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Prevalence of Intestinal Helminths Among Pupils in Oyo Senatorial Districts, Oyo State, Nigeria

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ABSTRACT

Socio-economic facilities, sanitation, hygiene, ignorance, and culture affect the prevalence of helminthic infections. This study investigates the prevalence of intestinal helminths among pupils in Oyo senatorial districts in urban and semi-urban regions between June and September 2019. One hundred and fifty (150) consenting pupils consisting 78 male and 72 female between the ages of 2 to 13 years were randomly selected and examined to detect the presence of intestinal helminths. Two local government areas were randomly selected from each senatorial district and 50 pupils were selected from each district comprising of 25 pupils from each Local Government Area. Freshly collected faecal samples were examined using direct wet mount and concentration technique which involves macroscopic and microscopic examination Fourteen (14) pupils were found positive with the prevalence of 9.3% for intestinal helminths out of which 13(8.7%) had single infection while 1(0.7%) had co-infection. Intestinal helminths found were *Ascaris lumbricoides* and hookworm with prevalence of 10(6.7%) and 3(2.0%) respectfully in single infection while co-infection was 1(0.7%). A non-helminthic infection with *Entamoeba histolytica* (0.7%) was also observed. The prevalence of 14.0% intestinal helminths- infections was observed in Oyo central followed by 8.0% and 6.0% in Oyo North and Oyo South respectively. The probability value (**P > 0.05)** showed no association between regions and rate of helminthic infection. Therefore, the region within the study area does influence the occurrence of infection. The highest prevalence of intestinal helminths was among ages 6-9 years while ages 10-13 years had the least infection. The rate of helminthic infection across age group was statistically significant **(P<0.05)**. The association between gender and worm infection was statistically not significant **(P>0.05)**. Thus, the prevalence of intestinal helminths was not sex-dependent in this study .The results showed low prevalence of intestinal parasites among pupils in the study area due to improved socio-economic facilities, sanitation and hygiene level which remain the major contributing factors responsible for the prevalence of intestinal parasites. Therefore, evaluation should be a continuous exercise in respect of the region to minimize morbidity and mortality among pupils.

Keywords: Prevalence, Intestinal Helminths, Oyo Senatorial Districts, Oyo State

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1. INTRODUCTION

Intestinal helminths are multicellular pathogens that affect a vast number of hosts comprising human and animal. The infection caused by helminths ranges from mild to chronic diseases that result in high morbidity and in some cases mortality (Crompton and Nesheim, 2002). At least one third of the world's population is estimated to be affected by intestinal parasites chronic infection and the prevalence varying from one country to another and sometime one area to another in the same country (WHO, 2006). There are a lot of helminths that infects human intestinal tract from which *Ascaris lumbricoides* (roundworm), *Ancylostoma duodenale / Necator americanus* (hookworms), *Trichuris trichiura* (whipworm) are nematodes reported as the most common species (Cheesbrough, 2006). Infections caused by intestinal helminths are among the most common cases occurring throughout the developing world (Usip and Ita, 2017).

Intestinal helminths are known to be more common in rural areas; in the developing countries of Asia, Africa and Central America, linked to poverty and other socio-economic problems such as poor sanitation and lack of clean water supply (WHO, 1998). Infection persist and prevail in communities with poor living condition, unhygienic environment, poor water supply, inadequate health care delivery, poor literacy level and low income (Crompton, 1999 and Worknel *et al*., 2014) which in Nigeria is typical of most rural urban slums rural communities. Pupils in these communities are at greater risk of being infected soon after weaning and can be constantly re-infected for the rest of their life. The overall prevalence of helminthic infection in the world is found to be about 500 million to one billion across all age group per annum (WHO, 1987).Globally, estimated statistics revealed that 280 million children are infected with hookworm, 478 million with *Ascaris lumbricoides* and 347 million with *Trichuris trichiura* annually (Michael *et al*., 1997).

