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Prevalence and Associated Pre-Disposing Factors of Amoebiasis among School Children in Makurdi Metropolis, Benue State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author MOI designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors NGI and ETA managed the analyses of the study. Author MOI managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

An epidemiological survey was conducted to determine the Prevalence and associated pre-disposing factors of amoebiasis among school children in Makurdi Metropolis, Benue state, Nigeria. Information on sex, age, location, source of drinking water, occupation of caregivers was retrieved through structured questionnaires. Three hundred and eighty five (385) stool samples were randomly collected and examined from children less than five years of age attending different Hospitals and Schools. Direct wet mount and Formol-ether concentration technique were adopted. Findings were subject to Chi-square analysis at P= 0.05. Findings revealed that a total of 8.31% children were infected with amoebiasis. Age related prevalence of infection showed the highest rate among children of 49-60 months (19.2%) and lowest among children of <12 months (1.5%; p<0.05). The males showed the highest prevalence (14.1%) than the females (8.46%) without a significant differences (p>0.05). Location related prevalence showed that the infection rate in Wadata was highest (18.4%), and the lowest prevalence was at High-Level (4.5%; p<0.05). Distribution of *Entamoeba histolytica* infection based on the major sources of drinking water showed that subjects

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who depended on tank reservoir as their major source of drinking water recorded the highest prevalence (18.8%), while those that drank packet water recorded no case of infection ($p<0.05$). Occupational prevalence showed that infection rate was highest among children whose caregivers were traders (13.5%), followed by farmers (9.6%), while civil servants showed the lowest prevalence of infection (9.0%; $p>0.05$). Increased health education, awareness creation, and provision of essential amenities for the children and their caregivers will go a long way in mitigating the present scenario.

Keywords: Prevalence; Entamoeba histolytica; school-children; pre-disposing factor; Makurdi.

1. INTRODUCTION

Amoebiasis is caused by a protozoan *Entamoeba histolytica* which is part of the genus *Entamoeba* predominantly infecting humans and other primates [1]. The trophozoite stage of *E. histolytica* invades the colonic mucosa of host, where it ingests erythrocyte and causes ulceration. This leads to diarrhoea which often contains blood and mucus [2].

It was estimated that diarrhea accounted for 9·9% of the 6·9 million deaths among children under 5years in 2011 [3]. Infections with *Entamoeba histolytica* can be acquired by the faecal-oral route either directly by eating or drinking faecally contaminated food or water [4]. It is highly endemic throughout poor and socio-economically deprived communities in the tropics and subtropics. Environmental, socio-economic, demographic, and hygiene-related behavior is known to influence the transmission and distribution of intestinal parasitic infections [5].

In many individuals, the infection remains asymptomatic whereas some patients exhibit severe symptoms which include (in order of frequency) diarrhea, malaise, excessive gas (often flatulence or a foul or sulphuric-tasting belch, which has been known to be so nauseating in taste that it can cause the infected person to vomit), epigastric pain, bloating, nausea, diminished interest in food, possible (but rare) vomiting which is often violent, and weight loss [6]. Children are more prone to infection than adults [7]. The laboratory diagnosis of amoebiasis is based on identifying cysts and the tropozoites in stool specimen using light microscopy, concentration and direct wet mount [8].

2. PATIENTS AND METHODS

2.1 Study Area

The study was conducted between April 2014 - November 2014 in Makurdi, the capital of Benue State, Nigeria. Wadata, Wurukum, High Level and North Bank, are high-density residential areas selected based on the human population. Makurdi lies between latitude 07°15'–07°45'N and longitude 08°15–08°40'E with altitude 113 m (370 ft). It has a tropical wet and dry/ savanna climate with a pronounced dry season in the low-sun months. The area has an annual rainfall of about 900-1000mm. The town lies in the guinea savanna vegetative belt and on the bank of the second largest River in Nigeria, River Benue. The river divides the town into north and south banks and the town covers an area of 16 Km^2**.** The river constitutes the main source of water supply for the inhabitants of the town.

2.2 Ethical Clearance

Ethical approval was sought and obtained from the Benue State Health Management Board; also consent was sought from teachers and parents of pupils through their head teacher and School Owners, before sample collection. Some of the consent was oral because some of the parents can neither read nor write. Those who refused to give fecal samples or to answer the questionnaire were simply excluded from the study.

