



**PREVALENCE OF INTESTINAL PROTOZOA INFECTIONS AMONG SOME PRIMARY SCHOOL PUPILS IN AKKO LOCAL GOVERNMENT AREA OF GOMBE STATE, NIGERIA**

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**Cite this article:**

M. S. Twan, Oguche A. J. (2024), Prevalence of Intestinal Protozoa Infections Among Some Primary School Pupils in Akko Local Government Area of Gombe State, Nigeria. African Journal of Biology and Medical Research 7(3), 110-118. DOI: 10.52589/AJBMR-6LDNWXUF

**Manuscript History**

Received: 11 Jun 2024

Accepted: 13 Aug 2024

Published: 9 Sep 2024

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**ABSTRACT:** *The prevalence of intestinal protozoa infections among primary school pupils in Akko Local Government Area of Gombe State, Nigeria was investigated. Stool samples were collected from 450 pupils aged 5–13 years from six (6) primary schools in the Local Government Area. A structured questionnaire was used to collect relevant demographic and risk factor data associated with intestinal protozoa infections. The stool samples were processed using the formol-ether concentration technique and microscopically examined for protozoan cysts; 10.7 % of the stool samples were positive for the cysts. The prevalences of intestinal protozoa were: 4.9 % for Entamoeba histolytica, 3.7 % for Entamoeba coli and 2.1 % for Balantidium coli. The prevalence of infection by protozoa in individual schools was not uniform despite the similarity in the local topography and weather conditions. Demographic data of age, sex and nature of school attended (public or private), were recorded at the point of sample collection. The age range prevalence for intestinal protozoa recorded 4.9%, 4% and 1.8% for 5-7 years, 8-10 years and 11-13 years respectively. More male pupils (6.4%) were infected compared to the females (4.3%). The laboratory analysis further revealed that prevalence was more among pupils that attend public school (7.1%) than those in private schools (3.6%). Poverty, ignorance and poor environmental sanitation were factors found to be associated with the prevalence rates recorded. It is therefore recommended that a concerted health education effort is necessary in order to curb the infections within the schools and the communities.*

**KEYWORDS:** Entamoeba histolytica, Intestinal Protozoa, Prevalence, Kumo and Infection.



## INTRODUCTION

Infections by intestinal parasites are of major public health importance worldwide, especially among children in developing countries. World Health Organization (WHO) estimated that approximately 3.5 billion people are infected by intestinal parasites and about 450 million children are ill due to these infections (WHO, 2000; Warunee *et al.*, 2007). Infection with intestinal parasites may have important health consequences and are known to cause iron deficiency anaemia, growth retardation in children and other physical problems (Scolari *et al.*, 2000; Nasiri *et al.*, 2009). Intestinal parasitic infections are linked to lack of sanitation, lack of access to safe water and poor hygiene and are therefore linked to poverty (Alhassan *et al.*, 2013).

Protozoan parasites contribute immensely to the burden of intestinal parasitic infections among children (Harhay *et al.*, 2010; Hotez *et al.*, 2009). Poor hygiene coupled with children voracious eating habits particularly puts them at greater risk of acquiring these infections (Schunk *et al.*, 2001; Mohammed *et al.*, 2015). Protozoan parasites have been recognised as significant causes of gastrointestinal illnesses, malnutrition and substantial mortality. Several pathogenic protozoan parasites are responsible for the above health issues including *Entamoeba histolytica/dispar*, *Giardia lamblia* (also known as *Giardia intestinalis* and *Giardia duodenalis*), *Cryptosporidium* and *Balantidium coli*, which are the most common species associated with significant illnesses (Onubugu, 1978; Rodriguez-Morales *et al.*, 2006 and Cheesbrough, 2005). Infection by *E. histolytica* is considered the third most common cause of death after malaria and schistosomiasis (Mukhtar, 2003). In addition, *Cryptosporidium* spp. and *G. lamblia* are important nonviral causes of diarrheal diseases in humans (Dinleyici *et al.*, 2003), while other species of intestinal protozoa are either not widely prevalent or non-pathogenic parasites.

Transmission is by feco-oral route and most infections tend to be asymptomatic. However, in few cases, common symptoms include vomiting, abdominal discomfort and dysentery (Schunk *et al.*, 2001). The consequences of intestinal parasites among children particularly include malnutrition, poor physical and mental development, and cognitive and behavioural deficiencies (Balci *et al.*, 2009). Studies have documented that, the prevalence rates of protozoan infections are quite high in developing regions, particularly Africa, and people there are often infected with one or multiple protozoan parasites (Biu and Adam, 2008). Despite people of all ages are at risk of being infected by intestinal protozoa, children are the most vulnerable and more likely to present with clinical symptom. Furthermore, school children can be more at risks due to their habits of playing or handling infested soil, performing unhygienic toilet practices and eating or drinking with soiled hands (Chandler & Read, 1961). Hence, there is a need to critically study to estimate the prevalence of protozoan parasite among primary schools pupils in Akko LGA of Gombe state, Nigeria.



