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PREVALENCE OF INTESTINAL PARASITES AND ASSOCIATED RISK FACTORS AMONG PRIMARY SCHOOL CHILDREN IN UYO AKWA IBOM STATE, NIGERIA

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ABSTRACT

Intestinal parasitic infections have become a global public health, and this burden is even higher among children in primary schools. Therefore, the study aims to determine the prevalence and associated risk factors of intestinal parasitic infection among primary school children in both public and private schools in Uyo urban was investigated. A cross sectional parasitological study consisting of 2000 school children 1000 each from five private and five public primary schools was carried out in Uyo metropolis. Structured questionnaire was used to obtained data on associated risk factors of intestinal parasitic infection. Microscopic examination of stool specimen of children by wet mount and formol either concentration technique was used for parasitological analysis of faecal samples. The results implicate poor toilet facilities, contamination of sources of drinking water, poor environmental sanitation and children attitude of playing bare footed and poor personal hygiene as the major risks factors. The overall prevalence of 952 (47.6%) was recorded with 342 (34.2%) from private school and prevalence of 610 (61.0%) from public school out of 1000 pupil examined from each group of schools. The most dominance parasites were *Ascaris lumbricoides* (10.5%) *Guardia intestinalis* (8.9%) *Ancyclostoma duodenales* (8.9%) *Entamoeba histolystica* (10.5%) *Trichuris trichuira* (10.9), *E coli* (3.0%) *Enterobius vermicularis* (2.4%) and *Strongyloides stercoralis* (2.1%). There was corresponding decrease in infection rate as the age increase. There is an urgent need for government and school authorities to create and maintain better sanitary and toilet facilities in school.

KEYWORDS: Risk Factors, Prevalence, Intestinal Parasite, School Children, Environmental Sanitation

INTRODUCTION

Intestinal parasitic infections have become a global public health burden and this burden is even higher among children in urban centres especially in developing countries. The consequences of intestinal parasitic infection among children includes stunted growth, iron deficiency *anaemia*, reduced hemoglobin. The deficiency, impaired cognitive functions and learning ability. The large population of school children in Akwa Ibom State are living in areas where the parasites are extensively transmitted and are therefore in need of treatment and prevention interventions (Usip *et al*., 2017; Atting et al., 2016).

Medical helminthology is concerned with the study of parasitic worms. They are responsible for an enormous burden of infection throughout the world and they are threat to human health. Soil-transmitted helminth infections are among the most common infections worldwide and affect the poorest and most deprived communities. Latest estimates indicate that more than 880 million children are in need of treatment for these parasites (WHO, 2014). Insub-Saharan Africa, intestinal helminths are the most common disease with a very higher negative public health and socio-economic impacts (Enimen *et al*., 2014).

Parasitic helminths are endemic in Nigeria, due to poor environmental sanitation, pollution, and contamination of water and soil. Children in Nigeria are highly exposed and very vulnerable to these infections (Usip and Afia, 2017; Damen *et al*., 2011a; Damen *et al.,* 2011b). In rural and sub-urban settlements in Nigeria. Intestinal helminthes have been a major problem. This is as a result of their poor socio-economic status and poor sanitary facilities (Usip and Ita, 2017).

Intestinal parasitic infections caused by soil-transmitted helminthes are pernicious and are among the ten most common infections in the world. The world health organization (WHO) estimated that 270 million pre-school and over 600 million school children in developing countries are living in areas where the parasites are extensively transmitted and are therefore in need of treatment and prevention interventions (WHO, 1991).

Intestinal parasite adheres to fingers, fruits, vegetables, instruments, door handles and money. They can also be transmitted by flies. However, their adherences to fingernails are salient sources of infection. Hence, the presence of intestinal parasites in the fingernails is an indication of one of the routes of transmission of the parasite, it is a pointer to the presence of an active infection or a source of parasitic infection. It is also an indication of poor personal hygiene associated with children from rural areas. Such children present a potent source of transmission to the larger community through sharing of common equipment in school, playing with one another and outright autoinoculative by means of finger biting and sucking, common among children of such age (Usip and Ita, 2017).

