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Prevalence of gastro-intestinal parasites among primary school pupils in Abayi, Osisioma Ngwa L.G.A, Abia State, Nigeria

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ABSTRACT

Gastrointestinal parasitic infection is one of the neglected tropical disease known to be a significant contributor to mortality and morbidity especially amongst school children in tropical Africa. This study was conducted to determine the prevalence of gastrointestinal parasites among primary school pupils in Osisioma Ngwa Local Government Area Abia State, Nigeria between the months of March and October, 2015.Prior to the study, consent of parents and guardian of the pupils were sort and approval obtained. A total of 648 pupils aged 5-13 years made up of 324 males and 324 females in primaries one to six had their faecal samples examined. Direct smear and formol ether concentration techniques were the parasitological procedures used for the faecal examination. A total of 281 (43.36%) children were infected. Four parasites were observed namely *Ascaris lumbricoides* (40.8%), *Entamoeba coli* (38.9%), Hookworm (17.1%) and *Trichuris trichiura* (3.3%). Mixed infections were also encountered. The combination of *A. lumbricoides* and Hookworm was the most common (67.1%). The age group 5-7 years had the highest prevalence (83.33%). More females (46.60%) than males (40.12%) were infected though the result showed a statistically non-significant difference. The public schools recorded a higher prevalence (48.46%) than the private schools (38.27%). Infection was highest in pupils in primary 3 (57.41%) ($P > 0.05$). Pupils whose mothers are farmers recorded the highest prevalence (96.67%). Many of the pupils (65,8%) responded “No” to eating food that fell to the ground. Those who used water closet system type of toilet had more infection (43.85%) than those who used pit latrine (41.67%) ($P < 0.05$). Infection based on sources of water for drinking and domestic purposes shows that those who used the combination of borehole and harvested rain water were the most infected (56.89%). This study recorded an overall parasitic infections of 43.4%. De-worming of pupils should be made an essential component of school health programmes. Adequate health education is also recommended and proper sanitary measures should be put in place to help reduce to the barest minimum infection with gastrointestinal parasites in school children.

Keywords: Gastrointestinal helminths, parasites, prevalence, school-children, Abayi.

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1. INTRODUCTION

Gastrointestinal parasitic infections are major public health problems in several developing countries like Nigeria with poor socio-economic status. More than 1.5 billion people globally are infected with gastrointestinal helminth infections (WHO,2018). The infections are widely distributed in tropical and subtropical areas, with the greatest numbers occurring in sub-Saharan Africa, the Americas, China and East Asia (WHO, 2018). It has been observed that gastrointestinal parasites are prevalent in areas with poor sanitation, unhygienic living conditions, insufficient water, contaminated water, poor sanitation, favourable climatic environmental condition for parasite proliferation and poor socio-cultural factors which permit transmission of these parasitic diseases (Michael et al.,2017; Tongjura et al.,2019; Okosa et al.,2022)

In developing countries, such as Nigeria, it has been reported that children and pregnant women are most vulnerable to these parasitic infections (Tongjura et al.,2019). Transmission is mainly through the ingestion of fecal contaminated foods or water, skin penetration and the use of night soil as

fertilizer (Ukpai and Ugwu,2003; Amaechi et al.,2013). Over 568 million school children reside in areas where these parasites are intensively transmitted and in need of treatment and preventive interventions (WHO,2018). Children are the most affected due to the heavy infections they harbor which is as a result of their vulnerability to nutritional deficiencies (Michael et al.,2017). Gastrointestinal parasitic infections are serious public health problem usually associated with complications such as anaemia, growth retardation, and other physical and mental health problems in children (Luka et al.,2000; Ekpenyoung and Eyo,2008; Obiukwu et al.,2008).