## MATERIALS AND METHODS

### Study area

The study was carried out in Akko local Government Area (LGA) of Gombe State, in North Eastern Nigeria. Akko LGA, is one of the eleven (11) LGAs of Gombe State, it has its headquarters in the town of Kumo on the A345 highway south of the State Capital Gombe. Akko town for which the LGA is named, is located west of Gombe at 10°17'N and 10°58'E. The LGA has an area of 2,627 km<sup>2</sup> and a population of 337,853 during the 2006 census. The inhabitants of Akko LGA are generally traders, farmers, tailors, cattle rearers, and civil servants. The sources of drinking water for household use are wells, streams and bore-holes.

### Study Population

The study population included 450 pupils aged 5-13 years of different sexes, from six primary schools. The parents of the pupils in the selected schools were also included. The primary schools include: Central Primary School kumo (CK), All Saints Primary School Kumo (AS), Asas Primary School Kashere (ASa), Central Primary School Kashere (CKa), Central Science Primary School Bogo (CB) and Standard Academy Primary School Tunfure (SD).

### Stool sample collection and microscopic examination

After obtaining ethical clearance and written consent, children who volunteer to participate in the study were given orientation on how to handle and submit their stool samples. Thereafter, pupils were given sample bottles and applicator stick to bring their fresh stool samples (WHO, 2000). Stool samples were analysed using formal ether concentration technique described by Allen and Ridley (1970) and modified by Fayer and Xio (2008) was used to concentrate parasite cysts.

### Data analysis

Prevalences of intestinal protozoa were calculated and expressed as percentages with respect to school. Chi-square ( $\chi^2$ ) was used to determine the mean difference between the participated groups and the level of infection among the pupils. Significance was determined at  $p < 0.05$  at 95% confidence interval (C.I).

## RESULTS

The total of 450 primary school pupils aged 5–13 years from six (6) primary schools in the Local Government Area were investigated for infection with intestinal protozoa. Forty eight (10.67%) subjects out of the 450 subjects investigated were found to be infected with protozoa parasites of three species infection as shown in table 1. The species positive for intestinal protozoa infections were: 22(45.83%) for *Entamoeba histolytica*, 17(35.42%) for *Entamoeba coli* and 9(18.75%) for *Balantidium coli* (Table 1). CKa had the highest prevalence of 17 (37.0%) while SA had the lowest prevalence of 3 (4.0%). There were no significant ( $P > 0.05$ ) in prevalence of infection in all the schools. From the positive infections of protozoa parasites, *Entamoeba histolytica* cysts were the most prevalent (45.83 %) while *Balantidium coli* had the least prevalence of (18.75%). *Entamoeba histolytica* 5(10.42%) and *Entamoeba coli* 5(10.42%) showed the highest prevalence in CB and CKa respectively among



all the parasites cysts recovered, the lowest prevalence of infection among the parasites 1(2.08 %) was shown by *E. coli* in SA, and by *B. coli* in AS primary schools. There were no significant differences ( $P>0.05$ ) in the prevalence of infection with the protozoan parasite cysts (*E. histolytica*, *E. coli* and *B. coli*), among the six schools

**Table 1: Overall prevalence of Intestinal Protozoa Infections According to Schools (n = 75 per school)**

SCHOOLS	E. histolytica	E. coli	B. coli	TOTAL POSITIVE	$\chi^2$	df	p-Value
AS	3	2	1	6(12.5%)	4.82	10	0.90
CK	4	2	3	9(18.75%)			
SA	2	1	0	3(6.25%)			
CB	4	5	2	11(22.92%)			
ASa	4	3	0	7(14.58%)			
CKa	5	4	3	12(25.00%)			
TOTAL	22(45.83%)	17(35.42%)	9(18.75%)	48(100%)			

**Table 2: Infection of Pupils with Protozoan Cysts According to Age**

AGE	E. histolytica	E. coli(%)	B. coli(%)	TOTAL POSITIVE	$\chi^2$	df	p-Value
5-7	12(54.55%)	7(41.18%)	3(33.33%)	22(45.83%)	1.42	4	0.84
8-10	7(31.82%)	7(41.18)	4(44.44%)	18(37.5%)			
11-13	3(13.64%)	3(17.65)	2(22.22%)	8(16.67%)			
TOTAL	22(45.83%)	17(35.42)	9(18.75%)	48			



**Table 3: Gender-related Prevalence of Intestinal Protozoa Infections in Primary School Pupils**

GENDE R	E. histolitical	E. coli	B. coli	TOTAL POSITIVE	$\chi^2$	Df	p-Value
MALE	15	10	4	29	1.53	2	0.47
FEMALE	7	7	5	19			
TOTAL	22	17	9	48			

