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Epidemiological Determinants of *Entamoeba histolytica* and *Schistosoma spp.* Infections in Selected Communities in Ijebu-East Local Government Area of Ogun State.

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ABSTRACT

Background: Amoebiasis and schistosomiasis remain major public health problems in poor, developing countries with poor sanitary and water infrastructure. Disease surveillance provides necessary data for intervention programs. This study, therefore, determined the prevalence of *Entamoeba histolytica* and *Schistosoma* spp. and assessed associated risk factors in selected communities in the Ijebu-East Local Government Area of Ogun State, Nigeria. Urine and stool samples were randomly collected from 123 people living in five communities in the study area. Stool samples were subjected to the Kato-katz method for the detection of *E. histolytica* cysts and *Schistosoma* ova. Urine samples were examined by filtration technique for the presence of *S. haematobium* eggs. Demographic and socio-economic data, and knowledge, attitude and perceptions of subjects to infection were assessed using a standard questionnaire.**Results:** The study revealed that only 7(5.7%) of the 123 study participants were infected with *E. histolytica*. Females (8.3%) were more infected than males (1.96%) ($p>0.05$), and the age group >51 years had the least prevalence ($p>0.05$) of *E. histolytica* infection. None of the assessed risk factors were significantly associated with infection. However, subjects that had watery stools had a significantly higher prevalence of infection ($P<0.05$). *Schistosoma* spp. infections were not detected in this study, but respondents' frequent contact with water bodies in their communities was shown. **Conclusions**: This study confirmed the presence of *E. histolytica* infection in Ijebu-East LGA, although at low prevalence. Health education is imperative to improve personal hygiene practices and prevent the transmission of these infections in the study area.

INTRODUCTION

Amoebiasis and schistosomiasis are major public health problems faced by millions living in the tropics and sub-tropics, where several low- to middle-income countries are domiciled (Ekpo *et al.*, 2012; Samie *et al.*, 2012). Annually, an estimated 100,000 deaths are caused by amoebiasis while schistosomiasis is responsible for disability-adjusted life years of about 1.9 million globally. Currently, both diseases are ranked second to malaria as the leading causes of death worldwide, especially in sub-Saharan Africa where more than 700 million people are at risk (Adam *et al.*, 2021; WHO, 2020; Chalmers, 2014).

These diseases are most prevalent in tropical and sub-tropical climates and in areas with inadequate sanitation and health infrastructures, putting the poor, especially those living in rural communities, at risk of morbidity and mortality. Annual reports estimate that over 90% of people affected by schistosomiasis are in Africa, with 15% of these cases occurring in Nigeria alone (Odeniran *et al.*, 2020; Sacolo *et al.*, 2018). All age groups are affected worldwide, but children are among the most important risk groups in endemic areas (Odeniran *et al.*, 2020; Samie *et al.*, 2012).

Amoebiasis is a parasitic disease caused by the pathogenic amoebae, *Entamoeba histolytica*, which belong to the order Amoebida and family Endamoebida together with several other non-pathogenic species that inhabit the human gut (Nowak *et al.*, 2015; Chalmers, 2014). These protozoa are primarily found in the colon of the digestive tract where invasive forms lyse and ingest mucosa cells, resulting in conditions such as amoebic dysentery, amoebic colitis, or amoeboma (Iboyi *et al.*, 2017; Chalmers, 2014). Common signs of amoebic dysentery include bloody or watery diarrhea, flatulent stomach, weight loss, fatigue, and abdominal pain (Shirley *et al.*, 2020; Mohammed *et al.*, 2018). These forms also exhibit extraintestinal involvement, causing fatal amoebic abscesses in the liver, brains, or lungs (Adam *et al.*, 2021; Mohammed *et al.*, 2018; Chalmers, 2014). Although the majority of those infected are asymptomatic, severe clinical disease is common among children and pregnant (and post-martum) women (Chalmers, 2014; Samie *et al.*, 2012).

Transmission of *E. histolytica* occurs by faeco-oral means, after ingesting infective amoebic cysts from food and/or water that is faecally contaminated (Shirley *et al.*, 2020). In developed countries, where prevalence is low, *E. histolytica* infections are common among immigrants from endemic areas, those who recently travelled to such regions, and institutionalized people (Samie *et al.*, 2012). The emergence of infection among men who have sex with men (MSM) in industrialized countries indicates direct oral-anal transmission of *E. histolytica* (Shirley *et al.*, 2020).