Solely in sub-Saharan Africa, 41 million school-age children were reported with hookworm infections (Albonico *et al*., 2002). In Nigeria, Nwosu, (1981); Obiamiwe and Nworsi, (1991); Uneke *et al.,*2007 and Odu *et al*., (2013a) reported high prevalence of intestinal helminths infections which have prevailed in the country due to low standard of living, poor environmental sanitation and ignorance of simple health promoting behaviours (Nwosu, 1981;Udonsi,1984). Other studies on the occurrence of intestinal helminths infections include those of Holland *et al*., (1989), Awogun *et al*., (1995) , Adeyeba and Akinlabi (2002). Some of the parasitic helminths found in some parts of Nigeria include the common roundworm *Ascaris lumbricoides*, the whipworm *Trichuris trichiura,* the hookworm *Ancylostoma duodenale* and the dwarf threadworm *Strongyloides stercoralis.*

However, the prevalence of intestinal helminths infections is of major health concern due to some predisposing factors such as poverty, hygiene level, ignorance and malnutrition with highest prevalence found in areas of poverty in the developing world. Favourable condition of the soil and continued contamination of the environment with faecal wastes are major factors contributing to the endermicity of intestinal parasites (Emmy - Igbe *et al*., 2013) while the spread is due to personal hygiene (Van *et al*., 2009).

The African Medical Research Foundation in 2007 cited poor environmental sanitation like refusal to use the latrines by young children from poor background as a major factor contributing to the prevalence and spread of intestinal helminths. In developing countries, intestinal heminthiasis is a major cause of disease burden. Children and pregnant women are the main sufferers from these parasitic infections (WHO, 2013). The groups at risk of heavy infection are school children between the ages of (0-15) years and are thus a good study group; they are grossly responsible for the contamination of the environment and transmitting the deadly infections (Albonico *et al*., 2002). The global prevalence and number of cases of intestinal helminths infection in school age children have been estimated to be Roundworm 35% (320million); Whipworm 25% (233million); Hookworm 26% (239million), others 14% (128million). The severity of the disease caused by intestinal helminths also known as Soil Transmitted Helminths (STH) has consistently been found to depend on the number of worms present per person (Crompton and Nesheim, 2002).

Intestinal parasitic worms have adverse effects on the survival, growth, general fitness and even academic performance of school children as reported by WHO (1998) and Bolaji *et al*., (2016). Pupils are at higher risk of their physical and mental development being affected. The efforts of a country to provide quality basic education could be prevented by these intestinal infections especially in Nigeria where only 70% of school age children are enrolled in primary school. There is a growing body of evidence that school-based health services such as treatment of schistosomiasis and intestinal nematode infections can be delivered at low cost and can contribute to improving children's general well-being, growth, nutritional status, cognitive ability, and school attendance. In developing countries poor people experience malnutrition and repeated infections resulting in increasing morbidity which may continue from generation to generation Cooper, (1991). Considering child survival improvements and the alarming proportion of children living beyond five years of age, attention is now focussed on the health of school age children. The public health importance of intestinal helminth infections continues due to their effects on the nutritional and immune status of infected individuals, particularly those living in the tropical and subtropical areas.

The prevention and control of these parasites are mainly by mass drug distribution. However, chemotherapy alone does not solve the problem. The role of other measures such as good sanitation and quality health education should also be considered. The success or failure of control measures may depend mainly on man's behavioural attitude and practices. Therefore, the participation of the community in active programme directed towards the improvement of their health and standard of living is of significant importance (WHO, 2006). Periodic de-worming of school children has also been instituted to curtail the problems caused by these worm infestations over the years and such programmes have been shown to improve growth and micronutrient status (Kirwan *et al*., 2009; Albonico *et al*., 2008). Intestinal parasitic infections have continued to pose serious medical and public health problem in developing countries, constituting a global health burden causing clinical mortality in 450 million people, especially in children (Arani *et al*., 2008; Odu *et al*., 2013).

