Determination of Prevalence Rate of *Entamoeba histolytica* Among Children Diagnosed with Acute Diarrhea in Kano, Nigeria

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ABSTRACT

**Objective:** The study was aimed to determine the prevalence of *Entamoeba histolytica* among children diagnosed with acute diarrhea in Kura General Hospital Kano, from February to August 2017.

**Methods:** A total of 236 stools samples were collected from children within the age group of 0–5 years diagnosed with acute diarrhea attending the hospital. The stool samples were examined for *E. histolytica* cysts and trophozoites using direct wet preparation and formol-ether concentration techniques.

**Results:** The result showed that 23 samples which accounted for 9.75% of the samples were found to be positive for the parasite. Highest incidence of the parasite was found among children within the age category of 4–5 years. The results also indicated that males (56.5%) were more infected than females (43.5%). However, there is no statistical difference in the rate of infection among the sex and age group of the patients at p<0.05.

**Conclusion:** Maintenance of personal hygiene and improved sanitation of the environment will indeed prevent contamination of food and water sources.

**Keywords:** *Entamoeba histolytica*, Acute diarrhea, Children, Prevalence.

INTRODUCTION

More than 50% of the world populations are infested with helminthes and protozoans [1]. Most people are asymptomatic to these infections but certain intestinal parasites may cause diarrhea and other related diseases [2]. Amoebiasis is a medical condition due to infection by protozooan parasite called *Entamoeba histolytica*. The organism is considered as the invasive type due to its intestinal tissue dissolving carnivorous potential, thus of medical importance [3]. Intestinal amoebiasis due to *E. histolytica* was ranked third among parasitic protozoan infection leading to death after malaria and schistosomiasis [4]. Transmission of the infection includes unsanitary habits, contamination of food and water by human feces already infected with the parasite as well as direct fecal-oral contact [5]. About 10% of infected individuals show clinical symptoms, which occur with invasive amoebiasis which though over 48 million people annually. Majority of symptomatic patients are presented with amoebic colitis while the rest manifested with extra-intestinal disease, most commonly as liver abscess [6]. The incidence and prevalence of amoebiasis vary in different part of the world [7]. The prevalence is increased in such a way that the newborn is now being reported with the infection [8].

The prevalence of infection caused by *E. histolytica* is very low in industrialized countries (about 1%) and high in tropical countries (about 50–80%) [9]. Clinical presentation of the intestinal infection may include abdominal discomfort, weakness, malaise, and constipation that may alternate with diarrhea, dysentery with the passage of exudates, blood and mucus, as well as colicky abdominal pain [10]. Systemic sign of infection includes fever, rigors, and polymorphic nuclear leukocytes while liver abscess results from infection through the intra-hepatic portal vessels [11]. *E. histolytica* infection is found in over 50% of the patients with acute diarrhea [12–14]. A study conducted in Egypt showed that 57.1% of the general patients with acute diarrheas were positive for the presence of *E. histolytica* [15]. On the other hand, similar study conducted in Saudi Arabia demonstrated that *E. histolytica* was found to be responsible for only 2.2% of acute diarrheas among children below 5 years of age [16]. The study was aimed to determine the prevalence of *E. histolytica* among children diagnosed with acute diarrhea in Kura General Hospital Kano.

METHODS

**Ethical clearance**

The ethical approval for the study with reference number MOH/off/797/T1/52 was obtained from Kano State Ministry of Health through Health Service Management Board Kano based on the consent of Kura General Hospital ethical committee.

**Study area**

Kura local area council is geographically located in the southern part of the state along Kano – Zaria road with a distance of about 35 km from the state capital. It is located at Latitude 11° 46’17” N and Longitude 8° 25’ 49” E. It covers an area of about 206 km² of land and population of about 144,601 according to 2006 census [17]. Kura Local Government shares common boundaries with Dawakin-kudu (East), Bunkure (South), Garun-Mallam (West), and Madobi Local Government (North) [17]. Kura is a rural communities inhabited by people whose predominant occupation is farming.

