# COMPARATIVE PREVALENCE OF INTESTINAL PARASITES AMONG CHILDREN IN PUBLIC AND PRIVATE SCHOOLS IN CALABAR SOUTH, CALABAR, CROSS RIVER STATE, NIGERIA

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## ABSTRACT

Epidemiological information on prevalence of intestinal parasitic infections and identification of local risk factors in different regions is a prerequisite to develop appropriate control strategies. Hence this study was conducted to determine the prevalence of intestinal parasites among pupils aged 6-13 years in 6 primary schools in Calabar South Local Government Area, Cross River State, Nigeria. Three public and 3 private schools were selected for the study based on environmental factors and accessibility. The pupils in each particular class in a school were randomly selected. A total of 1,055 stool samples were collected and analysed for ova/larvae of intestinal parasites using direct wet mount laboratory technique. Out of 1055 samples examined, 281(26.63%) were positive for parasitic infections. Of the 281 positive cases, six types of parasites were encountered namely, *Ascaris lumbricoides* 84(2.96%), *Strongyloides stercoralis* 46(4.03%), *Entamoeba histolytica* 65(6.16%), *Trichiuris trichuria* 15(1.42%), *Ancyclolstoma duodenale* 59(5.59%) and *Giardia lamblia* 12(1.12%). Multiple infections were also encountered. Parasitic infection rate was higher in male pupils than female pupils in both public and private schools. Pupils within the age bracket of 6-7years in public and private schools had the highest prevalence of 66(52.0% and 31 (18.7%) respectively. Intestinal parasite infection is still a public health problem among school children of Calabar South. There is need for improvement of sanitation and health education.

**Keywords:** Intestinal, parasites, pupils, stool and comparative

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## INTRODUCTION

Parasitic infections are chronic and insidious diseases producing long-term effects on man. They are among the most common and neglected infectious diseases worldwide (WHO, 2005).

Major contributors to the high burden of intestinal parasites include poverty, poor environmental sanitation, personal hygiene, lack of potable drinking water and inadequate healthcare which characterise most communities in developing countries including Nigeria (Ekundayo *et al.,* 2007; Wagbastoma, *et al.,* 2005). Some behavioural aberrations such as nail biting, finger sucking, encopresis and pica observed in some children have been postulated as important risk factors that may encourage soil contamination by helminths ova and intestinal parasitic transmission from one individual to another (Thomas *et al.,* 2014; Usip and Nwosu, 2013, Gimba and Dawan, 2015).

In Nigeria, the intestinal parasitic infections are very common and important because of the high rates of morbidity and sometimes mortality recorded among children in Nigerian towns and villages (Odu *et al.,* 2012; Okpala, 2014 and Meremikwu *et al.,* 1995). These are mostly the major problems in rural settlements in Nigeria because of their poor socio-economic status and lack of basic amenities such as water and toilet facilities (Okon and Oku, 2001). The Nigerian environment in which most of the country's children live is poor in hygiene and conducive for the development of the parasites (Usip and Mathew, 2015).

The effects of parasitic infections in children are adverse and alarming. Intestinal parasitic worms have detrimental effects on the survival, growth, general fitness and performance of school children according to reports by WHO (1998). These infections are known to trigger immune responses in man, present problems for the body's ability to fight disease, thus making affected individuals more prone to co-infection as was noted by (WHO, 2005; Desta *et al*., 2014 and Suresh *et al*., 2014).

Several reports on the survey of human intestinal parasites in different parts of Nigeria exist over the years, all of which were on surveys for intestinal parasites of Nigerians generally above school age stating some isolated intestinal parasites common in the region including *Ascaris lumbricoides,* the Whipworm *Trichuris trichiura,* the hookworm, *Ancyclostoma duodenale, Necator americanus* and *Strongyloides stercoralis* (Merenikwu *et al*., 1995, Ogbe *et al*., 2002 and Agbolade *et al*., 2007).

There were others that recorded the prevalence and intensities of the parasites mainly in Secondary School children and primary school pupils. These include the reports of Okon and Oku (2001), Usip and Nwosu, (2014). None of these reports, however, mentioned comparative prevalence of intestinal parasites among pupils of private and public schools, except the report from the survey that was carried out by Ogwurike et *al.*, (2010) on the comparative prevalence of Helminthiasis among public and private schools in Jos, Plateau State, Nigeria. Hence the need to carryout this study on the comparative prevalence of intestinal parasites among public and private school pupils in Calabar South, Calabar because there is little or no information on these parasites from the area.