Pupils are greatly exposed and highly prone to the risks of being infected and re-infected with intestinal helminths. Such risks include exposure rate to contaminated water, food and faeces. They are also known for some peculiar life styles like playing on sand, consumption of raw foods like vegetables, crustaceans, fish and meat (Montressor *et al*., 2002). These are some contributing factors responsible for the widespread of intestinal helminths infections. Pupils between the ages of 0 to15 years are a good study group and at greater risk of intestinal helminthiasis (Albonico *et al.,* 2002). Hence, there is need for continuous assessment and evaluation on the prevalence of intestinal helminths infections among pupils within these ages. Thus, a good target and study group since they belong to the groups that seem most likely at risk for constant infection and re-infection. In this study, the prevalence of intestinal helminths was investigated among pupils between the ages of 2-13 years.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in three units otherwise known as senatorial districts or zones in Oyo State between June and September 2019. Two local governments were randomly selected from each zone, 25 stool samples were collected from pupils in each Local Government Area totalling 50 samples from each zone. One hundred and fifty (150) stool samples were collected from semi urban and urban areas in the 3 senatorial units sampled. Oyo State is located in the South West geographical zone of Nigeria. Oyo State consists of 33 Local Governments Areas grouped into 3 units or senatorial districts known as Oyo Central, Oyo North and Oyo South (figure 1).

Oyo Central consists of 11 Local Government Areas which are Afijio, Akinyele, Egbeda, Ogo Oluwa, Surulere, Lagelu, Oluyole, Ona Ara, Oyo East, Oyo West and Atiba. Oyo North consists of 13 LGA which are Saki West, Saki East, Atisbo, Irepo, Olorunsogo, Kajola, Iwajowa, Ogbomoso North, Ogbomoso South, Iseyin, Irelope, Ori Ire and Itesiwaju. Oyo South consists of 9 LGA which are Ibadan North, Ibadan North East, Ibadan North West, Ibadan South East, Ibadan South West, Ibarapa Central, Ibarapa North, Ibarapa East and Ido.

The State covers a total of 28,454 square kilometers of land mass bounded in the South by Ogun State, in the North by Kwara State, in the West it is partly bounded by Ogun State and partly by the Republic of Benin while in the East by Osun State. The land-scape consist old dome shaped hills which rise gently from about 500 meters in the southern part reaching a height of about 1,219 meters above sea level in the Northen part. The State topography is of gentle rolling low in the South, rising to a plateau of about 40 meters. The State is well drained with rivers flowing from the upland in the North South direction.

Oyo State has an equitorial climate with dry and wet seasons and relatively high humidity. In this area, the dry season last from November to March while the wet season starts from April and ends in October. Average daily temperature ranges between 25^{o}C (77.0^{o}F) and 35^{o}C (99.5^{o}F) almost throughout the year. Vegetation pattern is that of rain forest in the South and guinea savannah in the North. Thick forest in the South gives way to grass-land interspread with trees in the North.

The climate in the state favours the cultivation of crops like maize, yam, cassava, millet, rice, plantains, cocoa, palm produce, cashew etc. Oyo State is homogenous has a population of about 6 million and mainly inhabited by the Yoruba ethnic group who are primarily agrarian with a predilection for living on high density urban centers. The indigenes mainly comprise the Ibadans, the Ibarapas, the Oyos, the Ogbomosos and the Oke-oguns all belonging to the Yoruba family and indigenous of Africa, South of the Sahara. Notable cities include Oyo, Ogbomoso,Ibadan etc.