Schistosomiasis (also known as bilharziasis), on the other hand, is primarily a chronic disease caused by snail- and water-borne parasitic helminths belonging to the genus *Schistosoma*. Six species are widely known to affect humans. These include *S. haematobium*, which causes urinogenital disease, *S. mansoni*, *S. japonicum*, *S. intercalatum*, *S. mekongi* and *S. guineesis* which are responsible for the intestinal disease (Odeniran *et al.*, 2020; Sacolo *et al.*, 2018). The most common species in sub-Saharan Africa are *S. haematobium* and *S. mansoni* both of which are responsible for considerable morbidity and mortality, especially among pre-school and school-aged children, as well as women living in endemic regions (WHO, 2020; Sacolo *et al.*, 2018; Ekpo *et al.*, 2012).

Schistosomiasis is one of the most important neglected tropical diseases affecting the poor in rural communities of developing countries (Ekpo *et al.*, 2012). People living in these areas have limited access to potable water and adequate sanitary facilities, hence they contaminate streams, rivers, dams and pools with faeces and urine that may contain viable vacative parasite stages that later become infective to those who come in contact with these contaminated water bodies (Sacolo *et al.*, 2018).

Several studies have reported the prevalence of *E. histolytica* (Agbolade *et al.*, 2004; Azikiwe, 2006) and *Schistosoma* species (Anosike *et al.*, 2006; Ayanda, 2009; Ekpo *et al.*, 2010) in different parts of Nigeria, as well as identified factors responsible for their occurrence in these areas. These studies have established both diseases as important health problems, especially among children in the country. Such epidemiological data are however

scarce or not up-to-date for some communities, despite the fact that such data provide useful information that underpins rational control and possible elimination.

This study, therefore, aimed to determine the prevalence of *E. histolytica* and *Schistosoma* spp. in five selected communities in Ijebu-East Local Government Area (LGA) of Ogun State as well as access the risk factors associated with their occurrence.

MATERIALS AND METHODS

1. Study Area:

This cross-sectional survey was conducted in five randomly selected communities, namely, Ebute, Toluwo, Uba, Fotedo and Fowoseje located in Ijebu-East LGA of Ogun State, Southwestern Nigeria. Ogun (fig 1). State borders Lagos and the Atlantic Ocean to the south, Oyo and Osun States to the north, and the Republic of Benin to the west. She is named after the Ogun River which runs through it from north to south. With a land mass of 16, 980.55km^2, Ogun State has a population of 3, 751, 140 residents according to the 2006 census. Ijebu-East is one of the nine LGAs located in the Ogun East senatorial district. It has a land area of 2,234 km^2 and a population of 110,196 as of 2006. The majority of the residents in the selected communities are primarily farmers and fishermen.