In Nigeria, gastrointestinal parasitic affect all the zones of the country with varying prevalence between 15.2% to 58.3% (Funso-Aina et al.,2020). The worm burden of gastrointestinal parasitic infections is enormous in children between the ages of three and fifteen years, making that age group a target for study (WHO, 2018) and intervention. Report on the prevalence of gastrointestinal parasites in some parts of south eastern Nigeria exists (Ukpai and Ugwu, 2003; Obiukwu et al., 2008; Odu et al.,2010; Amaechi et al.,2013; Ivoke et al.,2014; Onyido et al.,2016). The distribution and prevalence of various species of intestinal parasites differ from region to region. Although several studies have been conducted on the distribution and prevalence of intestinal parasites in Nigeria, there are still several localities and communities in Abia State for which epidemiological information has not been established. There is no published information on the current status of gastrointestinal parasites on primary school children in Abayi, Abia State, Nigeria. Therefore, the present study aimed at ascertaining the prevalence of gastrointestinal parasitic infections among school-aged children in Abayi, Abia State, South eastern Nigeria which at the present is unreported. It is hoped that, the results of this study will be useful for the formation and implementation of effective and sustainable control programme against the disease in the area

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2 MATERIALS AND METHODS

2.1 Study area

The study was conducted in six randomly selected schools in Abayi, Osisioma Ngwa LGA of Abia State involving three Private Primary Schools and three public Primary Schools.The headquarters of Osisioma Ngwa L.G.A. is Osisioma with the total population of 219,632 at 2006 population Census (NPC, 2012). The L.G.A, is bounded on the East by Rivers State, on the South by Aba North, on the North by Isiala Ngwa South on the west by Obingwa L.G.A; with coordinates longitude 5°8′59″N and latitude 7°19′49″E.It has a mean annual rainfall of 2600 mm, a tropical rainforest vegetation and the climate experiences a constant high temperature. The rainy season falls between the months of March and October while the dry season falls between November and February (although there could be variations). The relative humidity is also very high and this encourages the development and survival of infective stages of gastrointestinal parasites. The main source of water in this area is bore-hole water and there is poor drainage system which renders the environment hazardous to both public and individual health. Different toilet facilities such as water closet system and pit latrines are available. Most of the water closet in the study area were found not be in a good situation unlike the pit latrines that were properly cemented and covered.

The main geographical features are plains which are suitable for agricultural production. The inhabitants are farmers, civil servants, students and those involved in different types of business.

2.2 Selection of school/ Study Population

A total number of six hundred and forty-eight pupils (648) were randomly selected from a study population of one thousand four hundred and forty pupils (1440) obtained from six selected schools in Osisioma Ngwa Local Government Area. They were made up of one hundred and eight (108) pupils from each of school. The selected schools were obtained by ballot system. The private schools were about 12

while the public schools were 6 in number. The schools were made up of three private schools (Ginosko Model Schools, Waggom Intl. Schools, Praise- El-Intl Schools, and three public schools (Aba Owerri Road Primary School, Abia State University Primary School and Abayi Umuocham Primary School), randomly selected. Eighteen pupils (9 boys and 9 girls) each were selected from each class from primary one to primary six. The study was conducted between March to October, 2015.

2.3 Sample collection and parasitological examination

The study objectives were carefully explained to the teachers, parents/guardians and pupils thereafter each pupil was given a sterilized dry wide mouthed screw cap plastic container with a wooden stick for scooping their stool into the specimen bottle. Simultaneously, a pre-tested questionnaires were administered to all participants and for the very young ones, their parents gave responses to the questions asked to obtain socio-demographic variables. The specimen bottles were properly labelled indicating the name, class, sex and age of the pupil. All the stool samples collected on each day were put in a suitable container which allowed for easy and safe transportation to the laboratory where they were analysed and examined microscopically for the presence of eggs, cysts or trophozoites of parasites. Where this was not possible on the same day, the samples were preserved in 10% formalin. The eggs of gastrointestinal parasites seen were identified based on the characteristics and morphologies described by WHO (1987), Soulsby, (1982) and Cheesbrough (2004). Three methods of parasitological stool analysis were used; direct smear technique, iodine smear and formal ether concentration technique (Cheesbrough, 2005).

Pupils found to be positive for any of the parasites were sent to the local government primary health care for treatment.