**Aims**

To compare the prevalence of intestinal parasites among public and private school pupils in Calabar South.

**Objectives**

The objectives were to:

1. Identify the types of intestinal parasite infecting the school age children in Calabar South.
2. Determine the prevalence of multiple infection among the school children.
3. Determine prevalence with respect to sex and age and compare prevalence between private and public school.

## MATERIALS AND METHODS

### Study Area

The study was conducted in public and private schools in Calabar South, Cross River State. Cross River State is a coastal state in south Southern Nigeria, named after the Cross River which passes through the state located in Niger Delta. Cross River State occupies 21, 636.6 square kilometres, with coordinates of 5.7500°N and 8.5000°E. The state has an estimated population of about 2.89 million people (2006 census). The state lies between latitude 5°32 and $4^{o}$27N and longitude $7^{o}$50 and $9^{o}$28E. Cross River State has a serene environmental climate with

23.5°C to 27.5°C and warm weather conditions. It is Nigeria's premiere tourism destination. Calabar south is one of the local government areas of Cross River State, Nigeria. It has an area of 264km$^2$ and a population of 191, 630 at the 2006 census. It is a cosmopolitan area with many public and private schools.

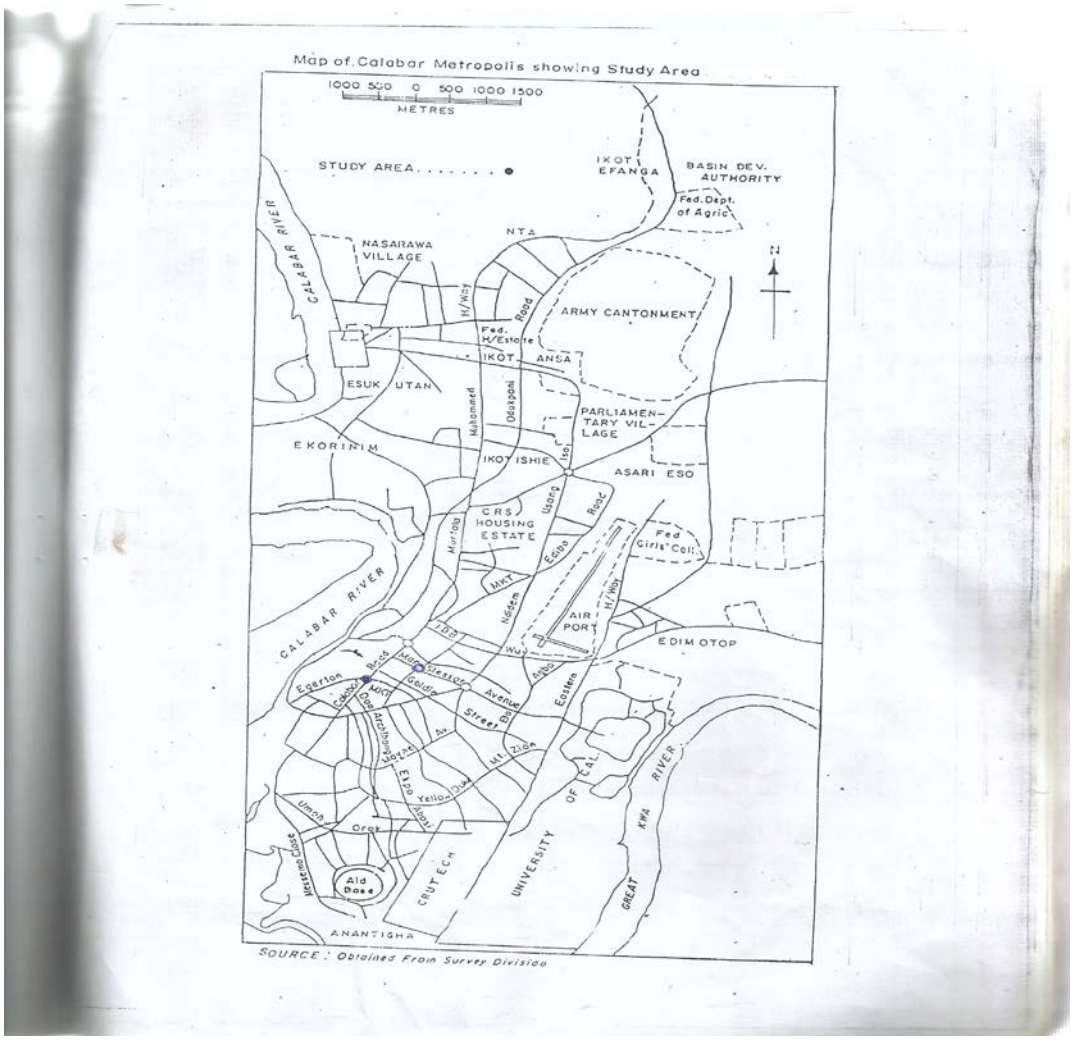


**Fig. 1: Map of Calabar South showing the Study Area.**

## Ethical Clearance

Approval for the study was obtained from the Ministry of Health, Cross River State, Calabar. After the purpose and objective of the study were made known to the head of the

school. Verbal consent was obtained from each study participant, written ascent was obtained from each participant parent or guardians. In order to keep confidentiality of any information provided by study subjects, the data collection procedure was anonymous.

**Study Design**

A cross sectional study was used in the survey- A total of 6 schools were selected for the study. Three Schools each from both private and public primary schools. The pupils in each particular class in a school were randomly selected by even number from the school register. Stool samples were collected and analysed from each schools, making a total of 1,055 stool samples

**Data Sampling and Collection**

Systematic Random Sampling techniques were used in selection of people for data collection. Collection of samples was carried out when school were in session.

Transparent, wide mouthed, corked, cleaned, labelled, specimen bottles were given to the pupils for the collection of morning stool samples, which were submitted that same day. The pupils were taught how to collect stool samples with the aid of their teachers.

Each child were also given an applicator stick and a toilet paper and instructed to bring a -stool sample of their own. The interval between stool collection and laboratory process was 8 - 12 hours. Approximately, 2 gram of the stool specimen was collected and were properly labelled and were carried to the laboratory where they were examined microscopically.

