academicJournals

Vol. 7(11), pp. 346-351, November 2015
DOI: 10.5897/JPHE2015. 0754
Article Number: BFEA8AC55725
ISSN 2006-9723

http://www.academicjournals.org/JPHE

Journal of Public Health and Epidemiology

Full Length Research Paper

Prevalence of *Entamoeba histolytica* among primary school children in Akure, Ondo State, Nigeria

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Received 23 June, 2015; Accepted 28 July, 2015

Amoebasis is one of the major causes of morbidity and mortality world wide, especially in developing countries because of lack of safe potable water and low level of hygiene due to high level of poverty. This study determined the prevalence and spatial distribution of amoebasis in school age children in Akure, Ondo State, Nigeria. Two hundred and seventy eight (278) stool samples were examined for the cyst or trophozoites of *Entamoeba histolytica* using direct smear and floatation techniques. One hundred and eighty-eight (67.6%) of the samples were found to be positive for the parasite. Females (68.3%) were more infected than males (66.9%), but there was no significant difference between prevalence and sex. Children within the age group of 4 to 6 years old had the highest rate (85.3%) of infection. There was a significant difference between prevalence and the age groups. The highest prevalence of 33 (94.3%), 58 (95.0%), 80 (88.9%) and 73 (91.3%) were recorded among children who drink water fetched from the stream, buy food from food vendors, use pit toilet and were de-wormed nine months before stool sample collection (P < 0.05). Improved sanitation, personal hygiene and policy for regular de-worming of school age children by parents and Government will decrease the rate of intestinal infections.

Key words: Prevalence, *Entamoeba histolytica,* amoebasis, infection, hygiene, children.

INTRODUCTION

Intestinal parasites infection (IPIs) are globally endemic and have been described as constituting the greatest single world wide causes of illness and diseases (Steketee, 2003). Amoebasis is a condition due to the infection by *Entamoeba histolytica* and is known to cause about 450 million infections per annum in developing countries, with an incidence of about 50 million and 100,000 deaths (Ravdin and Petri, 1995). Intestinal Amoebasis is said to be the world greatest cause of death attributed to parasitic infection after malaria and schistosomiasis (Walsh, 1985). The infection is acquired through the feacal-oral route by consumption of food, water or drinks contaminated with cysts of the parasite. Licking or sucking of faecally contaminated hands have been documented to introduce the infection to humans (Aribodor et al., 2012).

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E. histolytica is an aerobic parasitic protozoan belonging to Genus *Entamoeba* and an etiology agent of Amoebasis. *E. histolytica* is pathogenic in the caecum and colon of human being. The term *'histolytica* literally means "Tissue dissolving'' referring to the carnivorous habit of the organism. *E. histolytica* is the most unique among the Amoebas because of its ability to hydrolyse host tissue. It can become a highly virulent and invasive organism causing diarrhea. Acute infection of Amoebasis may be presented with other infection apart from bloody diarrhea such as ulceration of the colonic mucosa, abdominal pain and a palpable mass in corresponding areas of the abdomen. Amoebasis may give rise to amoebic liver abscess and intestinal pathologies (Aribodor et al., 2012).

Amoebasis is widely spread in its distribution, occurring in all parts of the world. The invasive amoebasis is more prevalent in certain areas of the world including West and South-East Africa, China, Mexico and Western portions of South America, and the India subcontinent (Ravdin, 1988). The distribution of the infection was reported to relate more with inadequate environmental sanitation, poor personal hygiene and climate. Ademiluyi and Odugbesan (2013) reported that illegally disposed wastes within and around human immediate environment, open type latrines, unsafe drinking water and improper hand washing has really promoted and increased diarrhea and Amoebic dysentery cases.

