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Prevalence of Amoebiasis Among Children Aged 0- 12 years in Health Facilities in Dutse Local Government Area, Jigawa State, Nigeria

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Abstract
Amoebiasis is an infection caused by a protozoan parasite Entamoebahistolytica which is a pathogenic amoeba associated with intestinal (amoebic colitis or amoebic dysentery) and extra-intestinal (liver abscess) infections. Previous study in Dutse Local Government in 2017 among "Almajiris" as well as some health facilities reported zero prevalence of the infection. This research determined the prevalence of amoebiasis among children aged 0-12 years in a secondary and two primary health facilities in Dutse Local Government Area, Jigawa State, Nigeria. One hundred (100) stool samples were collected from children attending the three health facilities and examined for the presence of cysts and/or trophozoites of Entamoeba histolytica using Formal-Ether Concentration method. Prevalence of amoebiasis was calculated and expressed in percentages. Chi squared was used to find out if there was no significant difference between prevalence of amoebiasis and factors such as gender, age, type of toilet, source of drinking water and finger sucking habit while Pearson Moment of Correlation was also calculated to determine the strength association between amoebiasis infection and the risk factors. The level of significance was determined at $P < 0.05$ and 95 % confidence interval. An overall prevalence of 2(2.00%) was recorded and all the infections were among males 2(3.45%) and also among the age group 0 – 3 years old. An infection was observed among users of pit latrine, 1(1.92%) and plastic containers, 1(3.03%). Based on source of drinking water users of tap water had 1(1.79%) while well water users, 1(4.76%). Habitual finger suckers as well as non-finger suckers had 1(2.67%) and 1(1.18%) respectively. There was no significant difference in prevalence of amoebiasis among the six different risk factors at $P < 0.05$. Again none of the six risk factors was found to be associated with prevalence of amoebiasis also at $P < 0.05$. Although amoebiasis appeared to be of low prevalence in the study area there is need to sustain improved portable water supply, general sanitation and health education in order to rid the community of E. histolytica and of course amoebiasis. Further work needs to be done using larger samples of subjects, covering more health facilities and also using more sensitive diagnostic methods such as Polymerase Chain Reaction PCRC) and Enzyme Linked Immunosorbent Assay (ELISA).

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Keywords: Prevalence, Entamoeba histolytica, Amoebiasis, Risk Factors, Health Facility, Formal-Ether Concentration Method

INTRODUCTION

Amoebiasis is an infection **c**aused by a protozoan parasite called *Entamoebahistolytica* (WHO, 1997). *Entamoeba histolytica* is the parasite responsible for amoebiasis and remains one of the top three parasitic causes of mortality worldwide (Michalla *et al.,* 2018).Several species of *Entamoeba*, such as: *E.coli,E.dispar*, *E. moshkovskii, E. hartmanni* and *E. polecki* infect humans, but not all of them are associated with the disease (Kagan, 1970; Mehmet and Petri, 2003). *E.histolytica* is well recognized as a pathogenic amoeba associated with intestinal (amoebic colitis) and extra-intestinal (liver abscess) infections and other invasive forms of the disease (WHO, 1997 andLucas and Upcroft, 2001).

Intestinal amoebiasis is frequently asymptomatic. Symptomatic cases vary from dysentery with fever, chills and bloody or mucoid diarrhea alternating with periods of constipation. Also, invasive infection can cause severe amoebic dysentery and extra-intestinal amoebiasis occurs when the parasite invades other organs such as liver, lung or brain causing abscesses (Lauren, 2004). Only approximately 10% of *E. histolytica* infected individuals show clinical symptoms with intestinal and/or extra-intestinal pathology (Gatti *et al.,* 2002).

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). 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 (Benetton *et al*., 2005; 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).