**Laboratory Faecal Sample Analysis**

The diagnosis of intestinal parasites was confirmed by the recovery of parasite eggs and larvae from each stool sample in the laboratory. Direct wet mount method and formal ether concentration technique was used for the diagnosis of these parasites. Small amount of each of the sample was analyzed using the direct wet mount technique which involved placing a drop of fresh physiological saline at the centre of a clean grease-free glass slide with the aid of applicator stick, little amount of faecal specimen was picked and placed in the saline preparation. It was emulsified thoroughly removing any debris. The entire preparation was then covered with cover-slip taking care that no air bubbles was trapped. The preparation was observed under x10

objective and x40 objective of the microscope for confirmation. The remaining portion was analyzed using formal ether concentration technique.

**Identification of parasites**

The parasites that were isolated in the stool sample were identified based on pictoral and identification keys by Arora and Arora (2012).

**Statistical Analysis**

A prevalence, species prevalence and intensity of intestinal parasites in the subjects were calculated. Quantitative variables was summarised using means and standard deviations. The significance of association between variables was tested using the chi-square test. A 95% confidence interval and less than 5% level of significance was used between independent and dependent variables by SPSS software.

**RESULTS**

A total of 1,055 pupils were used for this study. Out of which 281(26.63%) were positive for intestinal parasitic infection. There was a significant difference in infection among public and private primary pupils ($p<0.05$) (Table 1).

**TABLE 1: Prevalence of intestinal parasitic infections among school children in both public and private schools**

| **Schools** | **No. examined** | **No. positive** | **Percentage of infection.** |
|---|---|---|---|
| Public | 580 | 213 | 36.72% |
| Private | 475 | 68 | 14.45% |
| **TOTAL** | **1055** | **281** | **26.63** |

$^{2}$cal = 60.399 $^{2}$Tab = 3.841 Df=1 p=<0.05

Out of 580 public primary school pupils whose stools were examined for parasites, 213 (36.72%) were infected.

Out of the 475 private school pupils examined, 68(14.45%) had the infections. Among the public schools Christ African Church Primary Schools recorded the highest prevalence of infection 72(43.63%) followed by Sacred Heart Primary School 76(35.34%) and Henshaw Town Primary School 65(32.5%)(Table 2).

**TABLE 2: Prevalence of intestinal parasitic infections among public school pupils**

| **Public Schools** | **No. Examined** | **No. Positive** | **Percentage Positive** |
|---|---|---|---|
| Christ African Church primary school | 165 | 72 | 43.63 |
| Henshaw Town primary School | 200 | 65 | 32.5 |
| Sacred Heart Primary School | 215 | 76 | 35.34 |
| **TOTAL** | **580** | **213** | **36.72** |

Among the private schools, Palace International Nursery school 18(17.30%), Sacred Nursery School 30(16.66%) and Great Endurance Nursery school 20(10.81%) where Palace International Nursery School had the highest infection. Though the infection was low compared to the Public Primary School (Table 3).

