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**Abstract:** A study was carried out on the prevalence of *Entamoeba histolytica* in children of ages between 1 to 5 years in Gwagwalada Area Council, Abuja. Stool samples of the study population were analysed using saline and iodine methods. Of the one hundred and thirty eight (138) children sampled, 42(30.4%) were infected, while the proportions of the infected children were highest within the age cohort of 3 to 4 years 17(53.3%; OR = 1.31), followed by 4+ - 5 years (52.5%, OR = 1.12) and 1-2 years had 5.9% (OR = 0.13). More males 27(37.0%) had the infection than their female counterparts, 15(23.0%). The prevalence of *E. histolytica* showed significant relationship (OR = 1.4) with socio-economic status and source of drinking water in the council area. The Government should pursue deworming exercise alongside that of *E. histolytica* and other protozoan infections. Effective and functional toilets and water closets should be provided to the families, villages, communities and council to help minimize the spread of the infections, especially that of *E. histolytica*.

**Keywords:** Children, deworming exercise, *Entamoeba histolytica*, Gwagwalada, public health

## Introduction

Entamoeba as a genus, consists of several species of intestinal protozoans that infects human beings (Huston *et al.*, 1999), and *Entamoeba histolytica* (*E. histolytica*) as one of the species is considered, the most important pathogenic species due to its ability to invade the gastrointestinal tract (and lumen epithelium) causing amoebic dysentery (Huston *et al.*, 2013, Enyinnaya, 1975). *E. histolytica* has also been regarded as one of the most causative agent of amoebiasis, a common tropical disease affecting man, especially children in many countries in Africa, including Nigeria (Enyinnaya, 1975).

Intestinal amoebiasis is frequently asymptomatic, symptomatic cases vary from dysentery with fever, chills and bloody or mucoid diarrhoea alternating with periods of constipation. More so, invasive infection can cause severe amoebic dysentery (Lauren, 2004). Extra-intestinal amoebiasis occurs when the parasite invades other organs such as liver, lung or brain causing abscesses (Lauren, 2004). Only approximately 01% of *E. histolytica* infected individuals show clinical symptoms with intestinal and/or extra-intestinal pathology (Gatti *et al.*, 2002). The parasite in its victims causes distended abdomen, stomach upsets, headache, vomiting or stunted growth (Igbiosa *et al.*, 1996; Iwuala, 2001). Quite often infected children who are ordinary healthy and active become sickly and lethargic for reasons anxious mothers cannot fathom, such children, soon succumb and literally fail to thrive (Onyenema, 1996).

Infection by the parasite can be acquired by the faecal-oral route either directly by person to person contact or indirectly by eating or drinking faecally contaminated food or water (Petri and Singh 1999, 2006). Studies have identified inadequately treated drinking water and ingestion of raw vegetables as risk factors for infection in addition to failure to wash hands before eating and low socio-economic status (Anosike *et al.*, 2002; Benetton *et al.*, 2014; Rinne *et al.*, 2005). Generally, the risk of infection is highest in areas of poverty and in settings with poor sanitation where barriers between human faeces, food and water are inadequate (Stanley, 2003).

Epidemiological studies of diarrhoea have been reported from several African countries including South Africa (Stauffer *et al.*, 2006), Gabon (Stanley, 2003), Egypt (Omudu *et al.*, 2007). It ranks second only to respiratory diseases and is a major cause of morbidity among notifiable diseases in some parts of the world (Coker *et al.*, 2000).

The prevalence and presentation of symptomatic *E. histolytica* infection varies geographically, for instance, a study in

Bangladesh indicated that preschool children showed episodes of *E. histolytica* associated diarrhoea each year (Stanley, 2003). A comparative study in Egypt and South Africa also showed that amoebic colitis was predominant in Egypt, whereas, amoebic liver abscess is predominant in South Africa (Stanffer *et al.*, 2006).

In Nigeria, a number of studies have reported various prevalences among Primary School Children; for example, Nyenke *et al.* (2008); Happiness and Ishaya (2012); Okoroiwu and Okoroiwu (2012); Udensi *et al.* (2015); Simon-Oke and Ounleye (2015); Ayodele *et al.* (2015); and Gimba and Dawam (2015) revealed 11.0%; 42.62%; 33.0%; 36.6%; 67.6%; 75.1% and 38.1%, respectively in their studies.

However, in Abuja and Gwagwalada area council, there is paucity of reports and the relationship between epidemiological factors and prevalence of *E. histolytica* particularly in children has not been fully investigated. More so, organized control program targeting transmission factors has equally not been fully addressed, hence, this study was designed to provide current field baseline data on the occurrence of *E. histolytica* among the children in the area, establish the impact of epidemiological factors and control measures.