Amoebiasis occurs worldwide, with approximately 50 million people infected annually, causing close to 100,000 deaths per year (WHO, 1997; Ravdin and Stauffer, 2005). Amoebiasis is more common in areas with poor sanitation and nutrition particularly in the tropics (Ravdin and Stauffer, 2006). Morbidity and mortality occurs in Africa, Asia and Central and South America (Petri and Singh, 1999; 2006). In Nigeria several studies have reported prevalence ranging from 0.0% to 67.6% (Ogunlesi *et al.*,2005, Nyenke *et al.*,2008, Rine *et al.*,2013, Obadiah *et al.,* 2014, Simon and Ogunleye, 2015, Abubakar, 2017 and Mohammed *et al.,* 2018).

Dutse metropolis, the capital of Jigawa State is a growing city with attendant problems of sanitation and piped borne water supply to the populace. This situation is likely to promote infection with *E. histolytica*, but previous studies among almajiris (qur'anic students) by Abubakar, (2017) have reported zero prevalence. This study is designed to examine the

prevalence of amoebiasis in health facilities with a view to establishing the status of the disease in the area.

MATERIALS AND METHOD

Study area

The study was carried out in Dutse metropolis, Dutse Local Government Area, Jigawa State, Nigeria. Dutse is a city located in Northwestern Nigeria and the capital of Jigawa State. It is situated between latitude 11 42'8.46'N and longitude 9 20'2.46"E. Dutse is currently the largest city in Jigawa State with an estimated population of 153,000 based on 2006 national census(Federal Republic of Nigeria, 2009). Kano and Katsina States border Jigawa to the west, Bauchi State to the East and Yobe State to the Northeast. To the North, Jigawa shares an international border with Zinder region in the Republic of Niger, which is a unique opportunity for cross-border trading activities, with the total land area of approximately 22,410 square kilometer.

Study Design and Sample Collection

The study was a cross sectional design where a phenomenon is studied within a short period of time. Systematic random sampling was used to select 100 children from those that attended the three health facilities, 66 were screened in a health facility in Dutse town, 22 in Warwade and 12 in Sakwaya. The sample size for this study was calculated using Thrustfield (2005) formula: $n = Z^2P(1 - P)/d^2$ where n is the sample size, Z is the statistics corresponding to the level of confidence, P is expected prevalence and d is precision at 95% confidence interval. The study was carried out in August and September, 2019.

Specific instructions were given to the participants and in case of minors it was issued to the parents/guardians on how to collect the stool samples. The stool specimens were collected from the participants using clearly labeled disinfected plastic specimen bottles and then transported to the Biology Laboratory, Department of Biological Sciences, Federal University Dutse, Dutse, Jigawa State where they were immediately processed.

Administration of Questionnaire

A structured questionnaire was administered to the one hundred participants and in the case of minors their parents/guardians in order to obtain demographic and socioeconomic information such as age, gender, and other risk factors associated with intestinal amoebiasis. The administration of the questionnaire was done in the local language, Hausa.

Parasitological Method

The one hundred stool samples collected were processed using formal ether suspension method. This involved taking1-2g of each specimen initially fixed with 2mls of 10%Formal Saline, emulsified in about 6mls of 10% Formal Saline by stirring with a clean glass rod in test tube. The suspension was filtered over two layers of surgical gauze into a 10mls-capacity centrifuge tubes. About 2mls of diethyl-ether was then added into each tube and shaken vigorously. This was centrifuged using a centrifuge machine (GF-6 Model, England-FJ1179) at

increasing speed to a maximum of 3000 rpm for about 5mins. The supernatant was discarded and a drop of Lugol's Iodine solution was added to the residue. After tapping each tube, smears were made on clean slides, after which they were examined using a binocular light microscope at magnifications of ×100 and ×400 for the presence of *E.histolytica/E. dispar* complex cysts, oocysts and trophozoites (Clinical and Laboratory Standards Institute, 2005).

Data Analysis

Prevalence of amoebiasis was calculated and expressed in percentages. The data generated ware then tested using chi squared to find out if there is no significant difference between prevalence of amoebiasis and factors such as gender, age, type of toilet, source of drinking water and finger sucking habit. Again Pearson Moment of Correlation was also calculated to determine the association between amoebiasis infection and risk factors. The level of significance was determined at $P < 0.05$ and 95 % confidence interval.