**TABLE 3: Prevalence of intestinal parasitic infections among private school pupils**

| **Private Schools** | **No. Examined** | **No. Positive** | **Percentage Positive (%)** |
|---|---|---|---|
| Great Endurance Nursery School | 185 | 20 | 10.81% |
| Palace International Nursery School | 110 | 18 | 17.30% |
| Sacred heart Nursery School | 180 | 30 | 16.66% |
| **TOTAL** | **475** | **68** | **14.31%** |

The pupils were equally infected by the parasites irrespective of their ages. Thus, 97(33.44%) of the pupils in the 6 – 7 age bracket had the highest infections, 79(29.81%) of 8-9age bracket had the infection, 82 (27.47%) of 10-11 age bracket also had the infection while 23(13.93%) of 12-13 age bracket had the lowest infection rate respectively. However, there was a significant difference ($p<0.05$) between the age related infection rates of all pupils in both types of school. Sixty-six pupils, 66(52.8%) of 6-7 years of age were the most infected in the public primary schools while 31(18.7%) pupils in private primary schools were the most infected (Table 4).

**Table 4: Age distribution and percentage prevalence of intestinal parasitic infection in both public and private school**

| | Public | | Private | | Total for both schools(n=1055 | |
|---|---|---|---|---|---|---|
| **Age Group** | **No. Examined** | **No. / % infected** | **No. examined** | **No. /% infected** | **No. exam.** | **No. / % infected** |
| 6-7 | 125 | 66(52.8%) | 165 | 31(18.7%) | 290 | 97(33.4%) |
| 8-9 | 130 | 61(49.9&) | 135 | 18(13.3%) | 265 | 79(29.81%) |
| 10-11 | 220 | 67(3.04%) | 115 | 15(13.0%) | 335 | 82(274.7%) |
| 12-13 | 105 | 19(18.0%) | 60 | 4(2.42%) | 165 | 23(13.93%) |
| **TOTAL** | **580** | **213(36.7%)** | **475** | **68(14.3%)** | **1055** | **281(26.63%)** |

$^2$cal = 22.67 $^2$ tab=7.815 df=3 p=>0.05

Both boys and girls of both types of schools in Calabar South were infected by the six parasites encountered. Thus, 157(14.88%) of the 495 male pupils had the infections while 124(11.75%) of the 560 female pupils were infected. There was a significant difference between the two infection rates ($p<0.05$). There was no significant difference between the infection rates for the boys (42.70%) and girls (31.10%) in the public primary schools and between the boys (17.28%) and girls(11.87%) in private primary schools ($p>0.05$). However, there was a significant difference between the infection rate for boys (42.70%) in public schools and for boys (17.28%) in the private school ($p<0.05$) (Table 5) Fig 3.

**TABLE 5: Prevalence of intestinal parasitic infection in both public and private schools based on sex.**

| | Public | | Private | | Total for both schools(n=1055 | |
|---|---|---|---|---|---|---|
| **Sex** | **No. Examined** | **No. infected** | **No. Examined** | **No./% infected** | **No. Examined** | **No. infected** |
| Male | 281 | 120(42.70%) | 214 | 37(11.29) | 495 | 157(31.7%) |
| Female | 299 | 93(31.10%) | 261 | 31(11.87%) | 560 | 124(22.1%) |
| Total | 580 | 213(36.72) | 475 | 68(14.31%) | 1055 | 281(26.6%) |

$^2$=12.329 $^2$tab = 3.841 df =1 p=>0.05

The result in table 6 indicates that species of parasites encountered in the public schools were *Ascaris lumbricoides* 59(10.2%), *Strongyloides stecoralis* 35(6.03%), *Truchuris trichiuria* 14(2.41%), *Ancyclostoma duodenale* 44(7.58%), *Entamoeba histolystica* 52(8.96%) and *Giardia lamblia* 9(1.55%). *Ascaris lumbricoides* was the most prevalent in public primary schools with 10.2% infection rate. In the private schools, the prevalence of parasitic infection were *Strongyloides stercoralis* 11(2.3%), *Ascaris lumbricoides* 25(5.5.26%), *Trichuris trichiura* 1(0.21%), *Ancyclostoma duodenale* 15(3.15%), *Entamoeba histolytica* 13(2.75% and *Giardia lamblia* 3(0.63%) Fig. 4.