## Materials and Methods

### Study area

The study was undertaken in four selected sites in some parts of Gwagwalada area council in Abuja, Nigeria. These sites are Gwagwalada township clinic, Angwan-Dodo Primary Health Center (PHC), Dagiri PHC and Paiko PHC.

Gwagwalada area council is located about 55 Km away from Federal Capital City. It lies on latitude 8° 55' North and 9° 00' West and longitude 7° 05' East (Ishaya, 2013). The area covers a total of 65sq Kilometres of very fertile land with abundance of grasses (Ishaya, 2013). It falls into the Guinea Savannah vegetation zone of the country which is the broadest of all the vegetation types, constituting about 50% of the land area of Nigeria. There are two seasons within this vegetational zone. Dry season that lasts between four to seven months and rainy season that lasts between four to five months. The rainfall ranges between 1016 and 1524 mm with relative humidity of between 60 and 80%. The Guinea savannah is divided into two vegetation zones, the northern and the Southern Guinea savannah. The northern Guinea savannah is characterized by mainly grasses like *Hyperrhenia andropogon*, *Schizachyrium* species with interspersing trees of *Isobelina doka*, *Albizia zygai*, *Anthoesta virgelli*, *Annona senegalensis*. High tall

grasses of about 5 – 10 m for example *Andropogon gayanus*, *Tectorum* species and more densely trees characterize the Southern Guinea savannah, hence, the name transition Woodland. The trees are thick-barked of up to 40-50 feet. Common trees, such as *Daniella oliveri*, *Azelia africanus* among other species, are common. The temperature of this area is highly influenced by the Niger-Benue trough where heat is trapped. The highest diurnal temperature ranges between 27 and 37°C in the months of November-April (dry season). The rainy season comes between the months of April to October with temperature range of 23 and 36°C. It is pertinent to observe that, this area has a higher temperature than any other area council in the Federal Capital Territory throughout the year (Ishaya, 2013).

**Research Design**

The study is a cross-sectional descriptive study of the prevalence of *E. histolytica* in children in Gwagwalada area council.

**Study population**

The study population were children of ages between 1 to 5 years attending health facilities in Gwagwalada Area Council, FCT, Abuja.

**Sample size determination**

A suitable sample size of 138 children between the ages of 1 to 5 years was chosen using the formula:  $n = Z^2P(1-P)/d^2$  (Naing *et al.*, 2006)

**Where:** n = sample size, Z = 1.96 (standard statistical value at 95% confidence interval); P = 10% (based on previous prevalence) and d = 5% (marginal error or precision);  $n = (1.96)^2 \times 0.10 (1.0-0.10) / (0.05)^2 = 138.296$ ; n = 138

**Ethical approval**

Permission to study in the council was obtained from the department of Health Gwagwalada Area Council while verbal consent was equally obtained from the parents of the participating children.

**Sample collection**

A total of one hundred and thirty-eight (138) stool or faecal samples were collected from the children using a normal procedure; the stool samples were collected into clean, clear, transparent and wide mouthed bottles. The names, ages and sex of the children were properly labelled on the universal bottles containing the samples. They were immediately sent to diagnostic laboratory for processing.

**Processing of the specimen**

Wet Normal saline and Iodine smears of the stool samples were made on clean grease free slides, and were examined under the light binocular microscope using X10 and X40 objectives for cysts and trophozoites of the parasite.

**Results and Discussion**

Of the 138 stool samples examined, 42(30.4%) of them were positive for *Entamoeba histolytica*; 27(37.0%) of the male while 15(23.0%) of the female counterparts were infected (Table 1). The total prevalence of *E. histolytica* among the children in the Area Council is 30.4%. The males, 27(37.0%) were more infected than their female 15(23.0%) counterparts.

Age-related prevalence of *E. histolytica* among children in Gwagwalada Area Council showed that *E. histolytica* is higher (53.3%, OR=1.31) within the age bracket of 3-4 years than their counterparts in age cohorts of 1-2 years with 45.9%, OR =0.13 and 4+ - 5 years who had 52.5% with OR = 1.12 (Table 2).

Amoebiasis is a gastrointestinal disease that is contracted by eating of foods or drinking water that has inadvertently been contaminated with *E. histolytica*, and in this study, the overall prevalence of *Entamoeba histolytica* among the children population studied in Gwagwalada Area Council is 30.4% as shown in Table 1. While the most affected age group is 3-4 years (OR = 1.31; 53.3%) as reported in Table 2.