**Table 4: Intestinal Protozoa Infections According to the Type of School**

SCHOOL TYPE	E. histolitical	E. coli	B. coli	TOTAL POSITIVE	$\chi^2$	Df	p-Value
PRIVATE	9	6	1	16	1.53	2	0.47
PUBLIC	13	11	8	32			
TOTAL	22	17	9	48			

The prevalence rates of infection in the age categories were shown in table 2. Out of the 450 stool samples examined from pupils, the age group 5-7 years, had the highest prevalence of protozoa parasites cysts of 22 (45.8%) was obtained while age group 11-13 had the least prevalence in which the difference between the age groups is statistically not significant. The percentage of the positive protozoa cysts shows that *E. histolytica* 12(%) had the highest among the age group and the lowest 2(%) were for *B. coli*. There was no significant difference in the prevalence of protozoa cyst among the age groups ( $P>0.05$ ) (Table 2).

The prevalent rate of infections in both gender were shown in table 3, out of the 257 stool samples examined from male pupils and 193 from female pupils, 29 (6.4 %) and 19(4.2 %) respectively, contained cysts of the parasites intestinal protozoa infections therefore, showed higher prevalence of infection in male than in female pupils. The differences in the infestation between male and female were however, not significant ( $P>0.05$ )

Table 4 shows that out of the 225 stool samples each examined from private and public school pupils, 16 (3.6%) and 32 (7.1%) respectively, contained protozoan cysts; the difference in infestation between both sets of schools was also not significant ( $P>0.05$ )



## DISCUSSION

The results of the present study established the occurrence of three species of intestinal protozoa infections among six primary school pupils in Akko Local Government Area, Gombe State. The prevalence of infection obtained (10.67%) was lower than what has been reported in studies conducted in other parts of North-Eastern Nigeria. In a similar studies conducted by Biu and Dauda (2008) and Biu *et al.* (2012) in Maiduguri, Borno State, prevalences of 72 % and 60 % of enteric protozoans and gastrointestinal heminthes ova respectively, were reported. The possible explanation for the discrepancy between the result of the present and those of previous such studies in Borno State might be due to the differences in sampling techniques, quality of drinking water, sample size, and variation in the environmental and climatic conditions of the different study localities. These observations, with which I concur, were made by Aina (2002).

Among the cysts of protozoan parasites found in this study *E. histolytica* had the highest prevalence (4.89 %) which might be due to the fact that primary school children eat food and would drink water indiscriminately while in school, and which could be contaminated with the cyst. The distribution of infection on the basis of age revealed that age 5-7 years 22(45.8%) is more infected with this parasitic infection, this may be due to the fact that they are the most active among these children and involved more in outdoor activities than the other age groups. Age 11-13 (16.7%) was not highly infected with this diseases, this may be because they are matured than the other groups and do not involve much in outdoor activities than the other age groups. It was also established from the questionnaires that this age groups are knowledgeable of this disease hence the low infectivity rate. The findings also revealed that public schools pupils had the highest prevalence of protozoan cysts than the private schools pupils participated in the study with the following results 31(64.7%) and 16(33.3%) respectively.

In this study it was observed that males had 29 (60.4%) cases of infection compared to 19 (39.6%) recorded among the females. this could be attributed to the fact that males are more involved in outdoor activities such as playing, fishing etc and are more exposed to this infection than females. This is in line with previous findings in Maiduguri (Biu and Adam, 2008 & Mohammed *et al.*, 2015).

Even though the prevalence rate of infections is low when compared with other studies in the region, the result of this study highlights the public health challenge represented by intestinal parasitism in the study area in particular and the nation in general, and the needs to be addressed to decrease its burden on health care. The prevalence may be attributed to poor environmental management, poor personal hygiene and lack of public health education which were all noted in the course of this study. Public health education and improved sanitations conditions in our environment are key success to the prevention of spread of intestinal protozoan infections. Mohammed *et al.* (2015) noted that such infections were also common among primary school children in Boso Local Government Area, Niger State. In this regards the finding of this study can serve as a basis for developing strategies and preventive programs targeting group at risk of intestinal protozoan infections in school pupils.



## CONCLUSION

The study revealed that an overall 10.67% prevalence rate was found and male pupils are infected with the three protozoan parasites cysts (6.5%) than females (4.2%). The research findings also revealed that the prevalence rate of infections in age group 5-7 (45.83%) had the highest positive prevalence examined compared to the other age groups. The study found that hand washing habit before meal and after going to the toilet was associated with intestinal protozoa infections. Appropriate intervention and health education are required for the control and prevention of Protozoa infections in Akko Local Government Area, Gombe state.

## RECOMMENDATION

Poverty, ignorance and poor environmental sanitation were factors found to be associated with the prevalence rates recorded. It is therefore recommended that a concerted health education effort is necessary in order to curb the infections within the schools and the communities.

## ACKNOWLEDGEMENTS

The Authors wish to acknowledge the assistance rendered by Mal. Saleh Usman with respect to laboratory analysis of samples and to the various school authorities for the kind gesture extended to us at the course of the exercise.

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