*Ascaris lumbricoides* was also most common among the private primary school pupils with an infection rate of 5.26%. However, there was a significant difference in the overall infection rates between private and public school pupils ($p<0.05$).

**TABLE 6: Relative proportion of parasites isolated in faecal specimens of both public and private school**

| | | | *Helminths* | | | | *Protozoa* | |
|---|---|---|---|---|---|---|---|---|
| **Schools** | **No. Exam.** | **No / % infected** | ***Ss*** | ***Al*** | ***Tt*** | ***Ad*** | ***Eh*** | ***Gl*** |
| Public | 580 | 213(20.18%) | 35(6.03%) | 59(10.2%) | 14(2.41%) | 44(7.58%) | 52(8.96%) | 9(1.55%) |
| Private | 475 | 68(6.44%) | 11(2.31%) | 25(5.26%) | 1(0.21%) | 15(3.15%) | 13(2.73%) | 3(0.63) |
| **Total** | 1055 | 281(26.63) | 46(4.26%) | 84(7.96) | 15(1.43%) | 59(5.59%) | 65(6.16%) | 12(1.14%) |

**KEY:** *Ss=Strongyloides stercoralis; Al=Ascaris lumbricoides; Tt =Trichuris trichura; Ad=Ancyclostoma duodenale; Eh=Entamoeba histolytica; Gl=Giardia lamblia*

Multiple infections were common among the pupils of both public and private schools with 21(1.99%) of the 1,055 pupils carrying 6 types of double infection and *Ascaris lumbricoides + Ancyclostoma duodenale* combination was 2(0.34%) of the 1,055 pupils examined (Table 7).

*Entamoeba histolytica + Ancyclostoma duodenale* 6(1.03%) in public and 1(0.21) in private schools were infected with multiple infection. *Entamoeba histolytica + Stongyloides stercoralis* found in public schools with 1(0.17%) multiple infection. *Ancyclostoma duodenale + Ascaris lumbricoides* 7(1.20%) public and 3(0.63%) private; *Entamoeba histolytica +Trichuris trichiura* 1(0.17%) in public only while *Ancyclostoma duodenale* and *Strongiloides stercoralis* combination accounted for only 1(0.21%) in public.

**Table 7: Prevalence of Multiple infection for both public and private schools**

| | Public (n=580) | | private(n=475) | |
|---|---|---|---|---|
| **Parasite combination** | **No. infected** | **Percentage of infection** | **No. infected** | **Percentage of infection** |
| Al + Ad | 2 | 0.34% | | |
| Eh + Ad | 6 | 1.03% | 1 | 0.21% |
| Eh + Ss | 1 | 0.17% | | |
| Ad +Al | 7 | 1.20% | 3 | 0.63% |
| Eh + Tt | 1 | 0.17% | | |
| Ad + Ss | | | 1 | 0.21% |
| **TOTAL** | 17 | 2.93% | 4 | 0.842% |

**KEY**: *Ss=Strongyloides stercoralis; Al=Ascaris lumbricoides; Tt=Trichuris trichiura; Ad= Ancyclostoma duodenale; Eh=Entamoeba histolytica; Gl=Giardia lamblia*