However, life cycles of nematodes are complicated and closely related with mode of transmission in to the Human body. An in-depth knowledge of their cycles is important clinically for prevention and treatment. There are three main modes of transmission. Nematodes such as E*nterobius vermicularis* are transmitted directly from infected person to non-infected person. While ova of the species such as *Ascarislumbricoides, Necator americanus* and *Ancylostoma duodenale* mature in soil and subsequently the adult nematode infect human beings (Anderson and May, 1985). In Nigeria intestinal helminth infections have continued to

prevail because of poor standards of living, poor environmental sanitation and ignorance of simple health promoting behaviours (Usip *et al*., 2017; Nwosu, 1981; Udonsi, 1984). Intestinal helminth infections are most common in school age children and they tend to occur in high intensity in this age group (Albonico *et al*., 2002). These infections have been associated with an increased risk for nutritional anaemias, protein-energy malnutrition and growth deficits in children (Sackey *et al*., 2003). Several environmental and socio-economic factors have been identified to be responsible for the continued persistence of intestinal parasite infections in children. Some of these include poor sanitary conditions, unhygienic practices, absence of potable water, poor housing facilities and poverty (Edungbola and Obi, 1997; Nwoke, 2004). In view of the negative socio-economic impact of these parasitic infections in children, there is a need for the development of good preventive and control measures adaptable for the tropics. For this to be effectively achieved there is a need to constantly generate baseline data on the occurrence of parasitic infections in different areas. The aim of the study was to determine the prevalence of intestinal infections and associated risk factors among school children in some primary school in Uyo capital city of Akwa Ibom State.

MATERIALS AND METHODS

Ethical Clearance

In fulfillment of the requirements of the nature of this study, ethical clearance was sought and obtained by the researcher from Ministry of Health, Akwa Ibom State. The objectives of the study were explained to the school teachers and students at the time of sample collection. They were also briefed on the impact of helminthes, mode of transmission and related issues at the time. Prior to sample collection, informed consent was sought from the school directors.

Study Area

The study was conducted in Uyo (Figure 1), Akwa Ibom State of Nigeria.

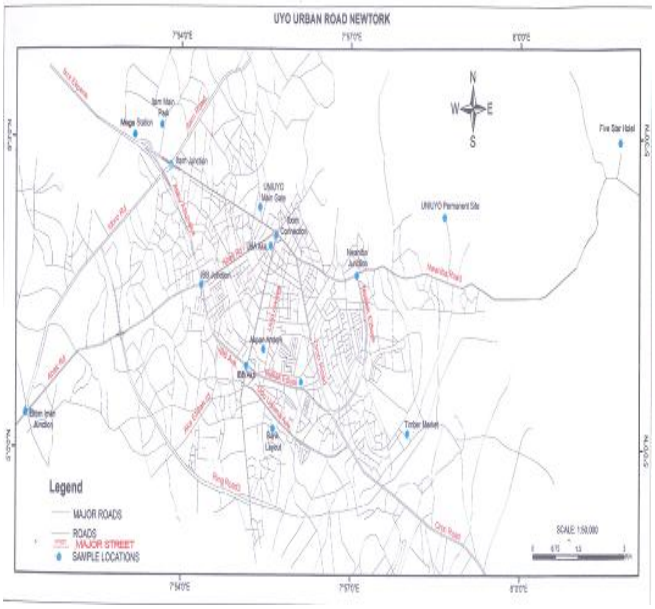

Figure 1: Map of Uyo Metropolis

The area was divided into five sections with major roads of Oron, Aka, Ikot Ekpene, Abak Roads, and Willington Bassey Way, belonging to different sections and forming the boundaries from where samples were drawn. Geographically, the state is one of the core Niger Delta states and is in the south-south geopolitical zone. The state lies between latitudes 4º 31′ and 5º 31′ North and longitudes 7º 35′ and 8º 25′ East. It has a total land mass estimated at 7,245,935 km. The state has common borders with Cross River State to the East, Abia States to the West, it is bounded on by the Atlantic Ocean by the south. It is made up of 31 local government areas with Uyo as the state capital.

Akwa Ibom State has a population figure of 3,920,208 with males being 2,044,510 and females as 1,875,698 and population density of 587. (FRN, Gazette, 2007, NPC Estimates 2009). The climate of Akwa Ibom State can be described as tropical rainforest zone. The months of May to October is characterized by heavy
rainfall (Rainy season) while the months of November - April is the dry season period with more sun and intermitted at rain that may be noticed. Annual rainfall ranks among the highest in the agro ecological zone with 2000mm in the hinterland and 2400mm along the coast.

Method of Sampling

A two-stage sampling procedure was adopted in selection of the sample. In the first stage a purposive sampling technique was used to select ten primary schools, five public and five privates located in the Uyo metropolis using the Ibom Plaza as a focus or starting point based on a recognizance survey. A complete list of all the Primary/Nursery Schools located in the five major axis of Uyo metropolis demarcated by roads was drawn up. This list was made up of both government and owned private Primary/Nursery Schools in the Uyo. The government and private owned schools was separated into 2 clusters for sampling.

In the first stage, cluster sampling procedure was applied where (one) 1 school each from the government and private cluster was randomly selected. This resulted in a total of five schools each from the two clusters giving a total of 10 schools.