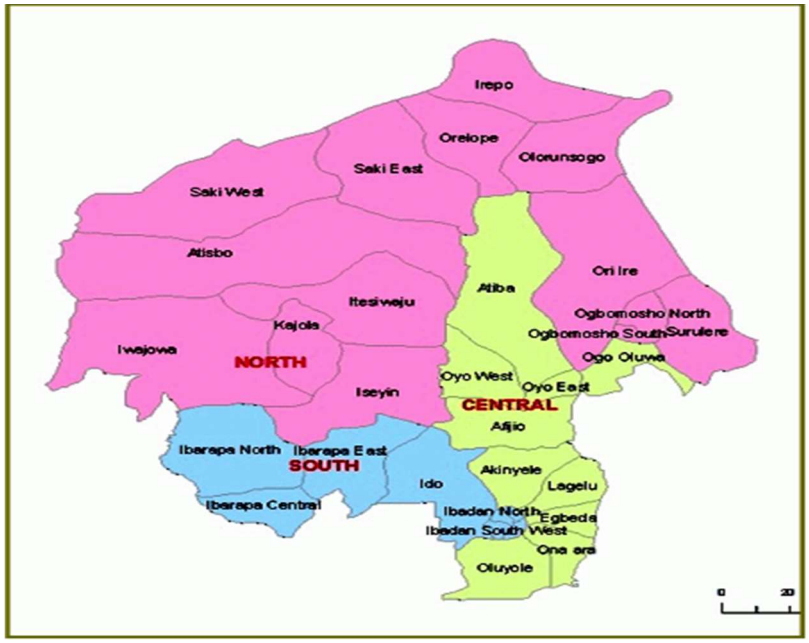

Figure 1: Map of Oyo State Showing The Three Senatorial Districts And Local Government Areas. Source: http//www.oyostate.gov.ng

2.2 Selection and Collection of Sample

150 male and female pupils between the ages of 2 to 13 were randomly selected and examined for the presence of intestinal helminths in the 3 units.50 pupils were selected from each unit and 25 from each Local Government Area. A total of 150 pupils were selected and sampled at the end of four months in semi urban and urban areas from the three senatorial zones. Participation was voluntary after obtaining Ethical approval from Ministry of Education. Prior to sample collection, permission or consent was obtained from the head of schools, parents and guardians of participants in sampled area through formal letter obtained from the Department of Medical Microbiology and Parasitology, College of Health Sciences, Ladoke Akintola University of Technology, Osogbo. Verbal consent was also obtained from each participant parent or guardian. Instructions were also given on the sample collection. Fresh faeces were collected into clean, dry, leak-proof universal sample bottles with spoon lid which was given to the selected volunteers. The bottles were labelled with identification number, the pupil's name, age and sex.

At the end of the exercise, the identification number, age and sex of the selected pupils were recorded. Pupils were advised to use the specific method by World Health Organisation. (The faeces were to be passed on a clean paper first before scooping a little scrap of it into the sample bottle using the spoon attached to the lid of the bottle or a clean dry stick and the bottle properly tightened).

2.3 Examination of Faecal Sample

Freshly collected faecal specimens were examined in Microbiology Laboratory, Department of Biological Sciences, Ajayi Crowther University, Oyo, Oyo State. The samples were examined using direct technique which involves macroscopic (reporting the appearance and consistency) and microscopic examination of the stool samples. Macroscopic examination was carried out on each stool specimen to detect the presence of parasitic eggs, larvae, segments, the consistency, colour, presence of blood, mucus and or pus in the sample.

Stool microscopic examination using direct wet mount method WHO (1994). A drop of fresh physiological saline was placed on one end of a clean slide and a drop of iodine solution on the other end avoiding too large a drop of each. Using a piece of clean applicator stick, small portion of each faecal sample(about 2mg) was well mixed with the saline and same amount with the iodine ensuring smooth thin preparation and covered with a cover glass. The entire slide preparation was examined under the microscope using first, the 10x objective with the condenser iris sufficiently closed to give good contrast followed by 40x objective to detect and identify the eggs and larvae. The type of intestinal parasite(s) seen was recorded. Other methods include Sedimentation method using formol-ether concentration technique.