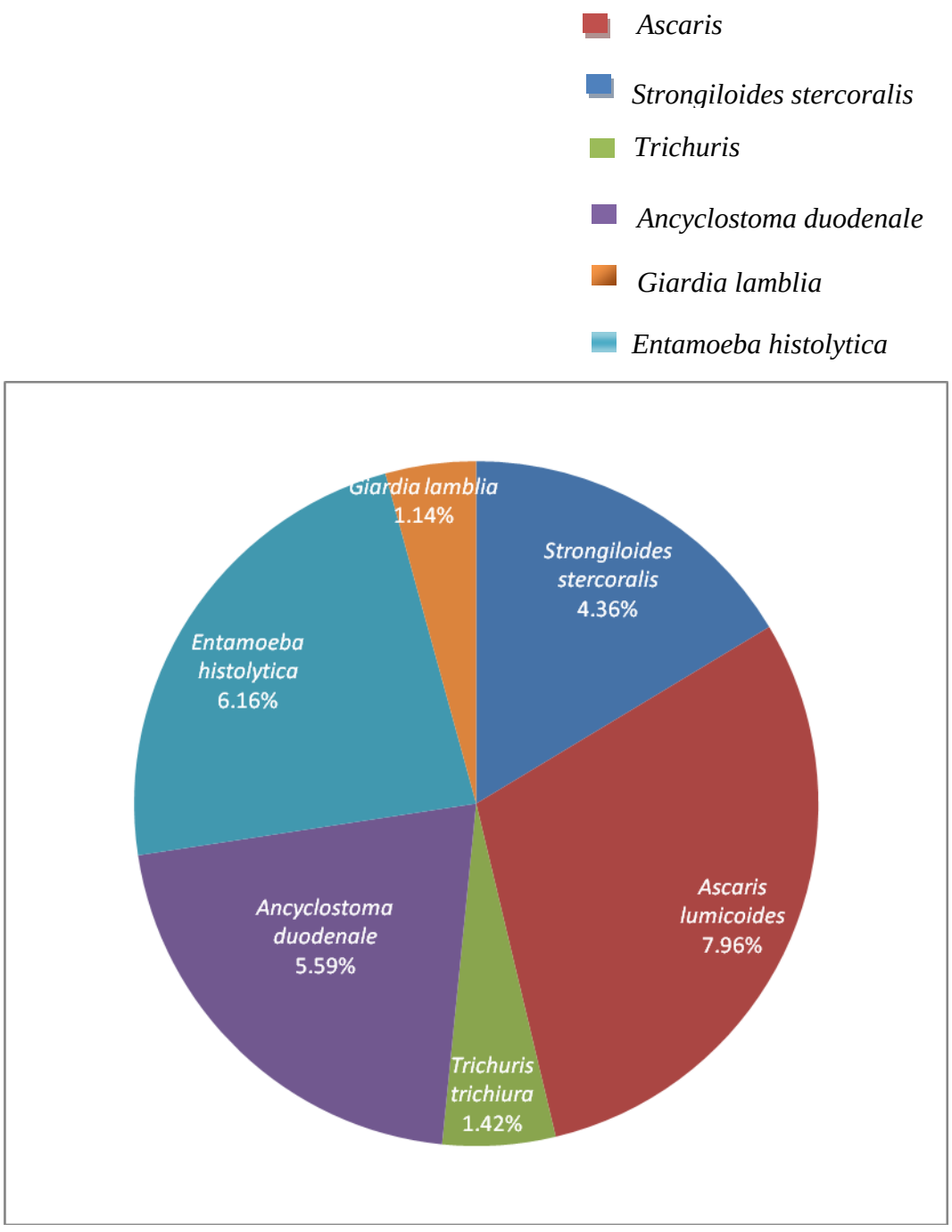


**Fig 2: Overall percentage of parasite infection from both public and private school pupils.**

The result in figure 2; indicates the overall prevalence of the species of parasite encountered in the study. The highest species of parasite encountered was *Ascaris Lumbricodes* 84(7.96%). Followed by *Entomalba duscheriale* 59(5.5%). *Stroglorides stercodis* 46(4.36%), *Trichirus trichura* 15(1.42%) and the least was *Gardia Lambiia* 12(1.14%).

The result of the parasite species prevalence of infection and the public and private school in figure 3 indicates that pupil from both public and private schools are affected with the six species of parasite encountered, but infection rates were higher in public school than private schools.

The result of prevalence of parasites in relation to sex in both public and private schools (Fig 3) indicate that there is no significant difference ($P < 0.05$) between male and females prevalence of infections.

