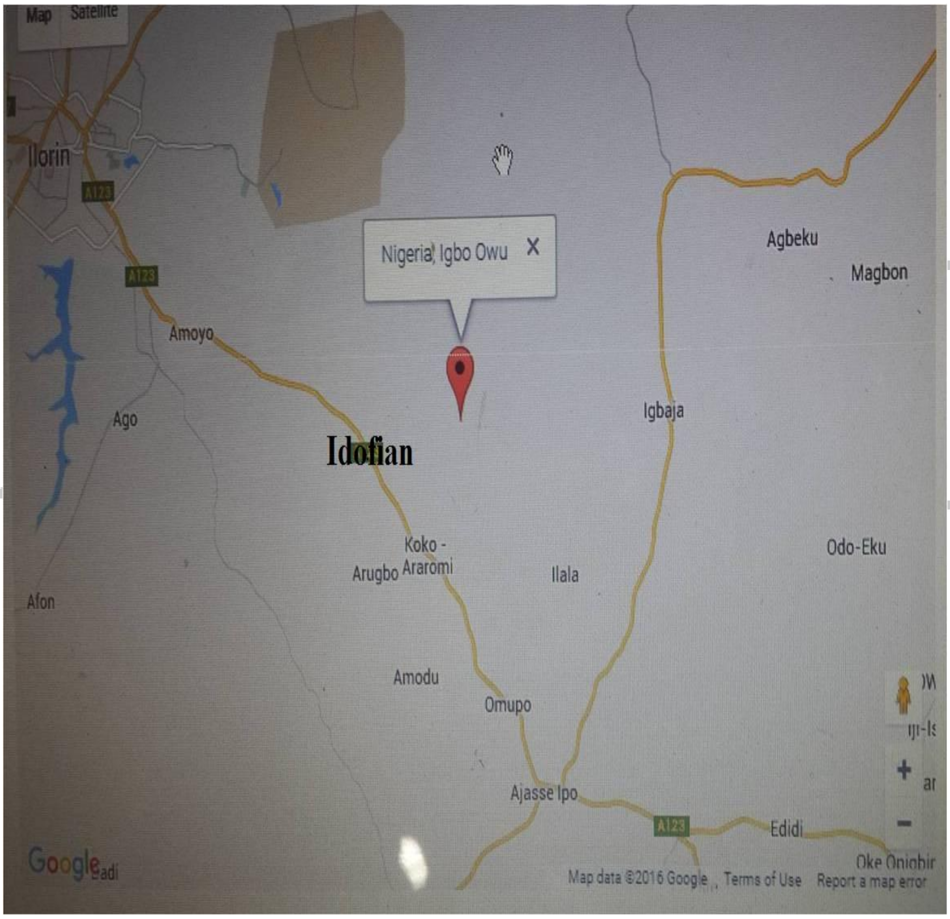

Figure 3.1: Map of Idofian and Igbo-Owu

Source: www.worldandcitymaps.com/africa/nigeria/kwara-state/igbo-owu/

Study Population and Sampling

The study population includes primary school children aged 3 – 18 years. Male and female children were randomly selected based on the pre-test screening that was conducted. Stool samples were collected from only those who indicated their willingness to be tested. A total of 160 stool samples were collected from St.

John LGEA Primary School (58), Muslim Community School Idofian (58) and ECWA LGEA Primary School (44).

Inclusion criteria

Children going to school from 3-18 years of age and from who consent were obtained from their parents, guardians and teachers.

Exclusion criteria

Adults and non-school children were not included in the study.

Data and Sample Collection

A pre-test questionnaire with close ended questions, which was developed based on known potential risk factors, was used to gather demographic, socio-economic and behavioural data. Interview questionnaire was administered to the children in English and their mother tongue, Yoruba. Finally, accuracy and completeness of the entire questionnaire were checked at the end of each data collection day. Prior to stool sample collection, children were guided on how to bring their stool samples not to mix it with soil and urine. Immediately after interview, each child was provided with a dry, clean and leak free stool bottle, labeled with the identification number of each child and applicator stick. Samples were preserved in 7% formalin solution and transported to the Medical Microbiology and Parasitology Laboratory of Ladoke Akintola University of Technology for processing and helminth examination.