In second stage, one stream each from the selected school was randomly picked resulting in 5 classes (irrespective of the streams), this gave a total of 25 classes. In the 3rd stage, 10% of the pupils from each class were randomly selected. Ideally, a class contains 25-30 pupils. Therefore, an average of 25 pupils per class was selected, the sample size was estimated at = 1250. The sampling frame of this study were primary schools located at the five major axis of Uyo metropolis demarcated by the major roads.

Method of Data Collection

Two types of data were collected. A pre-tested questionnaire which was developed and modified based on known potential risk factors, was used to gather demographic, socio-economic and behaviour data. During the time of interview, children were also checked for condition of their finger nails. Interview questionnaire were administered to the children in their mother tongue. Finally, accuracy and

completeness of all the questionnaires were checked at the end of each data collection day. Prior to stool sample collection, children were guided on how to bring their stool sample not to mix with soil and urine. Then immediately after interview, each child was provided with a dry, clean and leak proof stool cup, labeled with the identification number of each child and applicator stick. Samples were preserved in 8ml of 10% formalin solution, and transported to the micro-biology and parasitological laboratory of the Department of Animal and Environmental Biology, University of Uyo, Uyo.

Laboratory Analysis
Two different types of laboratory analysis were used:

Microscopic Examination (Saline and iodine Preparation)
A drop of the mixture of the swabbed sample with normal saline was transferred, using a sterile plastic Pasteur pipette to the centre, cleaned grease free slide and carefully covered with a clean slide cover at an angle of 45^0 to avoid air bubbles and over flotation. Direct microscopic examination of samples for ova of helminthes/trophozoites of protogen were carried out using x10 and x40 objectives respectively (Ukaga *et al*., 2002). This method was repeated with iodine preparation.

Formol-Ether Concentration Technique
In order to concentrate the parasites in the faeces, formol-ether concentration technique was employed. Using a stick about 1g of the faeces mixed with physiological saline was put in a screw-cap bottle containing 4ml of 10% formol water. The bottle was capped and mixed by shaking for about 20 seconds. Thereafter, the faeces were sieved, and the sieve suspension collected in a beaker. The suspension was transferred to a tube and 3ml of ether was added. The tube was stopped 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 slide and covered with a cover glass. The slide was examined under the microscope using first, the 10x objective followed by 40x objective to identify the eggs the number of pupils infected with intestinal parasites and the type of intestinal parasite observed were recorded.

Identification of Parasites
The egg/larvae of helminthes and the protozoa trophozoite were identified using the pictural key and identification guide provided in the atlas of microbial helminthology and protozoology (Arora and Arora, 2010; Jeffrey and Leach, 1976).

Data Analysis
The prevalence of parasites was presented as descriptive statistics while the relationship between several variables and the presence of parasites was determined by the chi square test. $P<0.05$ was considered significant at 95% confidence interval. Data analysis was performed with the aid of Statistical Programme for Social Science (SPSS) version 18.0. The mean, Standard Deviation (SD) and Coefficient of Variance (CV), which reflects spatial variability of the numerical parameter values from the intestinal parasitic infections' information collected was computed and presented in tables and figures.

RESULTS AND DISCUSSION

Results
The result of the overall prevalence of intestinal protozoa and helminthes infection among school children in Uyo showed that out of 2000 primary school children examined 952(47.6%) were infected with parasites. Of the total number infected 370(18.5%) were infected with protozoa parasites and 582(29.1%) were infected with helminth parasites. There was a significant difference ($p < 0.05$) in prevalence of parasitic infection between protozoan and helthminth infection. The protozoa encountered were *Entamoeba histolystica* 132(6.6%), *Guardia intestinalis* (8.92) and *Entamoeba coli* 60(3.0%) (Table 1).

Table 1: The prevalence of intestinal protozoa and helminthes infection among school children in Uyo, Akwa Ibom State, Nigeria.

Parasites	Number Examined	Number Infected	Prevalence
A-Protozoa			
Entamoeba histolytica despair	2000	132	6.6
Grardia intestinalis	2000	178	8.9
Entamoeba coli	2000	60	3.0
	Subtotal	370	18.5
B – Helminth			
Ascaris lumbricoides	2000	210	10.5
Strongiloides Stercoralis	200	42	2.1
Trichuris trichiura	2000	104	5.2
Ancylostoma duodenale	2000	178	8.9
Enterobius vermicularis	2000	48	2.4
	Sub Total	582	29.1
Total	2000	952	47.6

$$x^2 = \sum \frac{(oj - ej)^2}{ej}, x^2 = 252.84, \quad df = 7, \quad p < 0.0001$$

The p-value is < 0.00001. The result is significance at $p < 0.05$.