In Nigeria, amoebasis is prevalent and widespread (Ajero et al., 2008). There have been several reports from various parts of Nigeria (Adeyeba and Akinlabi, 2002; Taiwo and Agbolade, 2000) which recognizes them as important health problems especially among young children. Several epidemiological studies have indicated a high prevalence of intestinal parasitic infections among Nigerian children (Agbolade et al., 2004). Amoebasis is contagious wherever the living condition is unsanitary and when the hygiene is poor. The chances are higher that the infection will pass from one person to another. When infected stool contaminates food or water supplies, it spreads to many people at once (Hague et al., 1995). Infants under a year old are rarely infected with amoebasis (Ajero et al., 2008). The incidence gradually increases during childhood and usually reaches its highest incidence in young adult (Azikiwe, 2006). Worm infestation results in malnutrition, anaemia and retarded growth, they cause absenteeism in children of school age and affect their performance, other physical and mental health problems with serious consequences may occur and overall development (Evans and Stephenson, 1995). The high prevalence of *E. histolytica* infections is closely linked with poverty, poor personal hygiene, poor environmental hygiene, and poor health service providers having an inadequate supply of drugs and lack of adequate and proper awareness of the transmission mechanisms and life cycle patterns of these parasites (Adeyeba and Akinlabi, 2002; Mbanugo and Onyebuchi, 2002).

The high morbidity and death associated with the disease, especially among school age children in Nigeria, are of significance, hence the need for this study.

MATERIALS AND METHODS

Study area

The study was carried out in Akure South Local Government Area of Ondo State, South West Nigeria between March and June, 2013. Akure Local Government lies on Latitude 7° 24 N and Longitude 5° 21 E with an average temperature of 27°C. Two schools, Federal University Staff Nursery and Primary School and St. Peter's Primary School were randomly selected.

Sample collection and examination

Prior to the commencement of the research work, permission was sought from the school authorities and parents of the pupils were informed. A total of 278 pupils aged between 2 to 12 years were enrolled in the study. Information on age, sex, source of food eaten in school, source of drinking water, type of toilet used, parents occupation and last day de-wormed were obtained from the subjects. Clean, labelled faecal plastic specimen bottles were given to the pupils and were instructed on how to introduce sample (stool) into the bottles. Stool samples were collected and transported to the research laboratory, Department of Biology for parasitological examination. In some cases, the stool samples were preserved using 10% formol ether.

Preparation of faecal smears and identification of parasite

Wet preparation

A small portion of the stool specimen was collected and mixed with 3% iodine solution to form a smear. A drop of 3% iodine was also dropped on the microscope slide, covered with a cover slip and viewed under the microscope using ×40 objective for identification of the parasite. This method was used because iodine stains the nucleus of *E. histolytica* properly for easy identification. Floatation method was also employed in analyzing the faecal samples. A portion of the stool was placed into a test tube containing saturated salt solution (0.98%) which is three-quarter full. The test tube was covered and shaked until the stool was completely emulsified, more salt solution was carefully added through pipette until the meniscus of the fluid was leveled with the tip of the test tube. A slide was held horizontally over the tube so that the surface touched the meniscus of the fluid and left standing for about five minutes. It was stained with eosin and after five minutes, cover slip was placed on the slide. The slide was examined under ×10 and ×40 objectives for identification of cyst of *E. histolytica* with its features as described by Cheesburough (1998).

Statistical analysis

Data collected were analyzed using Chi-square test to determine association between variables. Values were considered significant

Table 1. Prevalence of *Entamoeba histolytica* infection in relation to sex.

Sex	Number examined	Number positive	Percentage positive
Male	133	89	66.92
Female	145	99	68.28
Total	278	188	67.63

Table 2. Age related prevalence of *Entamoeba histolytica* infection.

Age	Number Examined	Number positive	Percentage positive
1-3	50	33	66.00
4-6	68	58	85.29
7-9	78	55	70.51
10-12	82	42	51.27

at $P < 0.05$.

RESULTS

Out of 278 pupils sampled, 188 (67.63%) were positive for *E. histolytica* and 100 (35.97%) were negative. The prevalence of *E. histolytica* in relation to sex showed that out of the 133 male examined, 89 (66.92%) were positive or infected, while of 145 female pupils examined, 99 (68.28%) were infected with *E. histolytica.* The slight increase in female compared to the male is not statistically significant ($P > 0.05$) (Table 1). Table 2 showed that the prevalence of the infection in relation to age was highest (85.29%) in 4 to 6 year age group while the least infection of 42 (51.22%) was recorded in 10 to 12 year age group. There was a significant difference between ages of the pupils ($P < 0.05$) (Table 2). The infection of *E. histolytica* in relation to sources of drinking water is shown in Table 3. Pupils using water from the stream had the highest infection (94.29%), while the least infections (55.15%) were found in pupils using tap/ borehole water. The prevalence of infection according to sources of drinking water is significant.