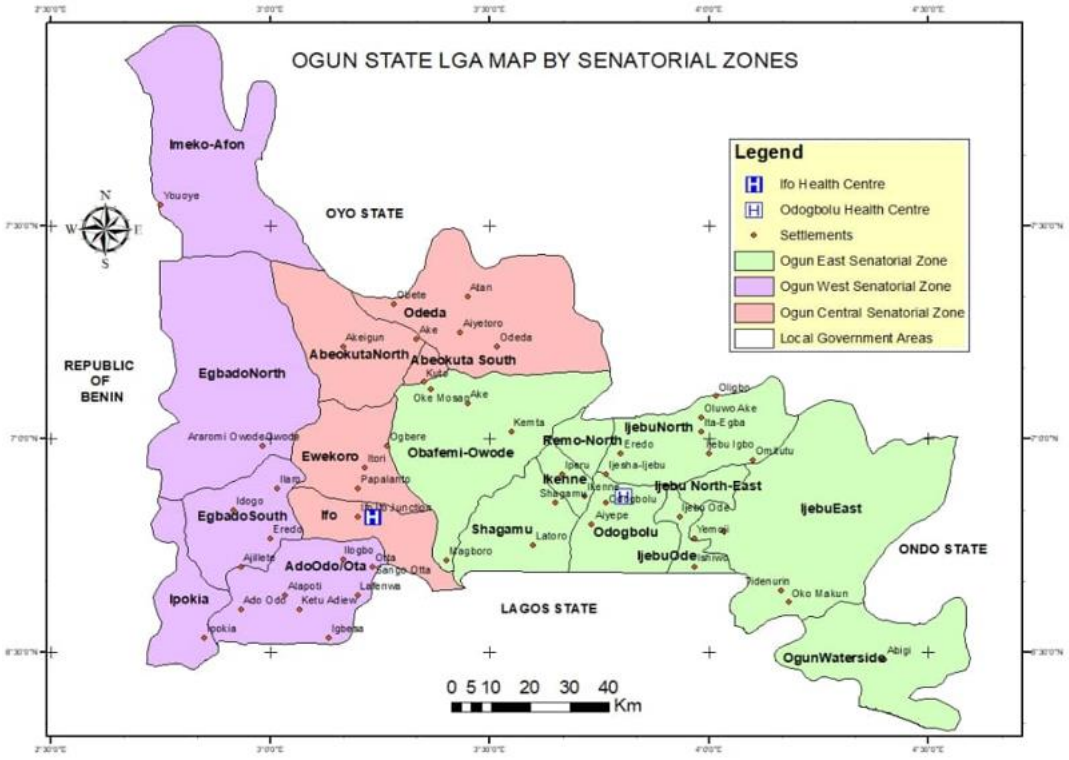

Fig.1: Map of Ogun State

2. Questionnaire Survey:

Questionnaires were designed and pre-tested according to the WHO standard format and administered to a total of 123 subjects selected at random from the five communities. The demography (age, gender, family size, educational level, and occupation), risk factors and knowledge, attitude and practices relating to schistosomiasis and amoebiasis were assessed. The questionnaires were administered by learned interviewers who are fluent in the local languages spoken in the area.

3. Parasitological Assessment:

Fresh stool and urine samples were collected from all the subjects who were assessed during the questionnaire survey. The samples were placed into separate clean and sterile sample bottles and

properly labelled for each participant. The samples were transported immediately in cool boxes for subsequent processing and examination at the Nigerian Institute of Medical Research, Lagos, Nigeria. The stool samples were examined under the microscope for cysts and eggs of *E. histolytica* and *Schistosoma* respectively, following the Kato-Katz technique described by Cheeseborough (2005). Urine samples were processed according to the filtration method and examined microscopically for the presence of *S. haematobium* eggs (Cheeseborough, 2005).

4. Data Analyses:

The statistical differences in the prevalence of infection according to gender, age group, and other demographic risk factors were determined using the chi-square test. All data were analyzed using SPSS version 16.0 (SPSS Inc. Chicago, IL).

5. Ethical Statement:

This study received ethical approval from Epidemiological Unit, Ogun State Ministry of Health, Ifo LGA with code IF/LG/45/137. Written informed consent for study participation and publication were obtained from all the study participants. In cases where the study participants were minors or unable to provide informed consent, consent was obtained from parents or legal guardians.

RESULTS

1. Prevalence of *E. histolytica* and Socio-Demographic Characteristics of Respondents:

Results revealed that 7 (5.7%) out of the 123 stool samples examined were positive for cysts of *E. histolytica*. The demographic and socio-economic distribution of the studied population in relation to infection are presented in Table 1. From this study, the prevalence of infection was higher among females (8.33%) than males (1.96%). Those within the age group 41-50 (12.5%) had the highest infection prevalence followed by the groups 11-20 years (6.7%), 21-30 years (6.67%), 1-10 (5.56%) and 51 and above (3.5%). There was no infection recorded in the 31-40 age group. The gender- and age-related differences observed were not statistically significant (P>0.05). At the community level, infection was most frequent in Toluwo (17.4%) followed by Fotedo (5.3%), and Ebute (4.6%). There were no positive cases in Uba and Fowoseje communities. The difference in *E. histolytica* prevalence based on community location was not statistically significant (P>0.05).

Based on the level of education, the highest prevalence was observed among those who had secondary education (8.5%), followed by no formal education (6.1%) and least in primary education (2.3%). None of those who had tertiary education were infected. *Entamoeba histolytica* was most prevalent among the unemployed, then the self-employed (5.6%) and employed (0.0%). Those who live in bungalows (8.9%) had a higher prevalence of infection when compared to those who live in one-room apartments (3.2%). There was also no statistical difference in infection according to the level of education, employment status and accommodation type (P>0.05).