The helminths parasite received were *Ascaris lumbricoides* 210(10.5%), *Strongiloides stercoralis* 42(2.1%) *Trichuris trichiuara* 104(5.22) *Ancyclostoma duodenale* 178(8.9%) and *Enterobius vermicularis* 48(2.4%). Thus, *Guardia intestinalis* had the highest level of infection (8.9%) among the protozoa and *Entamoebacoli* had the lowest 3.0%.
However, among the helminths parasite *Ascaris lumbricoides*, had the highest level of infection 10.5% to the least was *Strongyloides stercoralis* 42(2.19%).
The results in Figure 2 shows the distribution of the prevalence of parasite species spectrum; *Ascaris*

lumbriocoides had the highest prevalence of (22.06%) followed by *Ancylostoma duodonales* and *Guardiaintestinalis* with a prevalence of 18.7% each, while *Strogyloides stercoralis* had the least prevalence of infection (2.1%).

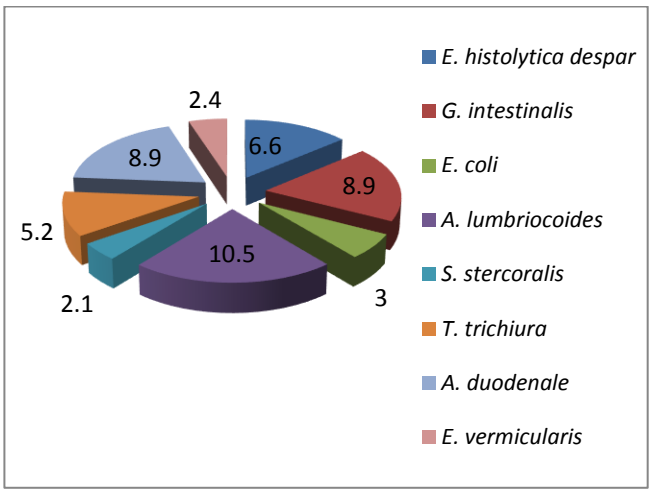

Figure 2: Prevalence of Parasite species spectrum among Primary School Pupils in Uyo Metropolis

From the result in Table 2a, Public school had the highest prevalence of infection 610(61.0%) than private school 342(34.2%) out of 1000 people examined from each group. The prevalence of intestinal parasitic infections in public school revealed that QIC Oku Group School 144(72.0%) had the highest prevalence of parasitic infections followed by St Georges Primary School 138(69.%), St. Patrick Primary School 134(67.0%), Methodist Primary School 114(57.0%), Christ the King primary School had the least prevalence of 80(40.0%).

The result to table 2b from the private school revealed a corresponding lower prevalence when compared with these of public school. Thus, Okonee Nursery/Primary School lead with the prevalence of parasitic infection of 92(46.0%), followed by Jevic Nursery/Primary School and Hillside Nursery/Primary School which recorded a prevalence of infection of 72(36.0%) each Christ the King Primary School has 64(32.0%) while Uniuyo Staff School had the least 42(21.0%)

There was prevalence of parasites infection of all the parasites species in all the public school except for *E. coli* which was absent in Christ the King Primary School. Similarly, among the private school only Uniuyo staff school recorded zero level of infection for*E.coli* and *S. stercoralis*. However, there was a significant prevalence ($p < 0.05$) of infection in public schools than in private schools.

Figure 3 indicates the comparative prevalence rate of parasitic infection among 1000 primary school children in each of public and private school, examined; Qua Iboe Nursery School (72.0%) had highest prevalence rate among the public school while Okonee Nursery/Primary School (46.0%) was highest among private schools' category. These were closely followed by St. Goregies Primary school (69.0%) and Jevic/Hillside Nursery/Primary School bracket (36.0%) in the public and private school respectively while Christ the King Primary School (40.0%) and Uniuyo Staff School (21.0%) had the least prevalence of infection in public and private schools respectively.

Table 3 revealed that age group 3-4 years 299(62.3) had the highest prevalence of intestinal parasitic infection while the age group 11-12 years had the least prevalence of 79(32.92%). The prevalence rate decreases with increase in age. There was a significant prevalence ($p < 0.05$) of infection in relation to the ages of the children.