Parasitological Technique

Freshly passed sample were collected between 11.00h and14.00h, being the peak of diurnal egg count. A single stool sample was collected from each study participant once using a labeled container, from which double Kato Katz thick smears were prepared and examined for geohelminths and *Schistosoma mansoni* eggs. To estimate the intensities of infection, results from the Kato Katz smears were prepared using 41.7g of the feacal sample and then examined for *Schistosoma mansoni and* geohelminth ova under a compound microscope within 30-60 minutes after preparation (Katz et al., 1972). The ova were then multiplied by factor 24 in order to express infection intensities as number of eggs per gram of stool. According to WHO 1993 & 1994, light infection ranges from 1-99eggs/gram of stool, moderate infections ranges from 100-399eggs/gram of stool, heavy infections ranges from 400-1000 eggs/gram of stool and very heavy infections ranges from 1001 and above (Katz et al., 1972). In dispatching of stools, 7% formalin solution was used as a preservative.

RESULTS AND DISCUSSION

RESULTS

Table 1 shows the overall prevalence of infection among the 3 schools. Of the 160 stool samples examined, only 10 (6.3%) had eggs of intestinal helminths. Therefore, the overall prevalence is 6.3% with *Ascaris lumbricoides* being the only helminth observed in the 3 selected schools. ECWA LGEA Primary School had the highest prevalence of 7 (4.4%) followed by St. John's LGEA with prevalence rate of 2 (1.3%) while, Muslim Community School had the least with only 1 (0.6%) infected pupil from the school. The difference in prevalence among the 3 schools was statistically significant (P =0.000) .Table 2 shows egg per gram (epg) of *Ascaris lumbricoides*. The infected male pupils 3(30%) had heavy intensity of ascariasis. While, 5 (50%) of female infected with ascariasis had heavy intensity of the infection. The remaining 2 (20%) were female with light intensity of infection. Generally, pupils of age group 11-15years had the highest number of population with heavy intensity 5 (50%) followed by age group 6-10years with 2 (20%) pupils. Only 1 (10%) had heavy intensity of infection among the pupils of age group 1-5years, while none of the pupils within 16-20years had heavy intensity of the infection. The difference in prevalence with respect to sex and age group was however not statistically significant (P = 0.301 for sex and 0.732 for age group). The infection intensities (eggs per gram of faeces) were scaled as follows: 1-299 epg, 300-499epg and ≥ 500 epg as light, moderate and heavy respectively for *A. lumbricoides*, while 1-199 epg (light), 200-399epg (moderate) and ≥ 400epg (heavy) for hookworm and *H. nana*, and 1-49 epg, 50-199 epg and ≥200 epg (light, moderate, and heavy respectively) for *S. mansoni* (World Health Organization Threshold, 2002; Montresor *et al.,* 2002). The infection intensity was determined by multiplying egg viewed per field of the objective lens by 24 as recommended on the Kato Katz kit used. Table 3 describes prevalence of infection in relation to pupils' attitudes and socio-economic parameters obtained from the questionnaire administered. Findings show that all the 160 pupils drink borehole water and they all have access to health facilities. Out of the 47 pupils who swim in the river, 3 (6.4%) were infected. While, 7 (6.2%) who didn't swim in the river were infected with *Ascaris lumbricoides*. A total number of 5 (9.1%) pupils out of 55 who played with soil were infected and 5 (4.8%) out of the 105 pupils who did not play with soil were infected. Out of 63 children who sometimes ate without washing their hands 6 (9.5%) were infected. Of the 97 who indicated that they sometimes washed their hands 4 (4.1%) were infected. Out of the 51 pupils who do did take antihelminthic, 4 (6.6%) were infected. While, only 6 (5.5%) out the 109 who took antihelminthic therapy were infected. Prevalence of infection with respect to schools and sex is shown in figure 1. The only 3 infected out of the 85 male pupils examined were from ECWA LGEA 3/85 (3.5%). While, 4/75 (5.3%) female pupils in the school had infection. At Muslim Community School, only 1/75 (1.3%) female participants had infection. Also, the 2/75 (2.7%) pupils infected at St. John's LGEA School were female respondents. The prevalence of infestation of female category was found higher than those of male pupils but the difference in prevalence with respect to sex was however, not statistically significant (P = 0.240). Figure 2 shows the prevalence of Ascariasis with respect to sex and age group of the pupils. Prevalence of *Ascaris lumbricoides* was found higher within the age range of 11-15 with 6 (3.8%) infected male pupils. The total number of female infected within the age group is 5 (3.1%). However, infected female pupils within the age group 6-10years were 2 (1.3%) while the male pupil was 1 (0.6%). Age group 1-5years had the least infection rate with only 1(0.6%) male pupil. While, none of the pupils within the age group of 16-20 had helminth infection. The difference in prevalence with respect to sex and age group was however, not statistically significant (P = 0.301 for sex and 0.732 for age group.