**Samples collection and examination of *E. histolytica***

A total of 236 stools samples were collected from children (125 males and 111 females) within the age group of 0–5 years diagnosed with acute diarrhea attending Kura General Hospital Kano Hospital from February to August 2017 in clean, dry, and leak proof sterile bottle. The specimens were immediately transported to the Laboratory of Department of Biological Sciences Bayero University, Kano for examination of *E. histolytica* cysts and trophozoites. The stool samples were examined for *E. histolytica* cysts and trophozoites using direct wet preparation and formol-ether concentration techniques.
Among children age between 0 and 5 years in this study was found to be 9.75%. Several studies on determination of the prevalence of *E. histolytica* were conducted worldwide [19-22]. The result of this study is in conformity with the result of Nynke et al. [23] on prevalence of intestinal amoebiasis in infant and junior school children in Degema General Hospital and environs who found percentage prevalence of 11%. This result also justifies the study of Memen et al. [24] who found the percentage of intestinal Amoebiasis in Children as 8.47%. The prevalence of 9.75% in this study is within the prevalence range of 5–15% of all protozoan infection as a causative agent of acute diarrhea as estimated by the World Health Organization. The result of prevalence rate of *E. histolytica* in the present study is higher than the reported prevalence of 4.2–6.5% of *E. histolytica* infection in Bangladesh children with diarrhea and also that of a Mexican study that found 8.4% of the samples to be seropositive for *E. histolytica* [25]. In Jordan, 8% of the reported acute gastroenteritis cases are because of *E. histolytica* [13]. However, the result of this study is lower than a similar study from Colombia who reported *E. histolytica* to be responsible for 10% acute diarrhea in children [26]. On the other hand, finding of this study was contrary to that of Mclver et al. [27] in Australia whose study did not find *E. histolytica* among children diagnosed with acute diarrhea. Several factors were responsible for the prevalence of *E. histolytica* in the present study, such factors include; poor drainage system, low standard of personal hygiene, and unhygienic method of sewage disposal.

Among the age categories in this study the children within age bracket of 4–5 years were highly infected, 8 (3.39%). Higher prevalence among children in this group can be as result uncontrolled wandering around the street and other activities such as swimming. Low prevalence rate among subjects category of <1 year may be attributed to their innate resistance due to production of secretory immunoglobulin A that can minimize the adhesion between *E. histolytica* trophozoites epithelial cells, hence reducing new infection [28]. Findings from this study revealed that male children were more infected (5.51%) than the female ones (4.24%). However, the difference is not statistically significant (p<0.05). This is possible due to the reason that both gender are living in the same community and generally engaged in similar activities such as farming and hence exposed to similar hazard continually.

**DISCUSSION**

The prevalence rate of *E. histolytica* among children age between 0 and 5 years has the highest prevalence with total of eight subjects which accounted for 3.99%, followed by 2–3 years and 3–4 years 5 subjects each (2.12%), 1–2 years 3 subjects (1.27%), and lowest frequency was found among patients of less than a year 2 (0.85%). With respect to sex, higher incidence was found among males with total of 13 subjects which accounted for 5.51% while female has ten positive samples (4.24%). The result is not statistically significant at p<0.05.

Table 1: Age and sex distribution of the participants

| Age (year) | Male (n) | Female (n) |
|------------|----------|------------|
| <1         | 20       | 19         |
| 1–2        | 22       | 25         |
| 2–3        | 28       | 22         |
| 3–4        | 25       | 24         |
| 4–5        | 30       | 21         |
| Total      | 125      | 111        |

**Table 2: Prevalence of *E. histolytica* based on age**

| Age (year) | No. of samples (n) | Positive samples (n) | Prevalence (%) | p-value          |
|------------|--------------------|----------------------|----------------|------------------|
| <1         | 39                 | 2                    | 0.85           | 0.528557*       |
| 1–2        | 47                 | 3                    | 1.27           |                  |
| 2–3        | 50                 | 5                    | 2.12           |                  |
| 3–4        | 49                 | 5                    | 2.12           |                  |
| 4–5        | 51                 | 8                    | 3.39           |                  |
| Total      | 236                | 23                   | 9.75           |                  |

*Chi-square value is 3.1776. The result is statistically not significant at p<0.05. *E. histolytica: Entamoeba histolytica*

**Table 3: Prevalence of *E. histolytica* based on sex**

| Sex       | No. of samples (n) | Positive samples (%) | Prevalence (%) | p-value          |
|-----------|--------------------|----------------------|----------------|------------------|
| Males     | 125                | 13 (56.5)            | 5.51           | 0.616589*       |
| Females   | 111                | 10 (43.5)            | 4.24           |                  |
| Total     | 236                | 23 (100)             | 9.75           |                  |

*Chi-square value is 0.2507. The result is statistically not significant at p<0.05. *E. histolytica: Entamoeba histolytica*
4. Farthing MS, Cavellos AM, Kelly P, Cook GC. Intestinal protozoa. In: Manson’s Tropical Disease. 20th ed. London: W.B. Saunders Company; 1996. p. 1255-67.

5. Ramasubramaniam V. Amoebiasis; 2008. Available from: http://www.webhealthcentre.com/diseaseconditions/ameb.aspx. [Last accessed on 2009 Jun 19].