2.3 Sample Collection

Three hundred and eighty five (385) Stool samples were collected from children attending various Hospitals and schools. Out of the 384 children sampled, male constitute 184 and 201 female. Also the range is between ≤ 12- 60 months old. 10 g of stool sample were collected from children attending in the Hospitals and Pre-nursery schools through the assistance of the parents, school nannies and ward attendants into well labelled wide mouthed sterile specimen bottle. Fresh stool samples were collected in the morning without contamination with urine.

2.4 Laboratory Techniques

The samples were first examined macroscopically identifying their morphology.

Prepared Lugols iodine solution was drop at the centre of the slide, using Pasteur pipette. A portion of stool sample collected was mixed with Lugols iodine solution on the slide and covered with cover slip. The prepared slide was then examined for cysts, trophozoites and eggs of parasites using 10x and x40 objective lens.

A portion was preserved with 10% of formalin for formol-ether concentration technique to detect the presence of cysts and trophozoites. Identification was done by the manual of Cheesbrough [8].

2.5 Statistical Analysis

The prevalence of the parasites infection was calculated in percentage while data analysis was done using chi square. The level of statistical significance was set at p = 0.05.

3. RESULTS

Out of the 385 school aged children admitted into the study and screened for infection, 32(8.3%) were infected with amoebiasis with the age bracket 49-60 months being the most infected (19.2%), this was followed by 25-36 months (14.3%) and 37-48 months (12.7%). The lowest prevalence was in children <12 months (1.5%) (Table 1). The differences in prevalence amongst age groups were statistically significant (p<0.05).

The distribution of amoebiasis among school aged children in relation to sex was given in Table 2. Male children had higher prevalence 19(10.3%) compared to the female children 13(3.8%). However, the test of difference was not significant (p>0.05).

Table 3 shows the number of respondents in relation to location. Out of 385 respondents, 101 were from North-bank of which 9(8.91%) tested positive for amoebiasis, 97 respondents from Wurukum, 7(7.2%) tested positive for the parasites. 12(12.2%) tested positive of 98 respondents from Wadata and of 89 respondents from High-level, 4(4.5%) tested positive. However, the difference was not statistically significant (p>0.05)

Occupational status of children's caregiver showed that the infection rate was highest among the traders (10.1%), followed by farmers (7.5%), while the civil servants showed the least prevalence (5.5%) of amoebiasis (Table 4). Difference in occupational prevalence was found not to be statistically significant (p>0.05).

Prevalence of amoebiasis with respect to the main sources of drinking water. Highest prevalence is in children's homes where tank reservoirs (18.8%) were used, followed by rain water (16.7%) and boreholes (13.5%). The lowest prevalence was observed in children homes where packaged water (0.0%) was used. *E. histolytica* occur in all the sources of drinking water except package water (0%) (Table 5) However, there was no significant difference in infection rate (p>0.05).

Table 1. Prevalence of amoebiasis with respect to age

Age (Months)	No. examined	No. infected	Percentage
<12	65	1	1.5
13-24	94	5	5.3
25-36	77	8	10.4
37-48	71	7	9.9
49-60	78	11	14.1
Total	385	32	8.3

Table 2. Prevalence of amoebiasis with respect to sex

Sex	No. examined	No. infected	Percentage
Male	184	19	10.3
Female	201	13	3.8
Total	385	32	8.3

Table 3. Prevalence of amoebiasis with respect to location

Location	No. examined	No. infected	Percentage
North-Bank	101	9	8.9s
High-level	89	4	4.5
Wadata	98	12	12.2
Wurukum	97	7	7.2
Total	385	32	8.3

4. DISCUSSION

This study evaluates the prevalence of *Entamoeba histolytica* among school aged children in Makurdi metropolis of Benue State, Nigeria.