Table 1: Overall Prevalence of Infection among the 3 Selected Schools in the study area.

School	No. Examined	No. Infected	Percentage (%) Infected
ECWA LGEA	44	7	4.4
Muslim Community	58	2	1.3
St. John's LGEA	58	1	0.6
Total	**160**	**10**	**6.3%**

Table 2: Egg per Gram (EPG) of *Ascaris lumbricoides* in Faeces of the Ten Infected Pupils in the study area.

S/N	Sex	Age	EPG	Status
1.	F	6	192	Light
2.	F	15	288	Light
3.	F	14	744	Heavy
4.	M	11	1488	Heavy
5.	F	12	720	Heavy
6.	M	3	672	Heavy
7.	F	10	2280	Heavy
8.	M	10	1224	Heavy
9.	F	13	1680	Heavy
10.	F	14	864	Heavy

Table 3: Prevalence of Infection with Respect to Pupils' Attitudes and Socio-economic factors in the study area.

Parameters	Use borehole water (%)	Swim in the river (%)	Play with soil (%)	Eat without hand-washing (%)	Take anti-helminthic (%)	Presence of Health facility (%)
School						
ECWA LGEA	44/44 (100)	15/44 (34.1)	26/44 (59.1)	30/44 (68.2)	35/44 (79.5)	44/44 (100)
Muslim Comm.	58/58 (100)	17/58 (29.3)	23/58 (29.7)	24/58 (39.7)	46/58 (41.4)	58/58 (100)
St. John's LGEA	58/58 (100)	15/58 (25.9)	6/58 (10.3)	9/58 (15.5)	28/58 (48.3)	58/58 (100)
Total	**160/160(100)**	**47/160 (29.4)**	**55/160 (34.4)**	**63/160 (39.4)**	**109/160(68.1)**	**160/160 (100)**
No. Infected (%)	**10/160 (6.3)**	**3/47 (6.4)**	**5/55 (9.1)**	**6/63 (9.5)**	**6/109 (5.5)**	**10/160 (6.3)**
Not Infected (%)	**150/160 (93.8)**	**7/113 (6.2)**	**5/105 (4.8)**	**4/97 (4.1)**	**4/61 (6.6)**	**150/160 (93.8)**