Ethical Clearance

This was obtained from the Ethical Committee, Federal University Dutse. Permission to undertake the work in the secondary and primary health facilities was granted by the Director, Hospital Services, Jigawa State Ministry of Health. Informed consent of the participants was obtained in writing from parents/guardians of the participants before the commencement of the work.

RESULTS

Demographic characteristics of the participants

The demographic characteristics of the respondents are presented in Table, 1. Based on gender, 58(58%) were males while 42(42%) were females. According to age groups, those within 0 - 3 years old age group were 53(53%), 4 – 7 years old were 31(31%), 8 – 11 years old were 14(14%) and12 – 15 years old were 2(2%). Considering respondent sources of drinking water 56(56%)were found to use tap, 21(21%) well and 23(23%) borehole or hand pump. Based on use of toilet by the participants,52(52%) were found to use pit latrines, 15(15%) water closet and 33(33%) plastic container. Finger suckers represent 15(15%) and non-finger suckers 85(85%).

Table 1: Demographic Characteristics of Participants of the Three Health Facilities

Variables	Number (%)
Gender	
Male	58(58)
Female	42(42)
Age groups	
0 - 3	53(53)
4 - 7	31(31)
8 - 11	14(14)
12 - 15	2(2)
Source of drinking water	
Tap	56(56)
Well	21(21)
Bore hole or Hand pump	23(23)
Type of toilet used	
Pit latrines	52(52)
Water closest	15(15)
Plastic container	33(33)
Thumb finger suckers	
Suckers	15(15)
Non-suckers	85(85)

Prevalence of amoebiasis in relation to risk factors

The prevalence in relation to risk factors is presented in Table 2. The overall prevalence in all the health facilities was 2(2.0%). All the infections were recorded at the secondary health facility. The prevalence of amoebiasis was observed only in males 2(3.45%). The lowest age group, 0 – 3years old age group had all the infections, 2 (3.77%).Based on the type of toilet system used the prevalence among users of pit latrine was 1(1.92%), 1(3.03%) among children that make use of Plastic containers and no infection among users of water closest. Prevalence of amoebiasis according to the source of drinking water was 1(1.79%) among tap water users, 1(4.76%) for users of well water and 0(0.00%) for hand-pump or borehole users. The prevalence based on finger sucking habit revealed that suckers had 1(2.67%) and non-suckers 1(1.18%).There was no significant difference between the prevalence of amoebiasis and any of the six risk factors- health facility, gender, age, type of toilet used, source of drinking water and habit of finger sucking. Out of the six risk factors tested for association with prevalence of amoebiasis as shown in Table, 3 none was found to be significantly associated at $P < 0.05$.

Table 2: Prevalence of amoebiasis in relation to risk factors in health facilities

Variables	No. Examined	No. Positive (%)	X^2	P. Value
Health facility			1.051	0.591
GHD	66	2(3.03)		
WHC	22	0(0.00)		
SHC	12	0(0.00)		
Gender			1.478	0.224
Male	58	2(3.45)		
Female	42	0(0.00)		
Age group			1.810	0.613
0-3	53	2(3.77)		
4-7	34	0(0.00)		
8-11	14	0(0.00)		
12-15	2	0(0.00)		
Type of toilet used			0.486	0.784
Pit latrine	52	1(1.92)		
Water closet	15	0(0.00)		
Plastic container	33	1(3.03)		
Source of drinking water			1.300	0.522
Tap water	56	1(3.79)		
Well water	21	1(4.76)		
Borehole or hand pump	23	0(0.00)		
Finger sucking			1.961	0.161
Suckers	15	1(6.67)		
Non-suckers	85	1(1.18)		

Table 3: Correlation of amoebiasis with risk factors(Gender, Type of Toilet, Source of Drinking Water and Finger Sucking Habit)