6. Guven A. Amoebiasis in the new born. Indian J Pediatr 2003;70:437-8.

7. Dialogue on Diarrheal; 1986. Available from: http://www.rehydrate.org/dd/pdf/dd27.pdf. [Last accessed on 2007 Feb 5].

8. Kaur R, Rawat D, Kakkar M, Uppal B, Sharma VK. Intestinal parasites in children with diarrhea in Delhi, India. Southeast Asian J Trop Med Public Health 2002;33:725-9.

9. Nesbitt RA, Mosha FW, Katki HA, Ashraf M, Assenga C, Lee CM. Amoebiasis and comparison of microscopy to ELISA technique in detection of Entamoeba histolytica and Entamoeba dispar. J Natl Med Assoc 2004;96:671-7.

10. Haque R. Rapid diagnosis of Entamoeba histolytica infection by using Entamoeba histolytica stool antigen detection kits. J Clin Microbiol 1995;33:2558-65.

11. Huston CD, Haque R, Williams A, Peter J. Molecular based diagnosis of Entamoeba histolytica infection. Experts Rev Mol Med 1999;1999:223-5.

12. Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990-2020: Global burden of disease study. Lancet 1997;349:1498-504.

13. Haque R, Huston CD, Hughes M, Houp E, Petri WA Jr. Current concepts: Amoebiasis. N Engl J Med 2003;348:1565-73.

14. Loshak D. Unexpectedly high prevalence of amoebic colitis among acute diarrhea patients in Egypt. Doctors guides review. Diagnosis of amoebic colitis by antigen, capture ELISA in patients presenting with acute diarrhea in Cairo, Egypt. Trop Med Int Health 2002;7:365-6.

15. Abd-Alla MD, Ravdin JI. Diagnosis of amoebic colitis by antigen capture ELISA in patients presenting with acute diarrhea in Cairo, Egypt. Trop Med Int Health 2002;7:365-70.

16. El-Sheikh SM, El-Assouli SM. Prevalence of viral, bacterial and parasitic enteropathogens among young children with acute diarrhoea in Jeddah, Saudi Arabia. J Health Popul Nutr 2001;19:25-30.

17. National Population Commission. National Population Census Result. Abuja Nigeria: National Population Commission; 2006.

18. Tanyukssel M, Petri WA Jr. Laboratory diagnosis of amoebiasis. Clin Microbiol Rev 2003;16:713-29.

19. Pugh RN, Burrows SW, Bradey AK. Malunfashin endemic disease. Research project XVI, findings of a survey for Schistosoma mansoni, Hookworm, Girdiasis, E. Histolytica and nutritional status. Ann Trop Med Parasitol 1981;75:279-81.

20. Reynoldsion JA, Behneke JM, Pallant LJ, Machniss MG, Gilbert F, Gilles S. Failure of Pyrantelin treatment of human Hookworm infections (Anelystoma duodenale) in the Kimberly Region North West Australia. Acta Trop 1997;63:301-12.

21. Alaribe AA, Ursalo SJ, Gemede EL, Ejezie GC. Brine flotation (BF) as a standard technique for the detection of poly parasitism from stool. J Med Lab Sci 1994;4:16-20.

22. Agi PI. Comparative helminth infections of man in two rural communities of the Niger Delta, Nigeria. West Afr J Med 1997;16:232-6.

23. Nynen C, Chakwajekwu DC, Stanley HO, Awoibi NK. Prevalence of intestinal amoebiasis in infant and junior school children in Degema general hospital and environs. J Appl Sci Environ Manage 2008;12:83-7.

24. Memon IA, Jamal A, Memon H, Parveen N. Intestinal amoebiasis in children and its effect on nutritional status. J Coll Physicians Surg Pak 2009;19:440-3.

25. Katz DE, Taylor DN. Parasitic infections of the gastro-intestinal tract. Gastroenterol Clin North Am 2001;30:797-815.

26. Urbina D, Arzuza O, Young G, Parra E, Castro R, Pueldo M. Rotavirus Type A and other enteric pathogens in stool samples from children with acute diarrhea on the Colombian Northern coast. Int Microbiol 2003;6:27-32.

27. McVey CJ, Hansman G, White P, Doultree JC, Catton M, Rawlinson WD. Recognition of enteric pathogens in children with gastroenteritis. Pathology 2001;33:353-8.

28. Barbosa-Sabanero G, Avila E. Recognition of Entamoeba histolytica IIS, KDA surface protein by human secretory immunoglobulin from asymptomatic carriers. J Parasitol 2004;90:373-82.