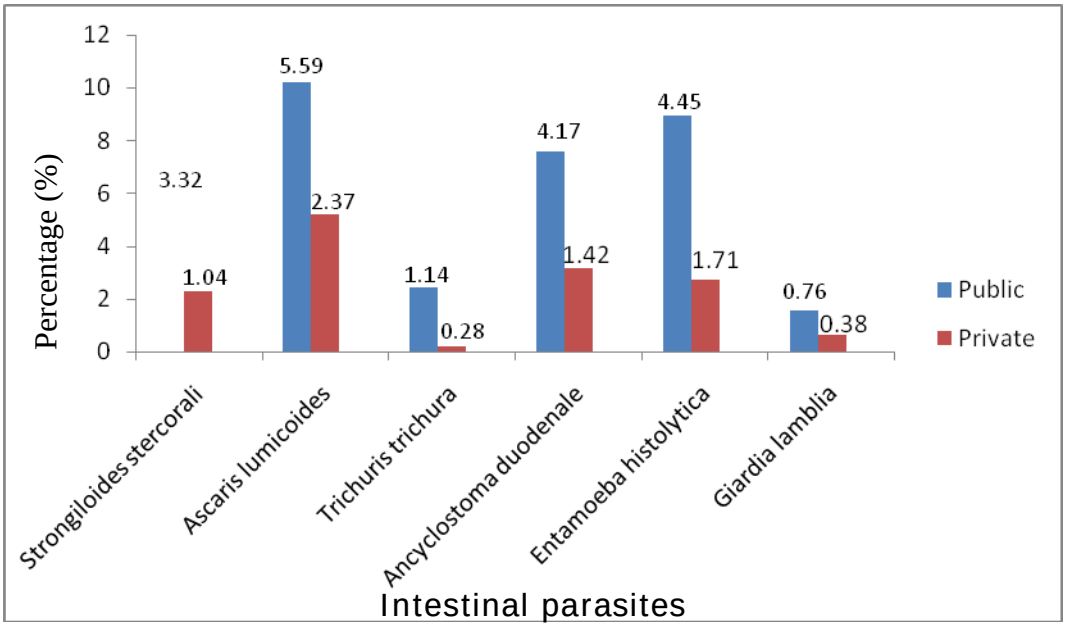


**Fig. 3: Prevalence of intestinal parasite infection from both public and private school pupils.**

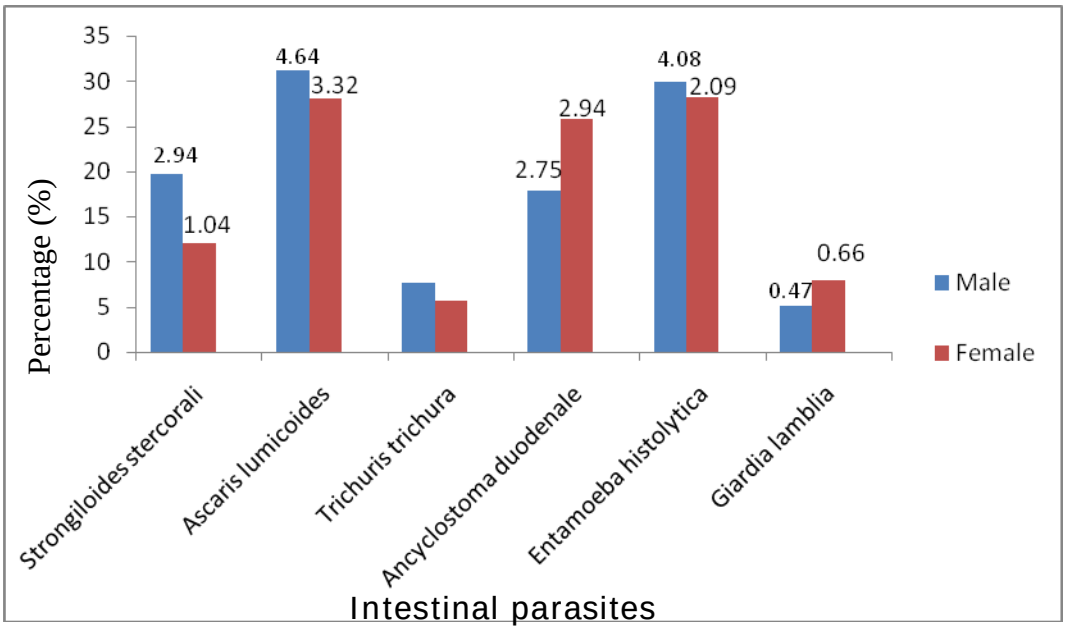


**Fig 4: Percentage prevalence of intestinal parasites with regards to sex in both public and private school Pupils.**

## DISCUSSION

The results obtained in the present study show that intestinal parasitic infection is common to all age groups and to both sexes of pupils in both public and private primary schools studied regardless of where they stay or live. The parasites encountered had moderate infection rate. The results generally show a low level of intestinal parasitic infection in the study population 26.63% when compared to 31.6% obtained in Jos North Local Government Area of Plateau State, Nigeria*(*Ogwurike *et al, 2010)*. However, the low infections encountered in this study are of great importance to the well-being and development of man, especially in children in whom they constitute a health problem (*Rajeswari, et a*., 1994, Usip and Matthew, 2015).