In Table 4, out of 2000 people sampled, 880 were males and 1120 were females out of 880 males examined, 48.3(54.89%) were infected and out of 120 females examined, 469(41.88%) had the infection. There was no significant difference ($p < 0.05$) between the prevalence of infection with bias to age. The parasitic specific prevalence of infection in males were 70(14.49) had. *Entamoeba histolystica* infections, 88(18.22%) had *Guardiaintestinalis*, 35(7.25%), *E. coli* 108(22.36) *Ascaris lumbricoides* 22(4.55%) *Strongyloides stercoralis Trichuris trichuria* 48(9.94%) *Ancyclostoma duodenales* 84(17.39%) and *Enterobius vermicularis* 28(5.80%). Out of 1120 females examined, 62(13.22%) had *Entamoeba histolystica* infections, others prevalence were *G. intestinalis* 90(19.19%), *E. coli* 25(5.33%) *Ascaris lumbricoides* 102 (21.75%), *strogyloides stercoralis* 20(4.26) *T. trichuria* 56(11.94%) *A.duodonale* 94(20.04%) and *Enterobius vermicularis* 20(4.26%).

Table 2a: Prevalence of Intestinal Parasite in Public School

Name of Public school	**No Examined**	**No (%) Infected**	***E. histolystica***	***G. Intestinalis***	***E. coli***	***A. lumbricoides***	***S. stercoralis***	***T. trichiura***	***A. duodenale***	***E. Vemicularis***
St. Patrick Primary Sch.	200	134(67.0%)	16(8.0%)	24(12.0%)	8(4.0%)	31(15.5%)	7(3.5%)	16(8.0%)	26(13.0%)	6(3.0%)
St. Georges Primary Sch.	200	138(69.0%)	18(9.0%)	26(13.0%)	14(7.0%)	24(12.0%)	6(3.0%)	18(9.0%)	28(14.0%)	4(2.0%)
QIC Oku Group Sch.	200	144(72.0%)	18(9.0%)	28(14.0%)	16(8.0%)	19(9.5%)	7(3.5%)	18(9.0%)	30(15.0%)	8(4.0%)
Methodist primary sch.	200	114(57.0%)	15(7.5%)	24(12.0%)	2(1.0%)	23(11.5%)	5(2.5%)	13(6.5%)	25(12.5%)	7(3.5%)
Christ the King Primary School	200	80(40.0%)	10(5.0%)	20(10.0%)	0(0%)	17(8.5%)	3(1.5%)	7(3.5%)	18(9.0%)	5(2.5%)
Total	1000	610(61.0%)	77(38.5%)	122(61.0%)	40(20.0%)	114(57.0%)	28(14.0%)	72(36.0%)	127(63.5%)	30(15.0%)

$x^2 = 22.23$, df = 4, P-value = 0.0001804. The p-value is 0.000171. The result is significant at $p < 0.05$

Table 2b: Prevalence of Intestinal Parasite in Private School

Name of Public school	No Examined	No (%) Infected	*E. histolystica*	*G. Intestinalis*	*E. coli*	*A. lumbricoides*	*S. stercoralis*	*T. trichiura*	*A. duodenale*	*E. Vemicularis*
Okonee Nur./ Pri. School	200	92(46.0%)	14(7.0%)	15(7.5%)	8(4.6%)	25(12.5%)	5(2.5%)	8(4.0%)	12(6.0%)	5(2.5%)
Jevic Nur./Pri. Sch.	200	72(36.0%)	12(6.0%)	11(5.5%)	3(1.5%)	25(12.5%)	2(1.0%)	6(3.0%)	9(4.5%)	4(2.0%)
Hillside Nur./ Pri. School	200	72(36.0%)	11(5.5%)	13(6.5%)	7(3.5%)	9(4.5%)	5(2.5%)	8(4.0%)	13(6.5%)	6(3.0%)
Christ the King Nur./Pri. Sch.	200	64(32.0%)	10(5.0%)	11(5.5%)	2(1.0%)	21(10.5%)	2(1.0%)	6(3.0%)	10(5.0%)	2(1.0%)
Uniuyo Staff School	200	42(21.0%)	8(4.0%)	6(3.0%)	0(0%)	16(8.0%)	0(0%)	4(2.0%)	7(3.5%)	1(0.5%)
Total	1000	342 (34.2%)	55(27.5%)	56(28.0%)	20(10.0%)	77(38.5%)	14(7.0%)	32(16.0%)	51(2.5%)	18(9.0%)

$x^2 = 27.17$, df = 4, P < 0.00001836. The p-value is 0.0000788, the result is significant at $p < 0.05$