Factor 1			Factor 2			
Amoebiasis	Health Facility	Gender	Age Group	Type of toilet	Source of drinking of water	Finger sucking habit
Pearson Correlation	0.094	-0.122	-0.117	0.030	-0.029	-0.140
P - value	0.352	0.228	0.245	0.766	0.711	0.165

DISCUSSION

The overall prevalence of *E. histolytica* that causes amoebiasis in this study among children aged 0 – 12 years was 2(2.0%) thus indicating that Dutse and its environs is endemic for the disease

though at present with low infection rate. This is contrary to the previous report of Abubakar (2017) of zero prevalence among almajiris (qu'ranic students) in study area. The low infection rate could be due to improved potable water supply, adequate medical facilities and general sanitation and the nature of orderly and disaggregated settlements associated with Dutse town and its environs that is devoid of overcrowding. This is in line with the observation of Mendel *et al.,* (1999) who reported that, amoebiasis is transmitted by fecal contamination of drinking water and food, also by direct contact with dirty hand or object as well as homosexual contact.

The overall prevalence was also low when compared with many other previous studies from different parts of Nigeria. For examples, studies among school aged children by Adedoja *et al.* (2015) reported prevalence as high as 75.1%in Pategi town, Kwara State, Mohammed *et al.,* (2018) 56.9% in Wamakko Local Government Area, Sokoto State, 26.7% byRine*et al.,* (2013) in Lafia, Nasarrawa State and 11% by Nyenke *et al.* (2008) in Degema, Rivers State. However a study involving mainly adults around Bingham University and its environs by Abisoye *et al.,*(2019) reported an overall prevalence of 6.5%. In all these reports the reasons deduced for the prevalence include, poverty, poor sanitation, cultural and religious issues, individual personal hygiene practices, unhygienic methods of waste disposal, poor clean or pipe borne water supply, immune status and level of enlightenment about the infection in the community. In case of school aged children the higher prevalence recorded among them is simply because at this age they are much exposed to activities such as open defaecation and playing on sand that predispose them to infection than other age groups.

All infections in this study were among males which differed with many previous works. Most studies reported higher prevalence among males than females. The major reason advanced for this trend was that in this part of the globe male are much involved in activities that make them more exposed to infection than their female counterparts. However, a study by Nyenke *et al.* (2008) revealed higher prevalence among females than males, but the difference was not significant at $P < 0.05$. Children of five years age and below are the most susceptible group to amoebiasis.

In this study, the prevalence was observed among children between age group of 0-3 years. Generally, children have been reported to be more exposed to infection with *Entamoeba histolytica* than adults. They are more susceptible to water-borne and food-borne infections, because their playing and hygiene practices predispose them to infection than older age group. More so, their immune systems are not fully developed and their level of health education is not sufficient to distinguish the dangers of contamination. In addition, the poor hygiene and sanitary of practices of their parents do expose them to infection with *E. histolytica*. This is in agreement with Bruga *et al.,* (2001) who reported a prevalence of 14.9% (110/735) and 25.4% (187/735) for *E.dispar/E.histolytica* complex, the most affected group in their study were children of age group 1-5years.

Water is a major source through which amoebiasis is contracted especially by children. In this study, out of one hundred samples collected, the two positive results arose from two children of

whose sources of water were tap water and well water respectively. In most homes, wells are left uncovered and are as well subject to contamination with cyst of *Entamoeba histolytica* which are the infective stage, from which various type of wastes including human and animal faeces. Cyst are known to persist for weeks or month in the dry season and are known to withstand desiccation and survive for a long period in the environment (Inabo*et al.,* 2002). Water irrespective of its source can easily be contaminated during handling, especially where sanitation and personal hygiene of caregivers are generally poor. It is easy to contaminate water and food by the use of contaminated hands and utensils.

The type of toilet facilities used in homes of the children in the study area include pit latrine, water closet system and then the use of plastic poo for children who cannot use either of the two systems usually due to their small age. The positive results were observed to be from children who used pit latrine and plastic poo which might eventually be due to the poor sanitation of such system as well as the caretakers of the children.