2.4 Statistical analysis

Data obtained were analyzed using Paleontological Statistics Software Package (PAST), version 2.17C and results presented in tables using descriptive statistics of percentages.
Differences in the prevalence of infection between ages and sexes were tested using the Chi square (X^2). Values are considered statistically significant when p-values were less than 0.05.

2.5 Ethical considerations

Permission was sought and received from the management of the schools before any data collection could be made. Letters were written to the parents/guardians of the pupils seeking for permission to collect stool samples from their children/wards. Only pupils whose parents/guardians gave their consent were included in the study.

3 RESULTS

3.1 Overall age and sex- related prevalence of gastrointestinal parasite infections among primary school pupils in Abayi.

An overall prevalence of 43.4% was recorded. The prevalence of infection in the age groups showed that children in age group 5-7 years recorded the highest prevalence of 83.33%. The difference from other age groups was statistically significantly (X^2 = 41.7 >$X^2_{.05\ (2)}$ = 5.99). Infection was higher among the female (46.60%) than the male (40.12%), though it was not statistically significant (X^2 = 2.771<$X^2_{.05\ (1)}$ = 3.841) (Table 1).

Table 1. Overall age and sex related prevalence among primary school pupils in Abayi

Categories	No Examined	No Infected	% Infected	p-value
Overall	648	281	43.4	
Sex				
Male	324	130	40.1	0.3 (n.s)
Female	324	151	46.6	
Age				
5-7	132	110	83.3	
8-10	231	100	43.3	
1-13	285	71	24.9	

n.s= not significant

3.2 Prevalence of intestinal parasites in public and private primary schools in the study area.

The results of the study in Table 2 showed that, the private schools recorded a prevalence of 38.27% while the public schools had a prevalence of 48.46%. The difference was statistically significant (X^2 = 6.842 > $X^2_{.05\,(1)}$ = 3.841;P > 0.05)

Table 2: Prevalence of intestinal parasites in public and private primary schools in the study area.

School	Number examined	Number infected	% Infection	p-value
Private	324	124	38.27	0.67
Public	324	157	48.46	

p value is significant at < 0.05

3.3 Prevalence of infection by class

All the classes recorded high prevalence of infection. Infection was however highest in pupils in primary 3 (57.41%) while the least infection was recorded in pupils in primary 5 (33.33%). The difference was statistically significant (X^2 = 15.715>$X^2_{.05\,(5)}$ = 11.070).(Table 3)

Table 3. Prevalence of infection by class

Class	Number examined	Number infected	% Infected	p-value
Primary 1	108	49	45.37	
Primary 2	108	50	46.29	
Primary 3	108	62	57.41	0.77
Primary 4	108	40	37.04	
Primary 5	108	36	33.33	
Primary 6	108	44	40.74	

P value is significant at < 0.05

3.4 Prevalence of intestinal parasites among the primary school pupils

Single and mixed parasitic infections were encountered. Single infection was of *Ascaris lumbricoides* (13.27%), *Entamoeba coli* (12.65%), Hookworm (5.56%) and *Trichuris trichiura* (1.08%) (X^2 = 15.715 > $X^2_{.05\,(5)}$ = 11.070). Mixed infections of *Ascaris lumbricoides* (AS) and Hookworm (HW) (7.25%), *Ascaris lumbricoides* (AS) and *Trichuris trichiura* (Tt) (2.01%) and *Ascaris lumbricoides* (AS) and *Entamoeba coli* (Ec) (1.54%) were observed (Tables 4 and 5)

Table 4: Prevalence of single infections in the study area

Parasite	Number infected	% Infection	P-value
Ascaris lumbricoides	86	40.8	
Entamoeba coli	82	38.9	0.78
Hookworm	36	17.1	
Trichuris trichiura	7	3.3	
Total	**211**	**32.56**	

P value is significant at <0.05

Table 5: Prevalence of mixed infections in the study area

Parasite	Number infected	% Infection
AS + HW	47	67.1
AS + Tt	13	18.6
AS +Ec	10	14.3
TOTAL	**70**	**33.2**