To concentrate parasites in faecal samples using formol-ether concentration technique, about 1g of the stool sample mixed with physiological saline is taken with an applicator stick into a screw-cap bottle containing 4ml of 10 % formol water. The bottle was well capped and mixed by shaking for about 20 seconds. Thereafter, the faeces were sieved, and the sieved suspension collected in a beaker. The suspension was transferred to a glass tube and 3 ml of ether was added. The tube was stoppered and mixed by shaking for one minute. Thereafter, the stopper was removed and centrifuged immediately at 3000 rpm for one minute.

After centrifuging, four layers were evident; the top layer of ether, thin layer of debris, formalin, and sediment in bottom with parasites. An applicator stick was used to loosen the layer of faecal debris from the side of the tube. The ether, debris and formalin were then carefully poured off. The sediment was mixed, transferred to a clean slide and covered with a cover glass. The slide was examined under the microscope using first, the 10x objective followed by 40x objective to detect and identify the eggs of parasites (Ash and Orihel, 1997). Intestinal parasite(s) detected and identified were recorded. The number, age and sex of pupils infected with intestinal helminths and the type were also recorded.

3. RESULTS

The overall prevalence rate of 9.3% was recorded in the study area. Two parasites namely *Ascaris lumbricoides* 6.7% and Hookworm 2.0% were isolated. The single infection gave prevalence of 8.7% while the multiple or co-infection was 0.6%. Semi urban study area namely Oyo central and Oyo north having prevalence rate of 14.0% and 8.0% respectively while urban study area, Oyo south had prevalence rate of 6.0% (Table 1).

In Table 2, Oyo East Local Government Area (LGA) had the highest prevalence of 16.0% followed by Atiba LGA and Ogbomoso South LGA with the prevalence of 12.0% while the least infection was observed in Ogbomoso North LGA and Ibadan South West LGA with prevalence of 4.0%. Table 3 shows that infection rate was higher among female 11.1% (6/72) than male 7.7% (6/78) but not statistically significant (P= 0.52). Also, the age group 6-9 years had the highest infection rate of 17.3% followed by age group 2-5 years with infection rate of 7.3% while the pupils in age group 10-13 years being the least infected (3.5%).

Table 1: Prevalence of Intestinal Helminths Infections among Pupils in Semi Urban and Urban Areas in Oyo Senatorial Districts.

1			Intestinal Helminths Prevalence (%)					Non Helminths	P – value
			Single infection			Double Infection			
Study Area	Sample setting	No. Examined	*A. lumbricoides*	Hookworm	No. Infected	*A. lumbricoides* + Hookworm	Total Number Infected	*E. histolytica*	P > 0.05
Oyo Central	Semi Urban	50	5(10.0)	1(2.0)	6(12.0)	1(2.0)	7(14.0)	1(2.0)	
Oyo North	Semi Urban	50	3(6.0)	1(2.0)	4(8.0)	0	4(8.0)	0	
Oyo South	Urban	50	2(4.0)	1(2.0)	3(6.0)	0	3(6.0)	0	
Total		**150**	**10(6.7)**	**3(2.0)**	**13(8.7)**	**1(0.7)**	**14(9.3)**	**1(0.7)**	

Table 2: Prevalence of Intestinal Helminths Infections among Local Government in Oyo Senatorial Districts.