The prevalence of *E. histolytica* in relation to sources of food eaten in school showed that pupils who bought food from vendors had the highest infection (95.01%) while those that brought their food from their homes had the least infection (55.87%) (Table 4).There was a significant difference between food sources. Table 5 showed that the prevalence of infection in relation to type of toilet used was highest (88.89%) in pit toilet, followed by bush (77.78%) and least infection was found in water closet (55.29%). The infection of *E. histolytica* in relation to the last date the pupils took de-worming drugs is shown in Table 6. Pupils that were de-wormed a month earlier before this research work had the least infection (25.0%), while those that were de-wormed nine months and above had the highest infections (81.25 and 91.25%), respectively. Analysis showed a significant difference ($P < 0.05$).

DISCUSSION

The results obtained from this work showed that 188 (67.6%) of the 278 stool samples examined were positive for *E. histolytica*. Children aged 4 to 6 had the highest prevalence of 85.3% while age 10 to 12 had the least prevalence of 51.2%. The prevalence of *E. histolytica* recorded in this study is quite higher than those obtained by some other researchers. A prevalence of 26.7% among school age children was recorded in Lafia, Nasarawa State (Reuben et al., 2013), in Anambra, Southeast and Jos , Plateau State Nigeria, rates of 12.6 and 17.0% were recorded among children, respectively (Amuga and Onyeka,1995; Dawet et al., 2012). However, the highest prevalence of 72% for *E. histolytica* among other intestinal parasites was reported among food vendors in Abeokuta (Idowu and Rowland, 2004). Also report has shown 5.3% in India (Nduka et al., 2006) while 39.8% prevalence of the *E. histolytica*/*dispar* complex with microscopy in Northern Ghana (Ukpai and Ugwu, 2003). The comparative high prevalence of *E. histolytica* in this study can be attributed to poor sanitary practices, unhygienic methods of waste disposal, shortage of good water supply and low standard of personal hygiene among the children, since the transmission is mainly by faeco-oral route (Emmy-Egbe, 2009).

The insignificant difference ($P < 0.05$) in infection according to sex observed in this study agrees with Dawet et al. (2012) and Houmsou et al. (2010), where

Table 3. Prevalence of *E. histolytica* in relation to source of drinking water.

Source of water	Number examined	Number positive	Percentage positive
Well	107	80	74.77
Tap/Borehole	136	75	55.15
Stream	35	33	94.29
Total	278	188	67.63

Table 4. Prevalence of *E. histolytica* infection in relation to sources of food eaten at school

Food source	Number examined	Number positive	Percentage positive
Buying	67	58	95.01
Home	179	100	55.87
Others	38	30	78.95
Total	278	188	67.63

Table 5. Prevalence of *E. histolytica* infection in relation to type of toilet

Type of toilet	Number examined	Number positive	Percentage positive
Pit	90	80	88.89
Water closet	170	94	55.29
Bush	18	14	77.78
Total	278	188	67.63

Table 6. Prevalence of *E. histolytica* in relation to the last date of de-worming

Month	Number examined	Number positive	Percentage positive
1	60	15	25.0
2	58	35	55.17
9	80	65	81.25
>9	278	188	67.63
Total	80	73	91.25

they recorded non-significant differences in distribution of intestinal parasites by sex among primary school children in Jos, Plateau State and Markudi, Benue State, respectively. Taiwo and Agbolade (2000) maintained that both sexes have the same chance of contracting the disease, in as much as boys go barefooted during games and girls do so in most of their games. However, this result is in collaboration with the work of Lawan et al. (2004) where the females had higher infestation rate (57.5%) than their male counterpart (42.5%) in children under five years in Jos.