Key: HW = Hookworm**, AS =** *Ascaris lumbricoides,* **EC**= *Entamoeba coli,* **Tt =** *Trichuris trichiura.*

3.5 Prevalence of infection based on Occupation of pupils' mother

From Table 6, it can be seen that pupils whose mothers are farmers recorded the highest prevalence of infection (96.67%), followed closely by pupils whose mothers are hairdressers. The least infection was recorded among pupils whose mothers are civil servants (15.62%). The difference in the prevalence rates was highly significant (X^2 = 275.98>$X^2_{.05\ (2)}$ = 5.991).

Table 6. Prevalence of infection based on occupation of pupils' mothers

Occupation	Number Examined	Number infected	% infected	p-value
Trading	183	130	71.04	
Civil servants	365	57	15.62	
Farming	60	58	96.67	0.668
Hair dressing	40	36	90.00	

P value is significant at <0.05

3.6 Prevalence of infection based on eating food that fell on the ground

A good number of the pupils did not eat food picked from the ground (79.78%) but some always did while some indicated they did eat sometimes. Infection was highest among those pupils who always picked food from the ground to eat (79.54%) (Table 7)

Table 7: Response based on attitudinal habit like eating food that fell on the ground

Eating food that fell on the ground	Number of Responses	% Response	Number of infected (%)
Yes (Always)	**44**	**6.79**	**35 (12.5)**
Sometimes	**87**	**13.43**	**61 (21.7)**
No	**517**	**79.78**	**185 (65.8)**

3.7 Prevalence of infection based on toilet facilities

The result shows that children that used pit latrine recorded the lowest prevalence (41.67%) while those that used water closet system had higher prevalence rate of (43.85%) (Table 8). The difference in the prevalence rate was also highly significant ($X^2 = 166.55 > X^2_{.05\,(1)} = 3.841$).

Table 8. Prevalence based on type of toilet

Type of toilet facility	Number examined	Number infected	% Infection
Pit latrine	144	60	41.67
Water closet system	504	221	43.85

4 DISCUSSION

Gastrointestinal parasitic infections are the most common infection that occur throughout the developing world. The burden of disease associated with worm infection is enormous. Majority of the world's population affected by these infections are children especially those living in the tropical and subtropical regions with warm climatic condition. School aged children (1-15 years) harbour heavy gastrointestinal parasites and thus are a good target group (Albonico et al., 2002). The overall prevalence of gastrointestinal parasitic infection observed in this work was 43.36%. This shows that gastrointestinal parasitic infection is endemic in the study area. This also buttresses the fact that gastrointestinal parasitic infections are endemic in the tropics and sub-tropics. The prevalence rate observed in this study compares with the findings of Ishaku et al. (2020) in Karu, Nassarawa State who recorded a 45.1% prevalence. The result however differed from the works of Wokem and Wokem, (2014) who reported 19.2% prevalence in Port Harcourt. Higher prevalence was recorded by several authors: Ivoke et al.(2014) in Ebonyi reported a prevalence of 57.9%, Opara et al.,2012 reported a 67.4% prevalence rate in Akwa Ibom, while Amaechi et al.,(2013) reported a 75.7% prevalence rate in Abia. The prevalence of intestinal parasitic infections in this study area could be due to inadequate hygienic condition and poor personal hygiene, and the presence of mechanical vectors like flies which could lead to contamination of food, water and fruits as observed in the community. This is in line with the report that intestinal parasitic infections usually occur in the tropics and sub tropics due to environmental conditions such as poor personal hygiene, faecal contamination of soil, water, food, vegetables, presence of vectors, in addition to temperature and moisture of the environment that encourages the transmission of parasites among people in a community. Infection could also have emanated from homes as a result of poor personal hygiene or playing with other children in contaminated environment. It has been reported that

prevalence of gastrointestinal parasite is often focal and can be high or low depending on a myriad of factors including geographical location, sanitation situation, behavioural and socioeconomic factors (Yeshitila et al.2020). This prevalence rate is however lower than the report of Hailegbriel (2017) who reported a 65.5% prevalence amongst primary school children in Bahir Dar, Ethiopia. Infections by intestinal helminths, protozoa or mixed infections appear to be a clear indicator of poor environmental sanitation and inadequate personal hygiene in the study area.