Senatorial District	Local Government Area	Sample setting	No. Examined	Intestinal Helminths Prevalence (%)					Non Helminths
				Single infection			Double Infection		
				A. lumbricoides	Hookworm	No. Infected	*A.lumbricoides* + Hookworm	Total Number Infected	*E. histolytica*
Oyo Central	Oyo East	Semi Urban	25	3(12.0)	0	3(12.0)	1(4.0)	4(16.0)	0
	Atiba	Semi Urban	25	2(8.0)	1(4.0)	3(12.0)	0	3(12.0)	1(4.0)
Oyo North	Ogbomoso North	Semi Urban	25	1(4.0)	0	1(4.0)	0	1(4.0)	0
	Ogbomoso South	Semi Urban	25	2(8.0)	1(4.0)	3(12.0)	0	3(12.0)	0
Oyo South	Ibadan South-west	Urban	25	0	1(4.0)	1(4.0)	0	1(4.0)	0
	Ido	Urban	25	2(8.0)	0	2(8.0)	0	2(8.0)	0
	Total		**150**	**10(6.7)**	**3(2.0)**	**13(8.7)**	**1(0.7)**	**14(9.3)**	**1(0.7)**

Table 3: Prevalence of Intestinal Helminths in Relation to Age and Sex among Pupils in Oyo Senatorial Districts.

		Male		Female		Total		P-value for age	P-value for sex
S/N	Age range	No. Examined	No. Infected (%)	No. Examined	No. Infected (%)	No. Examined	No. Infected (%)		
1.	2-5	25	2(8.0)	16	1(6.3)	41	3(7.3)	P <	P >
2.	6-9	30	3(10.0)	22	6(27.3)	52	9(17.3)		
3.	10-13	23	1(4.3)	34	1(2.9)	57	2(3.5)	0.05	0.05
	Total	78	6(7.7)	72	8(11.1)	150	14(9.3)		

4. DISCUSSION

The prevalence of intestinal helminths observed among pupils in the semi urban and urban areas in this study is generally low when compared to the results obtained by Ojurongbe *et al.,(* 2014) and Worknel *et al.,* (2014) who recorded a prevalence of 46.3% in Ile Ife and 83.4% in Ethiopia respectively, but conforms with the reports of Nwaneri and Omuemu, (2012) which reported a prevalence of 20.7%. Variability of the occurrence rate of intestinal parasites depends on the location under study.

A major factor enhancing the spread of intestinal helminth infections and other parasitic diseases is poor socioeconomic environment (WHO, 2002). Some human unhygienic practices such as defecating indiscriminately at nearby bushes, underneath bridges, along bush tracks, motor highways, river banks and even on open fields in the 1980s (Nwosu 1981; Adeyeba and Dipeolu 1984) have not changed much in Nigeria (Holland and Asaolu 1990). Many houses still lack lavatory facilities and public latrines (Nwosu 1981; Adeyeba and Dipeolu 1984).The poor drainage systems, often blocked by refuse contributes tremendously to the widespread of ova and larvae of these helminths (Obiamiwe 1977). Some cultural practices favour the spread of most intestinal parasitic infection such as the use of water for cleaning after defecation, a common practice among the Yorubas in Southwest Nigeria.

Poor personal hygiene such as poor hand washing practices and keeping dirty nails was found as contributing factors to faecal transmission of intestinal helminths. Majority of the country is warm and moist for most of the year creating a good environment for the parasites to develop all year round (Obiamiwe 1977. All these till date remain factors influencing the prevalence of intestinal heiminths in most communities in Nigeria. Low level of education and poor socio-economic status of parents are also associated with helminthic infection in children (Nwosu, 1981). Thus, helminthic infections are still diseases of poverty in Nigeria. Adekunle *et al* (2002), found a higher prevalence of helminthic infections in children whose parents are unemployed or petty traders, compared to children of professionals and middle class workers. Hence, the relatively lower prevalence of helmintic infections observed in the study area is not unexpected. This could be attributed to better socio economic environment, improved sanitation and access to good health services for these pupils.