Table 3: Prevalence of Intestinal Parasite Infection in Relation to Age group

Age Group	No Examined	No (%) Infected	*E. Histolystica*	*G. Intestinalis*	*E. coli*	*A. lumbricoides*	*S. stercoralis*	*T. trichiura*	*A. duodenale*	*E. Vemicularis*
3-4	480	299(62.3%)	42(8.75%)	58(12.08%)	18(3.75%)	66(13.75%)	14(2.92%)	32(6.67%)	55(11.46%)	14(2.92%)
5-6	460	239(51.96%)	36(7.83%)	45(9.78%)	14(3.04%)	56(12.17%)	10(2.17%)	25(5.43%)	42(9.13%)	11(2.39%)
7-8	430	187(43.4%)	25(5.81%)	35(8.14%)	12(2.79%)	40(9.30%)	8(1.86%)	23(5.34%)	34(7.91%)	10(2.33%)
9-10	390	148(37.95%)	20(5.13%)	28(7.18%)	10(2.56%)	30(7.69%)	6(1.54%)	17(4.35%)	29(7.44%)	8(2.05%)
11-12	240	79(32.99%)	9(3.75%)	12(5.0%)	6(2.5%)	18(7.5%)	4(1.67%)	7(2.90%)	18(7.5%)	5(2.08%)
Total	2000	952(47.6%	132(6.6%)	178(8.9%)	60(3.0%)	210(1.05%)	42(2.1%)	104(5.2%)	178(8.9%)	48(2.4%)

$x^2 = 149.029$, df = 4, P < 0.00001. The result is significant at $p < 0.05$

Table 4: Prevalence of Intestinal Parasite Infection in Relation to Sex

Sex	No Examined	No (%) Infected	*E. histolystica*	*G. Intestinalis*	*E. coli*	*A. lumbricoides*	*S. stercoralis*	*T. trichiura*	*A. duodenale*	*E. Vemicularis*
Male	880	483(54.89)	70(14.49)	88(18.22)	35(7.25)	108(22.36)	22(4.55)	48(9.94)	84(17.39)	28(5.80)
Female	1120	469(41.88)	62(13.22)	90(19.19)	25(5.33)	102(21.75)	20(4.26)	56(11.94)	94(20.04)	20(4.26)
Total	2000	952(47.6%)	132(13.87%)	178(18.7)	60(6.30%)	210(22.05%)	42(4.41%)	104(10.92%)	178(18.7%)	48(5.04%)

$x^2 = 0.206$, df = 1, P < 0.6500141. The p-value is 0.649921. The result is not significant at $p < 0.05$

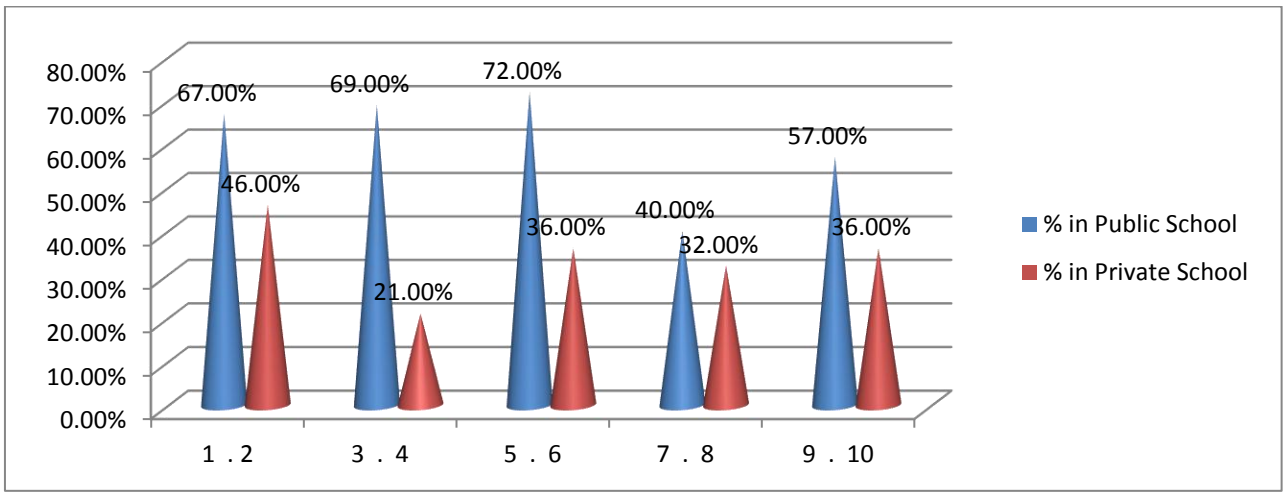

Figure 3: Comparative Prevalence Rate of Intestinal Parasites among Primary School Children in Public and Private Schools in Uyo Metropolis.