Ascaris lumbricoides recorded the highest occurrence of 13.27%. This compares with the report of Amali et al., (2013), who reported a 13.6% prevalence. This result however was higher than the findings of Atu et al., (2006) who reported a 9.0% prevalence rate and Siwila et al., (2010) who reported a 12% prevalence rate. It was lower than in the result of Aribodor et al., (2013) who reported a 19% prevalence rate, also lower than the result of Akinseye et al., (2013) who reported a 40.0% prevalence rate. Ugbogu and Asogu, in (2013) reported a much higher prevalence rate of 79%. The present result in this work could be attributed to poor personal hygiene, poor eating habit, contaminated environment as a result of seeding from faecal deposits and possible activity of mechanical vectors (flies) by perching on their food before it is eaten. The only protozoon reported in this study was *Entamoeba coli* with a prevalence rate of 12.65% prevalence. This prevalence is high when compared with the findings of Ukpai and Ugwu (2003) who recorded a prevalence rate of 0.3% for *Entamoeba coli* and Atu et al., (2006) who reported a 7.7%. However, Ogbe et al., (2002) reported a higher prevalence of 28% for *E. coli* in their work in Delta State. Infection could be due to ingestion of faecally contaminated water or food. The occurrence of this non pathogenic protozoa is indicative of the fact that most of the school children lack home sanitation and thus had greater opportunities to contacting contaminated soil and water. Hookworm infection recorded the prevalence of 5.56%. This compares with the findings of Ariwodo et al., (2013) who reported a prevalence of 6.0% for hookworm in their study. This however differed from the works of Adeyeba and Akinlabi (2002); Ogbe et al., (2002); Ukpai and Ugwu (2003); and Aribodor et al., (2013) who reported 10.1%, 20.0%, 53.37% and 81.6% respectively for Hookworm. Infection could be due to walking barefooted on contaminated soil which could result in larval penetration through the feet.

Trichuris trichiura had 1.08% prevalence in this work. This is similar to the 1.1% prevalence reported by Jeeviltha et al., (2014). The result however differed from the reports of Ukpai and Ugwu (2003), Ogbe et al., (2002) and Aribodor et al., (2013) who reported 2.3%, 28.0% and 13.0% prevalence respectively for *T. trichiura* in their works.

Mixed infection was observed in this work. The combinations observed were *Ascaris* and Hookworm (7.25%), *Ascaris* and *Trichuris* (2.01%), *Ascaris* and *E.coli* (1.54%). The occurrence of double infection in this study compares favourably with that observed in other parts of the country (Ukpai and Ugwu, 2003; Ugbomoiko et al., 2006; Houmsou et al*.,* 2010). The commonest combination was of Hookworm and *Ascaris lumbricoides* which seems to be the norm in many Nigerian parasite supporting – communities (Ukpai and Ugwu, 2003). This is not uncommon, particularly in a polluted environment where a chance of infection with one parasite exposes one to the other. It is important to note that no child had up to three parasites, the highest was a two combination parasites.

The prevalence of gastro intestinal parasites by age groups shows that children in age group 5-7 years recorded the highest prevalence rate of 83.33%. The lowest prevalence of 24.91% was in the age group 11-13years. This compares with the findings of Adeyeba and Akinlabi, (2002) who reported a higher prevalence in the age group 5-7 years in their work. The difference in prevalence between the different age groups was statistically

significant. The highest prevalence observed in age group 5-7 years might be as a result of the children being in contact with the soil, walking barefooted, being fond of sharing water bottles, spoons and eating indiscriminately with unwashed hands. The prevalence rate was decreasing with increasing age possibly due to change in attitude, habits and more awareness regarding personal hygiene among the older school children. A similar trend was observed by Luka et al., (2000) and Adefioye et al*.,* 2011) in Kaduna and Osun States respectively. Intensified health education on intestinal parasite infection that focuses on the effects on these children might go a long way to alleviate the devastating burden of these infections. Also, regular screening and de-worming exercise by the Local Government Public Health Department should be carried out to improve the health status of school children.