The habit of sucking finger is formed by children; it is a reflex action and is done without consciousness that the finger may be dirty. Finger sucking has the potential to aid direct transmission. Among the two children that were found positive for the infection in the study area, one exhibit the habit of finger sucking while the other does not. In other words, whether a child sucks his/her finger, he/she is vulnerable to contract amoebiasis in the study area suggesting that an underlying factor rather than sucking finger was at play.Of the risk factors considered none was found to be associated with prevalence of *E. histolytica.* This might be attributed to the low sample size examined in this study as well as level of sensitivity of the diagnostic method used in analyzing the stool samples.

CONCLUSION

From this study, it has been observed that the prevalence of *E. histolytica* among children aged 0-12 years was very low in the study area and reflect low endemicity in the area. This may be due to enlightenment and awareness campaign to the public by the government and organization such as Jigawa State ministry of Health through its various health facilities. Possibly also there is increase in literacy among people on how to protect themselves from taking contaminated food and water in the study area.

RECOMMENDATION

Although amoebiasis appears to be of low prevalence in the study area there is need to sustain improved portable water supply, general sanitation and health education in order to rid the community of *E. histolytica* and of course amoebiasis. There is need also to undertake further work involving larger sample, covering many more areas, over a longer period of time and perhaps using methods such as Polymerase Chain Reaction (PCR) and Enzyme Linked Immunosorbent Assay (ELISA) that have higher sensitivity than Formal – Ether Suspension method used in this study.

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REFERENCES

Abioye, Joki, Mbagwu, T. T. 1. And Seye Babatunde (2019). Prevalence of *Entamoeba histolytica* in Bingham University and Environs. *EC Microbiology,* 15(4): 242- 250.

Abubakar, Kabir (2017). *Prevalence of Entamoeba histolytica (amoebiasis) among almajiris(qur'anic students) in Dutse metropolis, Jigawa State, Nigeria*. An unpublished undergraduate project submitted to the Department of Biological Sciences, Federal university Dutse, Dutse, Jigawa State, Nigeria.

Adeyeba O.A. and Akinlabi A. (2002).Intestinal parasitic infections among school children in a rural community, southwest Nigeria.*Nig J. Parasitol*., **23**, 11-18**.**

Ajero C.M., Nwoko B.E.B., Nwoke E.A. and Ukaga C.N., Human Amoebiasis (2008).Distribution and Burden; and the Nigerian Environment.*Intl Sci. Res.,* **1(2),** 130 – 134**.**

Ayodele, A., Ajibola, A.A.lland Shola, B. (2015). Asymptomatic intestinal protozoa in school age children in Pategi, Pategi LGA of Kwara State, Nigeria,*Afr. J. Infect. Dis.,* 9(2): 39 – 42.

Benetton, M.L, Gonclaves, A.V., Meneghini, M.E., Silva, E.F. and Carneiro, M. (2005). Risk factors for infection *by Entamoeba histolytica/E. dispar* complex: an epidemiological study conducted in outpatient clinics in the city of Manaus, Amazon Region, Brazil. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 99:532-540.

Clinical and Laboratory standards Institute (CLSI) (2005).*Procedures for the recovery and identification of parasites from the intestinal tract.Approved guidelines.(2nd Edition).*Vol. 17, No. 23.

Federal Republic of Nigeria Official Gazette (2009).Legal Notice on Publication of 20006 Census Final Results.The Federal Government Printer, Abuja, Nigeriahttps://gazettes.africa/archive/ng/2009/ng-government-gazette-dated-2009-02-02-no-2.pdf.

Inabo, H., Galadima, M., Ogbadu, L.J. and Okuofu, C.A. (2000).Prevalence of *Entamoeba histolytica* and *Giardia lamblia* in primary school pupils in five rural villages around Kaduna and Zaria, Nigeria.*The Nigerian Journal of Parasitology*, 21: 61-67.

Kagan, I.G. (1970).Serologic diagnosis of parasitic disease.*The New England Journal of Medicine*,282(12):685-686.