Key:

1	-	St. Patrick's Primary School
2	-	Okonee Nursery/ Primary School
3	-	St .Georges' Primary School
4	-	University of Uyo Staff School
5	-	Qua Iboe Church Primary School
6	-	Jevic Nursery/Primary School
7	-	Christ the King Primary School
8	-	Christ the King Nursery/ Primary School
9	-	Methodist Primary School
10	-	Hillside Nursery/Primary School

Table 5: Prevalence of Intestinal Parasite among school children in relation to risk factors

Risk Factors	Number Examined	Number infected (%)	x^2	df	p-value
A. Toilet facility					
(i) Water system	160	28(17.5)	0.7	2	0.68386
(ii) Pit toilet	60	22(36.69)			The p-value is 0.704688.
(iii) defecating in an open places	230	24(8.57)			The result is not significant at $p < 0.05$
B. Source of drinking water					
(i) Portable pipe borne water	170	24(14.2)	4.939	2	0.08461
(ii) Borehole water	220	42(19.09)			The p-value is 0.084629.
(iii) Stream/well water	110	32(29.09)			The value is not significant at $p < 0.05$
C. Environmental sanitation					
(i)Walk bare footed	260	151(58.08)	197.086	4	0 < 0.0001
(ii) Do not wash hand after stooling	120	75(62.5)			Results is significant at 0.05
(iii) Drink unboiled water from streal/well	80	44(55.6)			
(iv) Do not wash hands after eating	140	76(5503)			
(v) Play bare footed in an open ground	400	232(58.0)			

Table 5 revealed the result obtained from the questionnaire distribution out 550 questionnaires distributed, 500 (90.9%) was retrieved. The analysis and data gathered from the questionnaire shows that the children were exposed to more than one type of risk factors which predispose them to parasite infections. Those who defecated in an open place 22(836.9%) compared to those who use pit toilet for defecation 28(17.5%).

Those who uses stream/well water 32(29.09%) had higher prevalence of infection than those that uses provision of portable/pipe borne water 24(14.2%). In terms of sanitation and personal hygiene. Those who do not wash their hands after stooling recorded the higher prevalence of infection 75(62.5%) followed by those who walk bare footed 151(58.08%) and those who do not wash their hands after eating 76 (55.03%), while those who play in the field 232(58.0%) are higher than those who don't usually wash hand before eating.

DISCUSSION

The result shows a prevalence of 47.6% infection among school children in Uyo with intestinal parasite. The observed

prevalence is relatively lower than previous findings of Wosu and Onyeabor (2014) (76%) in the neighbouring Umuahia, a state capital in the same region and 95.7% recorded by Ugbomoko *et al.* (2006) in Oba Ile community of Osun State Nigeria. However, the prevalence is higher than the finding of Ekpenyong and Eyo (2008), who reported a prevalence of 28.9% in some urban communities in Enugu State and 26.63% obtained by (Usip and Ita (2017), but similar to the report of Usip *et al.* (2017) in theneigbouring Itu Local Government Area of Akwa Ibom State. The recorded differences in prevalence may be attributed to the differences in the study age group, environmental contamination and degree of overcrowding in the communities.

Ascaris, lumbricoides (22.19%) had the highest prevalence of infection, while conversely *Strongyloidesstercoralis* (4.49%) infection was unexpectedly low, followed by *Enterobius vermicularis* (5.19%) inspite of the similar environmental conditions for development and similar transmission patterns showed this is in line with the report by Saka *et al.* (2014); Usip and Mathew (2015); Taiwo and Agboade (2000). This may be adduced to the rate of effective contact between individuals and the numbers eventually infected. The high prevalence of *Ascaris lumbricoides* infection may be attributed to high level of unhygienic practices among the pupils which embrace transmission. The presence of *Guardia intestinalis*, *Ancyclostoma duodenales*, *Tricharis trichura* and other intestinal parasite in the area was not unexpected since it is known that similar condition which influences the endermicity of *Ascaris lumbricoides* also influenced their endermicity (Olorcain *et al.*, 2000). It is also known that *A. lumbricoides* infections are rarely found alone in human communities. The observed high prevalence of *Ascaris limbricoides* may be attributed to the contamination of their hands with polluted soil which often contain the infective eggs of the parasites. The prevalence of *Ancyclostoma duodenales* could be as a result of children not wearing protective clothing even as a cover while playing outside and within the school premises which is in lined with Thomas *et al*. (2014) report.

The comparative prevalence of intestinal parasite among pupil in public and private primary school revealed that infection rate is significantly higher in public school than private school. The overall high prevalence of 610 infected pupils among the public school than 342 among private primary schools could be attributed to carelessness and unhygienic habits practiced by these children both at home and school in public schools. Similarly, lack of good sanitation facilities, lack of good toilet, and abundances of farmland and field also promotes children's habit of open field defecation when in school in public school as previously reported by Usip *et al*. (2017); Atting *et al*. (2016) and Ita (2017).

Also, experience shows that children of poor parentage patronized the public school which also point to the fact that even in their homes the situation is not charged and most of them still make use of pit latrine and open toilet facilities (Shehu *et al.*, 2013). Also, most children in public schools play and walk bare footed as some of them could not afford shoes to protect their exposure as previously reported by Thomas *et al*. (2017).