2. *Entamoeba histolytica* Infection and Associated Risk Factors:

The risk factors related to *E. histolytica* infections were assessed as presented in Table 2. According to toilet type, those that defecate in nearby open spaces (6.8%) had a higher rate of infection compared to those who use pit latrines (3.2%). There was no infection among those who use water closets (0.0%). Individuals who do not wash their hands before and after eating (14.3%) had a higher prevalence of infection when compared to those who do (0.04%). The case was similar for those who do not wash fruits before eating (8.9%) and those who do (3.0%). Infection was most frequent among subjects who cut their nails monthly (9.5%), compared to weekly (7.4%) and least in <3 days (2.8%). Those who wash their hands with water only (7.3%) had a higher prevalence when compared to those who use water and soap (4.2%). Respondents who do not practice

geophagy (7.8%) were more infected than those who do (4.5%). Infection only occurred among those who do not treat their drinking water. Based on the food source, respondents who buy food from vendors (21.1%) had a higher prevalence than those who eat homemade food (1.1%). There were no statistically significant differences observed in infection based on toilet type, hand washing, method of hand wash, fruit washing, geophagy and frequency of nail cutting (P>0.05).

Table 1: *E. histolytica* infection in relation to socio-demographic factors of respondents.

Variables	No. Examined	No. Infected	Prevalence (%)	P-value
Gender				
Male	51	1	1.96	0.135
Female	72	6	8.33	
Location				
Ebute	44	2	4.55	0.084
Toledo	23	4	17.39	
Uba	24	0	0.00	
Fotedo	19	1	5.26	
Fowoseje	13	0	0.00	
Age group				
1 – 10	18	1	5.56	0.742
11 – 20	29	2	6.70	
21 – 30	15	1	6.67	
31 – 40	16	0	0.00	
41 – 50	16	2	12.5	
51 & above	29	1	3.45	
Level of Education				
Primary	43	1	2.33	0.448
Secondary	47	4	8.51	
Tertiary	0	0	0.00	
No formal education	33	2	6.06	
Occupation				
Employed	5	0	0.00	0.248
Self-employed	72	4	5.56	
Unemployed	46	3	6.52	
Type of accommodation				
One-room apartment	62	2	3.23	0.834
Bungalow	45	4	8.89	
Flat	11	0	0.00	
No response	5	1	20.00	

Table 2: Prevalence of *E. histolytica* infection in relation to sanitary facilities and habits, treatment of water and food source of respondents.

Variables	No. Examined	No. Infected	Prevalence (%)	P-value
Toilet type				
Pit latrine	31	1	3.23	0.474
Water closet	3	0	0.00	
Nearby space	74	5	6.76	
No response	15	1	6.67	
Hand washing before and after the meal				
Yes	101	4	0.04	0.176
No	21	3	14.29	
No response	1	0	0.00	
Nail cutting				
<3 days	36	1	2.78	0.554
Weekly	54	4	7.41	
Monthly	21	2	9.52	
Others	12	0	0.00	
How do you wash your hands?				
Water alone	69	5	7.25	0.405
Water and soap	47	2	4.26	
No response	7	0	0.00	
Geophagy				
Yes	67	3	4.48	0.697
No	51	4	7.84	
No response	5	0	0.00	
Fruit washing				
Yes	66	2	3.03	0.158
No	56	5	8.93	
No response	1	0	0.00	
Treat drinking water				
Yes	14	0	0.00	0.329
No	109	7	6.42	
Where do you eat most time?				
Home-made	91	1	1.10	0.405
Food vendors	19	4	21.05	
Others	11	2	18.18	
No response	2	0	0.00	

3. Signs and Symptoms Of Gastrointestinal Disease And Prevalence of *E. histolytica* Infection:

The signs and symptoms of gastrointestinal disease experienced by the respondents in relation to E. histolytica infection are given in Table 3. Respondents who reported abdominal cramps (3.1%) had a lower prevalence than those who did not (8.8%). Infection was more frequent in those that were not vomiting (7.3%) than those who were (5.0%). Those who did not have bloody stools (7.5%) had a higher infection prevalence compared to those who did (3.1%). The rate of infection was however significantly higher among those with watery stool than those who did not have watery stool (0.0%) ($P<0.05$).