The prevalence of 8.3% recorded in this study was moderately lower than the prevalence of 10% reported by WHO [9] for developing countries. This result may be due to greater level

Table 4. Prevalence of amoebiasis with respect to parents' occupation

Occupation of caregiver	No. examined	No. infected	Percentage
Civil servants	134	10	7.5
Traders	178	18	10.1
Farmers	73	4	5.5
Total	385	32	8.3

Table 5. Prevalence of amoebiasis in relation to the main sources of drinking water

Sources of drinking water	No. examined	No. infected	Percentage
Stream/ rivers		1	5.3
Boreholes	133	13	9.8
Pipe borne	21	1	4.8
Rain	6	1	16.7
Well	105	9	12.4
Tank /Reservoirs	16	2	12.5
Packed water	17	_ _	
Borehole+ reservoirs	12	2	6.9
Well + Rain	29	1	8.3
Reservoirs +Rain	8	1	12.5
Borehole +Packed water	19	1	5.3
Total	385	32	8.3

of public health awareness in some areas. Findings however were in agreement with previous studies by Nyenke et al. [10] who reported (9%) prevalence in Degema. This was not consistent with the previous studies published by Houmsou et al. [11] who reported 2.2% in Makurdi, Benue State However, higher ($p>0.05$) prevalence was reported from previous studies where sanitation and personal hygiene were poor. Aribodor et al. [12] reported a prevalence of 12.6% in Anambra, Nigeria.

This research also showed that the male preschool children had a higher prevalence (14.1%) than the female children (8.5%). The study revealed that male children were found to influence amoebiasis. The higher rate of infection in male may be due to the more activities and as they were more in contact with environmental conditions than female.

Most male children especially between 3-5 years of age in their playing habits were exposed to polluted water from the environment or picking objects even from the heap of refuse dumps as their level of health education was not adequate for them to know the dangers of handling such objects that are likely to be contaminated. The result is in conformity with Aribodor et al. [12] who reported that males were more infected with a prevalence of 16.1% than females who had a prevalence of 9.3%. it also agrees with previous studies published by Amoke et al. [13] who reported 16.7% in male and 6.9% in female, However, higher prevalence in female children than the male children were reported by Inabo et al. [14] among primary school pupils around Zaria and Kaduna. This study also disagrees with the work of Orji et al. [15] who observed a higher prevalence of intestinal parasite in females than in males.

Infection in our study was present in all age groups and infection increased after first year of life, reached maximum at (25 – 60) months of age. The differences with age groups was statistically significant ($p<0.05$) However, the age range between 25-60 months were more susceptible to water borne infections because their playing habits and hygienic practices may predispose them to infection due to less care given to them than the age ranged between 1-12 months, where the protective care was adequate coupled with breast milk that contain antibodies and several anti infective factors such as bile salt stimulated lipase which was passed from the mother to the child during breast feeding, thereby enhances their immunity and protecting them against amoebic infection in the first year of life [16].

Water supply is an important risk factor for several outbreaks have resulted from the contamination of water supplies with *Entamoeba histolytica* cysts. Most people supply themselves with water from several sources of water at the

same time. Boreholes and dug wells are the main water sources in Makurdi town. In our study the highest prevalence was observed in children's homes where tank reservoirs were used, followed by rain water and boreholes the lowest prevalence observed in children's homes where packaged water was used showed no positive cases of infections. The sources of drinking water did not significantly influence the prevalence of amoebiasis. This high prevalence may be due to contamination of water supplies with human waste, poor quality of water, faulty sewage lines and insufficient level of chlorine. Water, irrespective of its source can easily be contaminated during handling, especially where sanitation and personal hygiene of caregivers are generally poor. Report from the Centre for Disease Control and Prevention [17,18] shows that transmission or outbreaks of diarrhea were contracted from contaminated source of drinking water such as well, ditches, spring and stream/rivers. No significance difference of these sources of drinking water with infection agreed with Sharon et al. [19]. A study conducted by Obadiah [20] in Zaria, Nigeria reported that sources of drinking water were not significant with *Entamoeba histolytica* infection.

The result from this study showed that children's home location environment influenced infection with *Entamoeba histolytica.* This implies that both North-bank and Wadata and its environs have the same predisposition of amoebiasis.

5. CONCLUSION

The present study showed a high prevalence of *Entamoeba histolytica* infection in asymptomatic children residing in Makurdi Metropolis. The factors more directly associated with the risk of amoebiasis infections shown to be age, home location, toilets and Parents' occupation, suggests that an increment in sanitation may likely have positive influence on the wellbeing of Makurdi children. Improved water supplies should be used, including protection of community wells and domestic storage tanks, together with mandatory inspection measures during transportation and distribution of commercial water to reduce the infection.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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