The high prevalence of 85.3 and 70.5% recorded among children between age groups 4 to 6 and 7 to 9, respectively could be as a result of their low immunity, social and sanitary habits since they spend most of their time outdoors. They play a lot with and on sand with no care and also eat most of the time with unwashed hands. A moderate prevalent rate of 55.7% recorded in ages 1 to 3 could also be attributed to their minimal contact with the outside environment since both at home and school they are always indoors for most of their activities. The age group 10 to 12 recorded lowest prevalence rate which could be attributed to their maturity and hygiene consciousness. The significant prevalence ($P < 0.05$) according to age recorded in this study is consistent with Houmsou et al. (2010), who reported that younger children

children below 14 years had high prevalence (54.5%) of intestinal parasite than older ones. Houmsou et al. (2010) and Reuben et al. (2013) also reported that age were significantly associated with the prevalence of *E. histolytica/dispar*.

The significant difference ($P < 0.05$) in the prevalence of *E. histolytica* in children that sourced water from well, tap and stream (74.8, 55.2 and 94.3%, respectively) could be due to the extent to which these water sources are associated with defaecation habits, sewage disposal habits and the level of sanitation at home and in the community at large. This result revealed that the prevalence of intestinal parasitosis was higher among children using water sources other than pipe-borne water alone. This work collaborate the report of Amuga and Onyeka (1995) where they reported significant infection rates of 26.9 and 25% of *E. histolytica* for users of surface water and unprotected well water, respectively while low infection rate of 11.4 and 15 were recorded for tap water and protected borehole water, respectively. Similarly, Lawan et al. (2004) reported a statistically significant relationship between gastro intestinal infection and source and domestic treatment of drinking water, among the under-fives in Jos. However, the result of this study is contrary to the reports of Dawet et al. (2012) and Oyerinde et al. (1979) who reported that the prevalence of *E. histolytica* was not associated with type of water supply but was seemingly influenced by storage of household supplies.

The significant difference ($P < 0.05$) in the prevalence of *E. histolytica* in children that sourced food eaten at school from buying (food vendor), home and other sources (95.0, 55.9 and 79%) could be due to the sanitary habits of the food vendors since their sole aim is to make profit. The lowest prevalence recorded in children who brings food from their various homes could be attributed to the level of good hygiene practiced at home. With respect to toilet types, children who use water closet toilet had the least prevalence (55.3%) while children who use pit toilet had the highest prevalence of 88.9% which could be as a result of the poor hygiene and maintenance of the environment as previously reported by Ademiluyi and Odugbesan (2013) since most of the children after using the toilet will not wash their hand and still eat with such hands. Flies also carry foods contaminated with faecal material from one place to another (Reuben et al., 2013).

The significant difference ($P < 0.05$) between the prevalence of *E. histolytica* and last date of de-worming among the children studied showed that it is advisable for parents and guardians to de-worm their ward in the space of three months interval as specified by some researchers. The children that were de-wormed a month earlier of this study had the least prevalence (25%) while those that were de-wormed nine months and above had high prevalence of 81.3 and 91.3%, respectively.

Conclusion

The high prevalence of *E. histolytica* infection in children in tropical Africa is a developmental challenge which calls for the assessment of the impact of programmes on millennium development goals in the areas of health. Mass chemotherapy and integrated measures of parasitic control would be of utmost importance in reducing the level of infections among children. Therefore, it is recommended; that the public should be sensitized on personal and public health; health education on these parasitic diseases should be taught in school and through the local health workers to the people of their immediate environment.

ACKNOWLEDGEMENTS

We are grateful to the management of the schools used for the study. Thanks also go to the parents of the children examined.

Conflict of interest

Authors have none to declare

REFERENCES

Ademiluyi IA, Odugbesan JA (2013). Sustainability and impact of community water supply and sanitation programmes in Nigeria, *An overview:* Afr. J. Agric. Res. (12):811-817.

Adeyeba OA, Akinlabi A (2002). Intestinal parasitic infections among school children in a rural community, Southwest Nigeria, Nig. J. Parasitol. 23:11-18

Agbolade OM, Akinboye D, Awolaja A (2004). Intestinal helminthiasis and urinary schistosomiasis in some villages of Ijebu North, Ogun State, Nigeria, Afr. J. Biotech. 3:206-209.