The result of this study is in agreement with the previous work by Chigozie *et al* (2007) who observed a high prevalence of *A. lumbricoides* among the school children because of contamination of their hands with polluted soil, which often contain the infective eggs of the parasites, thereby enhancing transmission from hand to mouth. Specifically, Ascariasis can lead to acute abdominal emergencies. The prevalence of *Ancyclostoma duodenale* infection also could be as a result of the children not wearing protective shoes while playing within and outside

school premises in the study area as observed by (Thomas *et al*, 2014). *Ancyclostoma duodenale* infections may result in iron deficiency anaemia which may be mild or life threatening (WHO, 1990); Trichuriasis can result in under-nutrition, stunted growth and iron deficiency anaemia (Cooper, *et al.*, 1990) Strongyloidiasis may lead to malabsorption syndrome in children. Entamobiasis can result in low cognitive functioning, diarrhaea, dysentery, abdominal pain and tenderness. Giardiasis is one of the most common parasites infecting cats, dogs and birds outline with (Inabo *et al*., 2000 and Wosu and Onyeabor *et al*., 2014) observation. The pupils infected with *Giardia lamblia* may have come in contact with infected pets at home which are the number one carriers of these infections or swimming in contaminated water as the cyst are resistant to conventional water treatment methods, such as chlorination and ozonolysis (Inabo *et al*,2000), or by poor hygiene practices thereby resulting in weakness in the body, loss of appetite, diarrhea, loose or watery stools, stomach cramps, upset stomach, projectile vomiting (uncommon), bloating, excessive gas and burning. These health conditions are commonly seen presented by children in many Nigerian health clinics and hospitals as previously observed by Okpala *et al*., (2014), Gimba and Diwan (2015).

The pupils in public primary schools in the study were more infected than the private primary school pupils. This might be because Public Primary Schools have large hectares of land for football and farming which leads to the transmission of parasites from an infected soil, and the government is not providing social amenities such as water system facilities to the public schools to ensure total eradication of these diseases. Also teachers take care of the children in private schools more than in public schools. The government is not encouraging health education in public schools where these children can be educated on good hygiene practices and behavioural activities. It is also as a result of parents not teaching their children about the dangers of playing in contaminated soils and walking barefooted. (Usip and Nwosu, 2013).

The same six species of parasites were found in pupils of both types of school because all the pupils share more or less the same environmental conditions which allowed the transmission and persistence of the parasites. These environmental factors which were observed during this study include inadequate sanitation, poor hygiene, walking barefooted in some cases, similarity in socio-cultural behavior of the pupils, poor access to health care and glaring signs of poverty which previous workers (Kightlinger *et al*, 1995; and Chigozie *et* al., 2007; Akogun and Badaki, 1998) had observed in their studies.

In the current study, the age group 6-7 were the most infected in both public and private schools while age group 12-13 was the least infected. The difference in the infection rate was significant ($p<0.05$). This survey revealed a decrease in infection rate as the age of the pupils increased; this may be due to the increase in public health awareness of the danger of intestinal parasites as the children grow older. Also acquired immunity due to frequent exposure to the parasite reduces the prevalence of infection with increase in age. The younger age groups are more infected due to frequent contact with infected soil, unhygienic habit of not washing hands before eating and after defeacation. (Usip and Mathew, 2015).

## CONCLUSION

The findings of this study here shown that six Intestinal parasites (*Ascaris Lumbricoides*, *Strongyloides stecoralis, Trichuris trichiura, Entomueba histolystica, Ancydostoma duodenole* and *Giardia lamblia* were prevalent among children in public and private school in Calabar South, Cross River State, Nigeria whose stool samples were used for the study. The presence of these six parasitic Intestinal parasites in Calabar, Cross River State, Nigeria constitutes a major public health problem in the country. The data obtained from this study also provides data for the understanding the epidemiological status of human gastro-intestinal parasites in the area.

There is an urgent need for the health agencies in Calabar South Local Government Area of Cross River State and the Federal Government of Nigeria to step up efforts that will reduce the load to parasitic infections in the nation's primary schools and other institutions through the improvement of the nation's health care system, health education, regular diagnosis and identification and chemotherapy of infections in school age children, these are possible and desirable, for they are fundamental investments in human development that will determine Nigeria's future.

## RECOMMENDATION

The outcome of this study underscores the urgent need for provision and improvement of sanitary facilities for schools. Consistent intervention strategies targeted at the parasites by way of deworming campaigns, environmental sanitation through provision of sanitary facilities and

adherence to personal hygiene ethics through health education, will go a long way to reducing the scourge of gastro-intestinal parasites in children. The involvement of parents and stakeholders in designing and implementing these interventions are fundamental to their success.

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