Table 3: Prevalence of *E. histolytica* infection in relation to observed signs and symptoms of gastrointestinal disease.

Signs and symptoms	No. Examined	No. Infected	Prevalence (%)	P-value
Abdominal cramp				
Yes	65	2	3.08	0.177
No	57	5	8.77	
No response	1	0	0.00	
Vomiting				
Yes	40	2	5.00	0.838
No	69	5	7.25	
No response	14	0	0.00	
Watery stool				
Yes	102	7	6.86	0.043
No	21	0	0.00	
Bloody stool				
Yes	32	1	3.13	0.214
No	80	6	7.50	
No response	11	0	0.00	

4. Prevalence of *Schistosoma* spp. Infection:

None of the urine or stool samples examined in this study were positive for eggs of *Schistosoma* species.

5. Associated Risk Factors and Knowledge of Respondents with Respect to *Schistosoma* spp. Infection:

Table 4 captures assessed predisposing factors of *Schistosoma* infection and the knowledge of respondents. A higher proportion of the study participants (82.9%) noted that they come in contact with water in their community. Most of the respondents reported that they use the water bodies for bathing (47.2%), followed by fetching (22.8%), fishing (11.4%) and others (14.6%). The majority use the water bodies 1 – 3 times weekly (47.9%), followed by those who use it daily (45.5%), twice a year (4.2%) and monthly (2.4%). Over 60 (49.6%) of the respondents do not accompany their parents to fish compared to those who do (43.9%). More than half (57.7%) accompany their parents to the farm while 37.4% do not. The percentage of those who cross a pond (8.1%) was lower than those who do not (87.8%). A high percentage of the respondents (87%) have never heard of bilharzia before; only 8.1% have. The majority (53.77%) of the respondents did not know about schistosomiasis while others believe it is a sign of maturity (8.13%) or a punishment from the gods (5.7%).

Table 4: Predisposing factors and knowledge of respondents in relation to *Schistosoma* infection

Variables	Number of respondents	Percentage response (%)
Do you come in contact with water in your community?		
Yes	102	82.9
No	19	15.5
No response	2	1.6
Activities at the water bodies		
Bathing	58	47.2
Fetch water	28	22.8
Fishing	14	11.4
Others (sell fish, wash motorbikes etc.)	18	14.6
No response	5	4.1
How often do you come in contact with water bodies?		
Daily	56	45.5
1 – 3 times weekly	59	47.9
Once a month	3	2.4
Twice a year	0	0.0
Never	5	4.2
Accompany parents to fish?		
Yes	54	43.9
No	61	49.6
No response	8	6.5
Accompany parents to farm?		
Yes	46	37.4
No	71	57.7
No response	6	4.9
Cross a pond		
Yes	10	8.1
No	108	87.8
No response	5	4.1
Have you heard about bilharzia before?		
Yes	10	8.1
No	107	87.0
No response	6	4.9
What do you think bilharzia is?		
Sign of maturity	10	8.1
Punishment from the 'gods'	11	8.9
Disease	7	5.7
Don't know	66	53.7
No response	29	23.6

6. Signs and Symptoms of *Schistosoma* spp. Infection Reported By Respondents And Their Source Of Treatment:

However, study participants had a history of fever (28.5%), swollen stomach (22.0%), painful urination (13.8%), bloody stool (8.1%) and haematuria (6.5%) (Table 5). The following treatment options were reported by respondents whenever they observe the symptoms above: herbal medicine (33.3%) followed by those who get medicine from drug stores (9.8%), those that visit the hospital (8.9%) and those that do nothing (7.3%).

Table 5: Reported signs and symptoms relating to *Schistosoma* infection and treatment source of respondents.