In this study females recorded the highest prevalence of 46.60% while males recorded 40.12% though this was not statistically significant. This result was in agreement with that of Obiukwu et al*.,* (2008), who reported that both gender have the same chances of being infected by these parasites. The parasites prevalence in the public schools was 48.46% which is higher than that found in the private schools (38.27%). The difference in prevalence was statistically significant This is similar to the work done by Wokem and Wokem (2014) in Port Harcourt where they recorded a higher prevalence of infection in the public school than in the private school. A survey of hygienic conditions in the six schools indicated that in the public primary school's borehole water was not always available as it was in private schools. This could have affected the issue of sanitations and personal hygiene such as washing of hands after toileting, which subsequently aid infection.

Infection was present in all the classes (primary 1-6) but primary 3 class recorded the highest infection rate of 54.41%. This age might be inclined to low attitudes to sanitation both at home and in school. This however differed from the report of Luka et al., (2000) and Adefioye et al., (2011) who reported higher prevalence in primary 6 pupils and lower prevalence in primary 3 pupils. The highest infection rate was among pupils whose mothers were farmers (96.67%). This agrees with the report of Amaechi et al.(2013) who recorded highest prevalence of infection among pupils whose parents were farmers. The least prevalence was observed among pupils whose mothers were civil servants (15.62%). This could be because parents/mothers are literate enough to know and also observe good personal hygiene and have passed same knowledge to their children to help prevent infection with intestinal parasites.

The number of children who responded '*No'* to eating food that fell to the ground were greatest (79.78%). This indicates a good hygiene habit and is quite commendable because any food picked from the ground and eaten could be contaminated with ova or cyst of parasites and expose one to infection. This is buttressed by the infection rate of those who always ate food picked from the ground (79.54%) as against those who did not eat at all (35.78%). Children should therefore be advised not to eat food picked from the ground to avoid being infected.

A comparison of the toilet systems used by the pupils showed that those who used water closet system recorded the highest prevalence rate of (43.85%) as against those that used pit latrine (41.67%). Infection might have been picked up from contaminated toilet seats due to inadequate water supply and not washing hands after using the toilet and before eating. Pupils that used a combination of borehole and harvested rain water as their sources of water for drinking and domestic purposes had the highest prevalence of infection (56.89%). Used water are usually stored in containers. These containers are sometimes left uncovered, and thus can be exposed to contamination from cysts or ova spread by mechanical vectors such as houseflies or from contaminated unwashed hands in the process of trying to collect water. The chances of being infected through drinking water are thereby

enhanced. Least infection was among those who used only borehole water (40.38%). Infection was still high. This means that the borehole water could also be contaminated. It may be that the bore hole was located near a soak away or septic tank which could gradually contaminate the ground water and thus expose the consumers to infection with intestinal parasites. The difference of infection between sources of water used was statistically significant.

The present findings have to do with the state of the environment or level of personal hygiene. This goes to buttress the fact that parasite transmission is dependent upon poor environmental conditions and poor personal hygiene.

The present work has been able to highlight the situation of pupils in the study area in terms of their health status and worm burden.

A major weakness could be seen in the study sample size which ought to be more in number to really understand the true picture of the situation.

4.1 CONCLUSION

Gastrointestinal parasitic infection is endemic in the studied population and study area. The result is close to being of public health concern. Males and females were infected, and all the age groups within primaries one to six recorded infections at various degrees. Infection was present in pupils who used different sources of water and different toilet facilities. Efforts should therefore be made to prevent the infection from getting to a public health status and to eradicate intestinal infection or bring it down to the barest minimum. This can be achieved through the combined efforts of the government, the community, the parents, the teachers and the children.

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