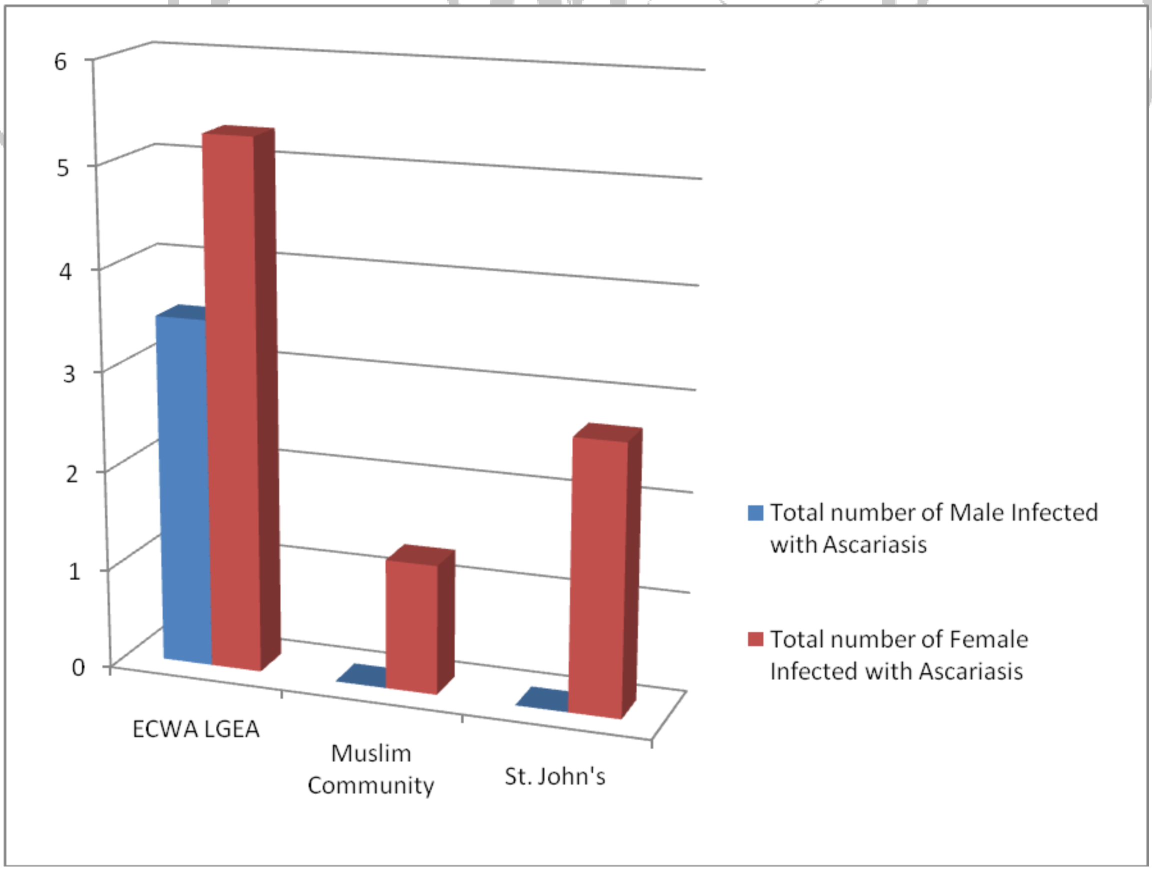

Figure 1: Prevalence of infection with respect to sex and schools in the study area.