Variables	Number of respondents	Percentage response (%)
Which symptoms of bilharzia have you experienced?		
Chills/shivering	35	28.5
Swollen stomach	27	22.0
Haematuria	8	6.5
Painful urination	17	13.8
Bloody stool	10	8.1
No response	26	2.1
How did you treat bilharzia?		
Hospital	11	8.9
Medicine from store	12	9.8
Herbal medicine	41	33.3
Did nothing	9	7.3
No response	50	40.6

DISCUSSION

Amoebiasis and schistosomiasis are serious health problems responsible for considerable morbidity and mortality in the tropical and sub-tropical regions of the world. They are most prevalent in developing countries, including Nigeria, where conditions of poverty, poor sanitation and lack of potable water subsist (Adenowo *et al.*, 2015; WHO, 2013). This study revealed prevalence rates of 5.7% and 0% for *E. histolytica* and *Schistosoma* spp. infection in selected communities in Ijebu-East LGA and identified some predisposing factors of infection. The prevalence of *E. histolytica* infection obtained in this survey (5.7%) was low when compared to those of recent studies carried out in other parts of Nigeria, including Benue (8.3%) (Iboyi *et al.*, 2017), Kano (9.75%) (Adam *et al.*, 2021), Rivers (11%) (Nyenke *et al.*, 2008), Abia (16.0%) (Amaechi *et al.*, 2014), Ogun (25.8%) (Akingbade *et al.*, 2013), Nassarawa (26.7%) (Rine *et al.*, 2013), Sokoto (56.9%) (Mohammed *et al.*, 2018) and Ondo (67.6%) (Adepeju and Esther, 2015). The reason for this low prevalence may be attributed to the overall good hygiene and sanitary conditions observed in the sampled communities. Another plausible explanation is the fact that this study was conducted among various age groups, unlike other surveys which were strictly school-based. Studies have shown that school-aged children are more predisposed to *E. histolytica* infection because of their unsanitary habits and low immunity (Ngui *et al.*, 2012). Similar prevalence rates were however obtained by Mbagwu (2019) (6.5%) among students and staff of a tertiary institution in Nassarawa and a much lower rate (0.8%) among pregnant women in Lagos State (Akinsanya *et al.*, 2018).

According to the age group of the participants, those within the 41-50 years age bracket had the highest prevalence of infection. This difference was however found to be statistically insignificant. Although, previous reports have observed that infection with *E. histolytica* was age-dependent and highest among children between the ages of 4 and 15 years (Adam *et al.*, 2021; Mbagwu *et al.*, 2019; Iboyi *et al.*, 2017; Adepeju and Esther, 2015 and Anuar *et al.*, 2012).

This study also revealed a higher prevalence in females than males. However, similar to the findings of several past surveys (Adam *et al.*, 2021; Mbagwu *et al.*, 2019; Mohammed *et al.*, 2018; Iboyi *et al.*, 2017; Rine *et al.*, 2013; Adepeju and Esther, 2015; Anuar *et al.*, 2012; Ouattara *et al.*, 2010; Nyenke *et al.*, 2008), there was no statistical difference in the prevalence of *E. histolytica* infection with respect to sex. This shows that both genders have equal chances of being infected, even though males are thought to engage in activities that increase their exposure to infective cysts

more than females (Adepeju and Esther, 2015).

The prevalence rates of infection varied between the communities sampled in this study but were not statistically significant. This is in consonance with the results of Iboyi *et al.* (2017). However, Toluwo had the highest prevalence when compared to other communities. The reason for this finding can not be properly elucidated in this study, since risk factor assessment was not carried out for each community.

Risk factor assessment of *E. histolytica* infection revealed that those who defecate in the open were found to have a higher infection rate when compared to those who do not. This is because mechanical vectors such as flies and cockroaches are common at defecation sites and carry parasite cysts to contaminate food and/or water. Although this finding was not statistically significant, it agrees with the reports of Mohammed *et al.* (2018).

The main transmission route of *E. histolytica* is faeco-oral. Susceptible individuals become infected when they ingest food, fruits, soil, or water contaminated with faeces containing mature parasite cysts. Thus, people with unsanitary habits and practices are more prone to infection. In this study, participants who wash their hands before and after meals and those who wash fruits and vegetables thoroughly with safe water before consumption was found to have a lower prevalence of infection compared to those who do not. This is similar to the finding of a study among school-aged children in Sokoto where children who do not wash their hands before and after eating and those who do not clean their hands after defecation were prone to infection 1.87 and 0.45 times respectively (Mohammed *et al.*, 2018).

The majority of the subjects who cut their nails every month, as against those who do it daily and weekly, had a higher prevalence of *E. histolytica* infection. Long fingernails tend to collect and retain soil that may have been contaminated with infective cysts, making children who have the habit of putting their hands in their mouths and people who do not wash their hands before and after eating get easily infected.