**Table 1: Gender-related prevalence of *E. histolytica* among the in the Area Council**

Gender	No. Examined	No. Infected (%)
Male	73	27(37.0)
Female	65	15(23.0)
<b>Total</b>	<b>138</b>	<b>42(30.4)</b>

**Table 2: Age-related prevalence of *E. histolytica* among the children in the Area Council**

Age (Year)	No. Examined	No. Infected	Frequency (%)OR
1-2	68	45.9	0.13
3-4	30	53.3	1.31
4±5	40	52.5	1.12
<b>Total</b>	<b>138</b>	<b>42</b>	<b>30.4</b>

The total prevalence of 30.4% observed in this study is high and constitute a major public health problem in the Area council. This isolation rate of 30.4% is in consonance with the report of Okoroiwu and Okoroiwu (2012) who discovered a prevalence of 33.0% in Owerri, Imo state in their study on the prevalence of intestinal protozoan parasites of medical importance in primary school pupils in Owerri Municipal Area of Imo state. The prevalence of 30.4% is high when compared with the results of Edo *et al.* (2016) and Nyenke *et al.*, (2008) who variously recorded 10.5 and 11.0%, respectively. However, when compared with the reports of Udensi *et al.* (2015), Gimba and Dawam (2015), Happiness and Ishaya (2012), Kpurkpur *et al.* (2016), Simon and Ogunleye (2015) and Ayodele *et al.* (2015) who variously revealed 36.6, 38.1, 42.6, 40.0, 67.6 75.1%, respectively in their studies, it is low. The variation in prevalence of *E. histolytica* among children in various studies could be as a result of several environmental factors such as socio-economic conditions of the study population, ignorance as well as level of education of the parents of the children. Moreover, differences in the level of exposure and nutritional status, unhygienic processing, handling, storage and hawking of foods as well as the level of water contamination through pipes and personal hygiene of the sampled children.

The gender-related prevalence (Table 1) of this result showed that infection is higher in male (37.0%) than in their female (23.1%). This result is not in agreement that of Okoroiwu & Okoroiwu (2012) and Edo *et al.* (2006) who in their different surveys recorded male (40.9%); female (41.1%); and male (11.0%), female (10.0%), respectively. The differences noted in the prevalence of *E. histolytica* infection between males and females by the various researchers are probably related to exposure rather than a true question of sex susceptibility to the infection according to Abioye (1972) and Rivera (1977).

The relationship between the age of the children and the prevalence of *Entamoeba histolytica* infection is shown in Table 2. There were more *E. histolytica* (53.3%; OR = 1.31) in the 3-4 years age group cohort while 4+ - 5 years age group recorded an infection rate of 52.5% (OR = 1.12) and 1-2 years had the least with 5.9% (OR = 0.13) rate of the same parasite. This age group result corroborated with the work of Okoroiwu and Okoroiwu (2012) who reported 50.0% infection rate among the 5+ age group cohort. It is however, not compatible with that of Edo *et al.*, (2016) who revealed a 14.3% infection rate among the same age group in Enugu. This could be due to the high level of health education of the people investigated in that state.

The higher prevalences of 53.3 and 52.5% within the age groups 3-4 and 4+ -5 years age group respectively is attributed to inadequate hygiene, because these age groups often spend most of their leisure time out-door, playing in the garbage dumps and foraging for wild berries and discarded food remains in the streets (Okonji *et al.*, 1990; Okoroiwu and Okoroiwu, 2012). Observations and records have shown that children harbour Amoebiasis as serious infection with

devastating consequences, coupled in some cases with worm infestations which sometimes lead to deworming exercise by the Government as an intervention. Nevertheless, this programme leaves *E. histolytica* and other protozoan infections unattended as a result no achievement is made, since after the exercise the problem or problems of protozoan infections still persist and remain unresolved. We therefore, urge the Government to pursue deworming exercise alongside that of protozoan infection. Public Health Officers and Sanitary Inspectors should collectively be sent to the Councils and Communities to carry out the spot assessment of these parasitic diseases. More so, effective and functional toilets and water closets should be provided to the families, villages, communities and councils to help minimize the spread of the infections, especially that of *E. histolytica*.

Moreover, the Government should not only target the treatment of these parasites, the ecological approach should also be considered, and the notification of diseases, especially in children, will help in the long term planning of health services and proper assessment and monitoring of the control programmes.

In conclusion, the findings of this study have shown that children in Gwagwalada Area Council harbour *E. histolytica* with a total prevalence of 30.4%, with the male having the infection (37.0%) more than the female who recorded 23.0%. It is therefore, suggested that for any meaningful control programme such as deworming, *E. histolytica* and other protozoan infections should be taken into consideration.

#### **Conflict of Interest**

Authors have declared that there is no conflict of interest.

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