Parasitic diseases prevail and persist in rural areas due to low income, literacy level and low sanitary conditions. *Ascaris lumbricoides* had the highest prevalence with 10(6.7 %) pupils infected, followed by hookworm 3(2.0 %) as shown in Table 1. This is consistent with the reports of Taiwo and Agbolade (2000) which showed *A. lumbricoides* as the most prevalent parasite (66%) among school children in Oru, Ogun State, also in the studies of Adeyeba and Akinlabi (2002), Asaolu, 2002, Sam-Wobo and Mafiana, 2006 but disagrees with that of Nwaorgu *et al*., (1998). Also contrary to this result, hookworm was revealed as the most prevalent helminth by Suswan *et al*., (1992) and Anosike *et al*., (2006). The high prevalence of *A. lumbricoides* infection may be attributed to poor sanitation and the level of unhygienic practices among the pupils infected which could enhance transmission. The highest prevalence of intestinal helminth infections (14.0%) observed in Oyo central comprising single infection (12.0%) and co-infection (2.0%) may be attributed to regional factor and their level of exposure to parasitic infections. Single non-helminth infection (2.0%) with *Entamoeba histolytica* was also observed in Oyo central.

Out of the total number infected in the study area, 7(50%) observed in Oyo central may be caused by poor environmental sanitation and unhygienic practices of pupils in the location. Next to Oyo central is Oyo north with 4(29%) infected and the least is Oyo south with 3(21%) infected. The variances in the different districts sampled could be related to the environmental factors practiced in the various locations. The probability value **(**$P > 0.05$**)** shows that there is no association between regions and rate of helminthic infection. Therefore, the region within the study area does influence the occurrence of infection.

In this study, ages 6-9 of both sex had the highest prevalence of intestinal helminths infections with 9(17.3%) with that of female 6(27.3%) higher than male 3(10.0%). At this ages (6-9 years), close monitoring of children by their parents is reduced which makes them less dependent for their personal care and prone to the risks of being infected such as their exposure rate to contaminated food, water, soil and faeces .In most studies, the bulk of worm burden has been observed and reported to be harboured by children within this age range (Nwosu 1981; Adeyeba and Dipeolu 1984). This study however shows pupils within the ages of 10-13years to be the least infected probably because at this age, education on the need for proper personal hygiene has been impacted and they are more conscious of their health than the other age groups.

That some of them were infected could be attributed to outdoor activities as had been suggested by Ozumba and Ozumba (2002) who in their study reported the highest rate of infection in age 12-17 teenagers relating it to their outdoor activity. bThe lower prevalence rate of intestinal helminthic infection among pupils between 2-5 years of age is contrary to the findings of Ekpenyong and Eyo (2008) who from their findings reported that children between the ages of 4 and 6 had the highest incidence of *A. lumbricoide*s infection and explained this to be due to an under developed immunity to parasitic infection. It would however be expected that at the age of 2 to 5, parents still monitor and restrict the outdoor activities of this age group as well as being active in taking care of their personal hygiene. At this age range, exposure to soil contaminated faeces is minimal. The rate of helminthic infection across age group is statistically significant ($P < 0.05$). Therefore, there is relationship between age group and helminthic infection.

In addition, female were infected more than male but statistically there is no relationship between sex and the prevalence of worm infestation. There was equal level of exposure to intestinal helminths by both sexes. Therefore, the association between gender and worm infection is statistically insignificant. This shows that the resultant prevalence of intestinal helminths was not sex-dependent, which disagrees with the reports of Ekpenyong and Eyo (2008) who in their studies suggested that the prevalence of worm infections were sex dependent.

5. CONCLUSION

Intestinal helminthiasis exists among pupils in semi urban and urban areas in Oyo senatorial districts with low prevalent rate. Despite the low prevalence, the economic implications and public health necessities of these finding should not be neglected. Considering the public health importance of intestinal helminths infections, adequate preventive and control measures need to be undertaken and maintained among pupils in schools, hospitals and communities in the affected area. This include periodic sensitisation of parents and pupils through proper health education, chemotherapeutic control of intestinal helminthiasis among pupils through existing periodic de-worming exercise by government or private bodies and economic development through good sanitation, improved water supply, poverty eradication and socio-economic status.

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