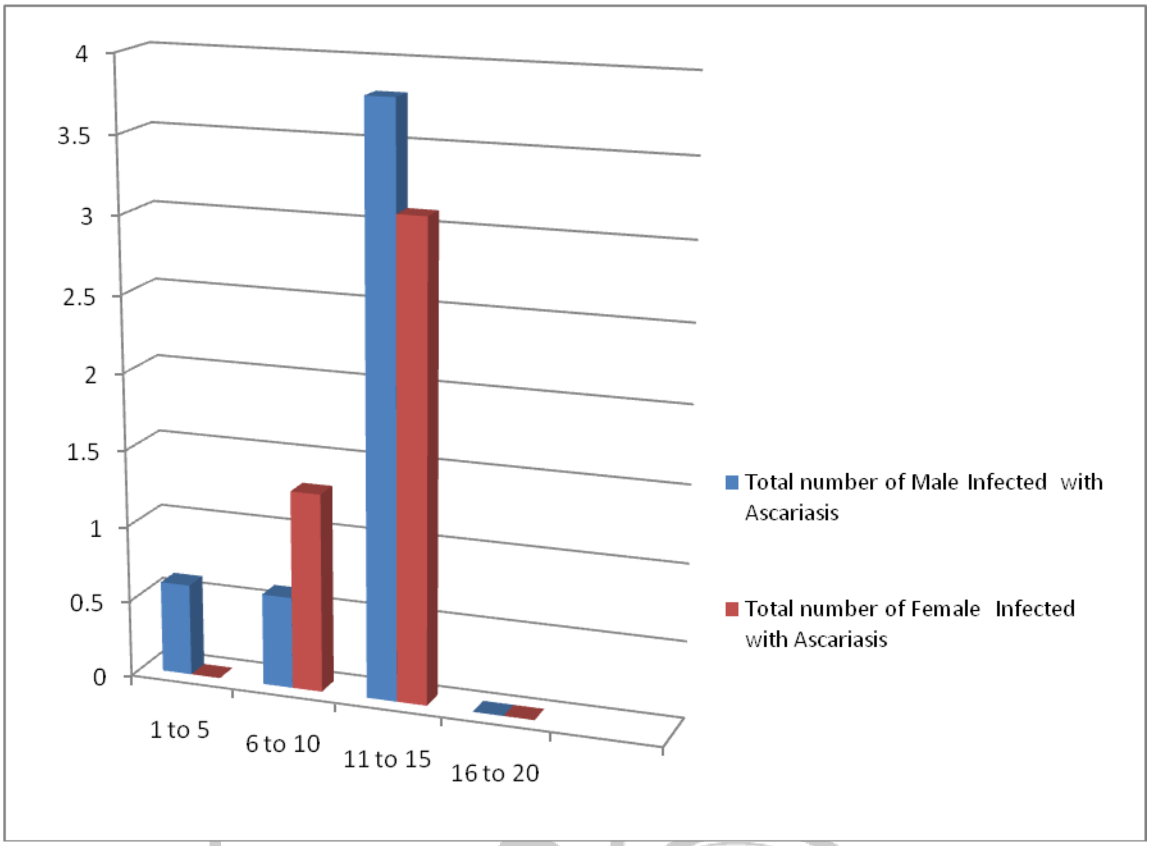

Figure 2: Prevalence of Ascariasis with Respect to Sex and Age Group of Pupils in the study area.

DISCUSSION

Soil-transmitted helminths are of great public health problem in several tropical and subtropical developing countries such as Nigeria, due to poor socio-economic status and personal hygiene. This is more common in school children and it is associated with high morbidity and mortality as well as economic loss to the country (Girum, 2005; WHO, 2002; Ukoli, 1990). The results of this study appear to agree with this remark. An overall prevalence of 6.3% of intestinal helminthiasis was obtained in this study. However, only the eggs of *Ascaris lumbricoides* were observed and this is in line with the findings of Timothy *et al.,* (2013) who reported that *Ascaris lumbricoides* has very high prevalence among primary school children. This may illustrate the general trend among primary school children throughout the state as roughly the same environmental conditions apply. In this study, the observed overall prevalence (6.3%) is relatively lower than what is obtained in studies done elsewhere within the state 41.9% (Babatunde *et al.,* 2013), 47.4% (Saka *et al.,* 2006) and the country at large 48% (Ezeagwuna *et al.,* 2010). The time at which this study was carried out (Dry season) could be responsible for the low prevalence obtained since it has been shown that high temperatures, combined with high rainfall are conducive to acquiring intestinal helminths (Laughlin., 1998).

The highest prevalence of helminth infestation was recorded in ECWA LGEA Primary School, Igbo-Owu probably as a result of the inadequate toilet facilities, improper disposal of refuse and low level of exposure observed in the village. The high prevalence of the infection among females obtained in this study may be due to the frequency and intensity of playing with soil which exposes them to contamination. This agrees with the reports of Ezeagwuna *et al.,* (2010) who recorded a high prevalence in females (8.56%) compared to (4.62%) in males. In this study, *Trichuris trichiura* was not encountered perhaps because *Trichuris* cannot successfully complete its life cycle in the absence of moist soil; this study was carried out in dry season (November 2015 – January 2016). Also, *Hymenolepis nana* was not found in the study area probably due to the fact that majority of the pupils were not allowed to play with animals like dogs. Fleas are important vectors of this species, and children in close contact with dogs may be bitten by infected flea which may prone them to having the infection. Findings from the questionnaire administered indicate that vast majority of the pupils take antihelminthic regularly either through their parents or as result of intervention by the State Ministry of Education. This may probably be responsible for the low prevalence of helminth eggs obtained in the stool samples.

It has been observed that major behavioural factors play a role in helminth infection transmission (Habbari *et al.,* 1999). Children who sometimes eat without washing their hand had a higher prevalence of helminths infestation compared to their counterparts who wash their hands regularly. However, there was no significant association between sources of water supply and helminths infestation. It is surprising that the result obtained showed no significant association between swimming in the river and types of toilets used, this could be due to regular de-worming of children and or resistance to infestation. However, this suggests the need for proper disposal of faeces; latrines should be used with the highest level of hygiene in order to check the spread of infestation and also campaign for hand washing is highly important. The presence of human faeces and garbage piles in the vicinity of homes is of great concern and indicates a need for regular environmental sanitation and inspection of premises.

Conclusion

The present study revealed that intestinal helminth infestation occurs among primary school children in Ifelodun LGA, Kwara State, which is Ascariasis and there are no Intestinal Schistosomiasis. Prevalence of helminthiasis among primary school children in the three (3) public schools in Idofian and Igbo-Owu communities is relatively low (6.3%). However, it is medically significant because an infected individual in a geographical location may aid the transmission of that infection to the whole population if care is not taken. Therefore, regular health education and de worming exercise should be enhanced. Improper disposal of refuse, indiscriminate disposal of human and animal faeces which promote helminthiasis should as well be discouraged.

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