The low prevalence in private school may be attributed to lack of field space for farming and sporting activities as most of the private schools do not even have a small field for sporting activities. Moreover, good method of sewage disposed (the water system toilet) were common in the private schools. Studies show that the children in private school are mostly from wealthy parents who are in more sanitary environment than those in the public schools.

As the age of the pupil increases the infection rate decreases thus as age increases, the children tend to exhibit more hygienic behaviour in their day- to-day activities. Major behavioural factors play a role in the transmission of infection (Timothy *et al.*, 2013).

The age group 3-6years had more infection than other age groups. This is a reflection of the exposure patterns in view of the fact that they are active, adventurous and mindless of hygienic habits. The dropping of infection rate in the higher age group (7-12years) may not only be attributed to awareness, cleanliness, good sanitary habit but in addition probably the development of protective immunity earlier in life due to repeated exposure from infancy Usip and Nwosu (2013). As a rule, children carry the heavy intestinal parasites burden because of their defecation practices, they are principal disseminators of infection (Odebumi *et al.*, 2007). There was no significance difference in prevalence of infection between males and females. The males in our study were equally as exposed as their females' counterpart. This is consistent with the report of Anosike *et al*. (2005).

Though there was no significant association of infection with sex, males show higher level of exposure to infection, which corresponds with the reports of Timothy *et al*. (2013); Ashefani (2014). This is because males are more involved in activities such as farming, fishing and sporting activities in the field than the female's pupils.

The result of the current study is in agreement with previous report that major behavioral (risk) factors play a role in disease transmission (Saka *et al*., 2014).

The higher prevalence rate of infection recorded in those children that use the bush to pass excreta against users of pit latrines and water system toilets could be explained by the fact that lack of personal hygiene and usage of faecally contaminated soil and water contribute to high levels of soil transmitted infection. These observations were also made by Thomas *et al*. (2014).

Furthermore, illiteracy, poverty and associated poor environmental sanitation practices have been implicated as heavy burden of parasitic disease among children Usip and Mathew (2015) observed that congestion of pit latrine in school and homes force some children to defecate in the surrounding bushes or farm land when they are pressed. The association between sources of drinking water and infection with intestinal helminth was not significant, however pupil who use stream and well water has higher prevalence than those who use pipe borne water. Poor hygienic practices associated with access to feacally contaminated water is a likely probable risk factor for increased parasitic infection Ashefani (2014).

Other risks factors such as the behaviour/habit of children playing bare footed on open field also contributed to parasitic infection of children in primary school. Some of the developmental stage of soil transmitted helminths such as *Ascaris limbricoides* and *Trichiuris trichiura* are found in the soil and this enhance active transmission to man.

The habit of not washing hands before eating is another important determinant in this transmission of parasitic infection in line with previous report of Emony-Egbe (2013). Some stages of parasitic helminth found in the soil are attached to the hand of the children from the field and farm as they rush to eat their meal without washing their hand the end up introducing the parasite along aside with their food into their body.

Some people defecate inside or near stream/well other discharge their domestic waste into the stream and well, by drinking such contaminated water without boiling, they are contaminated with the parasite diseases.

CONCLUSION

The present investigation shows a relatively low prevalence of intestinal parasite infection among children of private school when compared to those in public school. Generally, it was observed that intestinal parasitic infections were found among primary school children in both public and private schools. Thus, the public health and economic implications of these findings should not be overlooked. The study revealed that infections rate decreases with increase in age and that there is no bias to sex with intestinal parasitic infection of school children. Risk factors such as playing bare footed on open field, eating without washing hand and drinking of unboiled/untreated stream/well water was found to be significantly associated with intestinal parasitic infection in Uyo urban. The information may be used in design and application of control strategies.

Recommendations

(1) State and local governments should embark on measure to control the spread of intestinal parasitic infection among primary school children in Uyo.

(2) Efforts must be made to create better sanitary and toilet facilities in school at all times to avoid indiscriminate defecation that could lead to the transmission of intestinal parasitic infection. The government and non-governmental agencies and private individuals, should help in the provision of these social amenities to ensure total eradication of these disease.

(3) The teaching of health education in both private and public schools should be encouraged by government. It is also recommended that children should be educated on the need to always observe good hygienic practices and good behaviour activities both at school and homes. Teachers and parents alike teach the children about the dangers of playing bare footed in contaminated soil, eating without washing hand, indiscriminate passing of faeces in the field and farmland.

(4) Further studies on control of parasitic disease should be carried out as these should be coordinated with and integrated into epidemiological research. As an outcome of future researches prevalence of intestinal parasites and their attendant adverse effects on children will be laid off to the nearest minimum.

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