Ajero CM, Nwoko BEB, Nwoke EA, Ukaga CN (2008). Human Amoebasis: Distribution and burden; and the Nigerian Environment, Int. Sci. Res. 12:130-134.

Amuga AG, Onyeka JOA (1995). Prevalence of Entamoeba histolytica among rural community in Bassa Local Government Area of Plateau State, Ngeria, J. Pest Dis. Vector Manag. 2:89-92

Aribodor DN, Anidebe AO, Eneanya AO, Emelummadu OF (2012). *Entamoeba histolytica* Infection in Children Aged 0-12 Years in Rural Communities in Anambra State, Nigeria. Niger. J. Parasitol. 33(2):129-132.

Azikiwe AN (2006). Prevalence and pattern of intestinal infestation in an African University Community, Ann. Trop. Med. Parasitol. 78:333-334

Dawet A, Yakubu DP, Remkyes MS, Daburum YH (2012). Prevalence of *Entamoeba histolytica* and *Entamoeba dispar* among School Children in Jos L.G.A., Plateau State, Nigeria, Nigeria J. Parasitol. 33(1):77-83

Emmy-Egbe IO (2009). Studies on Intestinal Helminth Parasites in parts of Anambra State, Nigeria, Ph.D thesis, pp. 1-2, 99-106.

Evans AC, Stephenson LS (1995). Not by drugs alone: the fight against parasitic helminthes. World Health Forum 16:258-261.

Hague R, Nevielle P, Hahn P, Petri WJr (1995). Rapid diagnosis of *Entamoeba* infection by using *Entamoeba histolytica* stool antigen detection kits. J. Clin. Microbiol. 33:2558-2561.

Houmsou R, Amuta E, Olusi T (2010). Prevalence of Intestinal parasites among primary school children in Markudi, Benue State, Nigeria. The Internet J. Infect. Dis. 8(1):78-84.

Idowu OA, Rowland SA (2004). Oral faecal parasites and personal hygiene of food handlers in Abeokuta, Nigeria. Afr. Health Sci. 6(3):160-164.

Lawan UM, Zoakah AI, Abubakar IS, Yusuf NW (2004). The pattern and common risk factors for gastro-intestinal infections among under-fives in Hwolshe, a peri-urban settlement in Jos. Borno Med. J. 1(2):1-6.

Mbanugo JI, Onyebuchi CJ (2002). Prevalence of Intestinal Parasitesin Ezinifite Community in Aguata LGAof Anambra State, Niger. J. Parasitol. 23:27-34.

Nduka FO, Nwaugo VO, Nwachukwu NC (2006). Human Intestinal Parasite Infections in Ishiagu, aLead mining area of Abia State. Ann. Res. Int. 3(3):505-507.

Oyerinde JP, Alonge AA, Adegbite-Hollist AF, Ogunbi O (1979). The epidemiology of *Entamoeba histolytica* in a Nigeria urban population. Int. J. Epidemiol. 8:22-29.

Ravdin J (1988). Amoebasis: Human infection by *Entamoeba histolytica*, NewYork John Wiley and Sons 105-109.

Ravdin JL, Petri WA (1995). *Entamoeba histolytica* (Amoebasis), Principles and Practice of Infectious Diseases, 4th edition. Churchill Livingstone, New York pp. 2395-98.

Reuben CR, Katsa M, Hassan SC (2013). Prevalence of Intestinal Amoebasis in School Age Children in Lafia, Nasarawa State, Nigeria. Int. Res. J. Biol. Sci. 2(7):42-45.

Steketee RW (2003). Pregnancy, nutrition and parasitic diseases, J. Nutr. 133:1661-1667.

Taiwo AK, Agbolade OM (2000). Intestinal helminthiasis among school children in Oru, Ogun State, Nigeria. Niger. J. Sci. 34:283-286.

Ukpai OM, Ugwu C (2003). The prevalence of gastro intestinal tract parasites in primary school children Ikwuano Local Goovernment Area of Abia State, Nigeria. Niger. J. Parasitol. 24:129-136.

Walsh JA (1985). Prevalence of *Entamoeba histolytica* infection in: Ravdin J.ed. Amoebasis: Human infections by *Entamoeba histolytica*, New York Churchill Livingstone pp. 93-105