Mehmet, T. and Petri, W.A Jr. (2003).Laboratory diagnosis of Amoebiasis.*Clinical Microbiology Reviews*, 16(4):713-729

Micaella, K. ,Anarella, A., Andrea, E., Alan, S., Jose, T., Jose, G., Robert, H. and Christopher, O. (2018). Entamoeba Histolytica: Updates in Clinical Manifestation,Pathogenesis, and Vaccine Development.*Canadian Journal of Gastroenterology and Hepatology*, Article ID 4601420, 6 pages https://doi.org/10.1155/2018/4601420.

Mohammed, K.1., Tijjani, I.1., Spencer, T. H. 1., Mohammed, A. B., M. K. Garba, M. K.,

Nataala, S. U., Imam, A. U. andAschroft, O. F. (2018). Prevalence and Predictors of *Entamoeba histolytica*Infection among School-age Children in Wamakko Local Government Area, Sokoto State Nigeria. *South Asian Journal of Parasitology.*

Nyenke, C.; Chukwujekwu, D. C.; Stanley, H. O.; Awoibi, N. K. (2008).Prevalence of Intestinal Amoebiasis in Infant and Junior School Children in Degema General Hospital and Environs,*J. Appl. Sci. Environ. Manage.,*Vol. 12(3) 83 – 87.

Obadiah, H. I., Nock, I. H., Ndams, I. S., Kogi, E. andBugaje, M. A. (2011).Prevalence of*Entamoeba histolytica* infection in pre-school children in Zaria, Nigeria.*Nigerian Journal of Scientific Research, Volume 9&10, 2011.*

Ogbe, G.E. and Isichei, M. (2002).Intestinal helminth infection in primary school children in areas of operation of Shell Petroleum Development Company of Nigeria (SPDC), Western Division in Delta State.*Nig. J. Parasitol*., **23**, 3-10**.**

Ogunlesi, T.A., Okeniyi, J.A.O., Oyedeji, O.A., Oseni, S.B.A., Oyelami, O.A., Njokanma, O.F (2005). Childhood dysentery in Ilesa, Nigeria.The unusual role of *Entamoeba histolytica.The internet Journal of Tropical Medicine,* 2(2) 1-4

Petri, W.A. Jr. and Singh, U. (1999).Diagnosis and management of Amoebiasis.*Clinical infectious diseases*, 29:1117-1125

Ravdin, J.I. and Stauffer, W.M. (2005).*Entamoeba histolytica* (amoebiasis). In: Mandel, G.L., Benneth, J.E., Dolin, E. eds. Mandell, Douglas and Bennett's. *Principles and Practice of Infectious Diseases.* 6th ed. Philadelphia, P.A.: Churchill, Livingstone, pp.3907-3111.

Reuben C. Rine, Katsa Manasseh and Hassan Suleiman (2013).Prevalence of Intestinal Amoebiasis in School Age Children in Lafia, Nasarawa State, Nigeria,*International Research Journal of Biological Sciences* .Vol. **2(7),** 1-6**.**

Simon-Oke, I. A. and Ogunleye, E. (2015).Prevalence of*Entamoeba histolytica* among primary school children in Akure, Ondo State, Nigeria.*Journal of Public Health and Epideomiology,*Vol 7 NO.11.

Stanley, L.S. Jr. (2003). Amoebiasis.*Lancet,* 361:1025-1034.

Stauffer, W., Abd-Alla, M., and Ravdin, J.I. (2006).Prevalence and incidence of *Entamoeba histolytica* infection in South Africa and Egypt.*Archives of Medical Research*, 37:266-269.

Thrusfield M. (2005).*Veterinary epidemiology (2nd edition).*UK: Blackwell Scientific, pp.228-247.

Ukpai, O.M. and Ugwu, C. (2003).The prevalence of gastro-intestinal tract parasites in primary school children Ikwuano Local Government Area of Abia State, Nigeria.*Nig. J. Parasitol*., *24*: 129-136.

World Health Organisation (1997): Amoebiasis. WHO *Weekly Epidemiological Records,* 72:97-100.