Amoebiasis is prevalent among the poor living in developing countries of the world where potable water and sanitary facilities are inadequate or totally absent. Based on the toilet types, this study revealed that none of the study participants who use water closets were infected with *E. histolytica* compared to those who use pit latrines (3.2%). This agrees with the findings of Mohammed *et al.* (2018) and Adepeju and Esther (2015) and can be attributed to the unhygienic use of pit latrines and poor maintenance of the environments where they are built. Such unsanitary conditions attract flies that facilitate the spread of infective cysts found in faeces. *Entamoeba histolytica* was also found to be most prevalent in bungalows than in one-room apartments and flats in the study area. This might be possible if the bungalows are more densely populated than other accommodation types, and the people living have poor personal hygiene as well as have to share a limited number of toilets.

Infection with *E. histolytica* was most common among those who have secondary education and followed by those without formal education, and those who have primary education. This finding was however not statistically significant, indicating that the level of education of the people in the study area does not determine the prevalence of *E. histolytica* infection. Also, in relation to employment status, a higher prevalence of *E. histolytica* was determined among those who were unemployed followed by the self-employed. Although this finding is not statistically significant, amoebiasis is believed to be associated with poverty and a low standard of living.

Food handlers and vendors are important sources of *E. histolytica* infection because of their poor sanitary habits driven by their ambition to make a profit (Alemu *et*

al., 2019). The majority of the infected subjects in this study who buy and eat food made by food vendors were positive for infection compared to those who eat homemade food.

It is well established that 90% of people who become infected with *E. histolytica* are asymptomatic (Kantor *et al.*, 2018). On the contrary, a significantly higher prevalence of *E. histolytica* was found among subjects who had a watery stool in this study, suggesting that infection may be causing clinical disease in the study area. Immunocompromised immunity, underlying disease, or concomitant infections among those infected may be responsible for this outcome. There was however no significant difference between infection and other symptoms of amoebiasis such as vomiting, bloody stool and abdominal cramps.

Results showed zero prevalence for *Schistosoma* spp. infection in the study area despite increased human-water contact. This is not consistent with reports of previous studies that reported prevalence rates of *S. haematobium* and *S. mansoni* ranging from 5.5 – 60.8% and 0.3 – 2.9% respectively in Nigeria (Dogara *et al.*, 2020; Awobode *et al.*, 2016; Dawaki *et al.*, 2016; Okwori *et al.*, 2014; Singh and Muddasiru, 2014). It is possible the snail intermediate hosts are required for the transmission of schistosomes - *Bulinus* and/or *Biomphalaria* spp. - are absent in the water bodies in these communities. This finding may also mean that infection is occurring at intensities that are too low for microscopic detection, and thus, requiring more sensitive molecular and/or biochemical diagnostic tools.

Although *Schistosoma* spp. infection was not encountered in this study, and some factors that predispose to infection were observed. In communities without pipe-borne water, people depend heavily on water from rivers, streams and lakes for domestic, occupational and/or recreational use. A high proportion (82.9%) of the respondents in this study come in contact with the water bodies in their communities, with the highest percentage visiting 1 - 3 times a week (47.9%). Most of the study participants use the water for bathing (47.2%), followed by fetching (22.8%) and fishing (11.4%). The association between *Schistosoma* infection and human contact with freshwater bodies is well reported in previous studies (Dogara *et al.*, 2020; Sady *et al.*, 2013).

The knowledge, attitude and practices (KAPs) of people in relation to any disease are important epidemiological determinants. Accurate knowledge of people about a disease is vital to its effective control. More than half of the participants in this study do not know about the disease while others think it is a punishment from the gods (8.9%), followed by respondents who believe it is a sign of maturity. Some of the respondents reported symptoms of *Schistosoma* infection, including painful urination (13.9), bloody stool (8.1%), and haematuria (6.5%) amongst others. An appreciable percentage (33%) however reported that they sought herbal therapy when the symptoms surfaced. These findings show that the knowledge and practices of respondents with regards to schistosomiasis in the study area are generally poor, and will contribute to the rapid spread of the disease in case of infection emergence.

Conclusion

This study revealed a low prevalence of *E. histolytica* infection in Ijebu-East LGA, Ogun State, but found that it might be causing clinical disease in the study area. Also, *Schistosoma* spp. infections were not prevalent, although a high rate of human-water contact was reported. The provision of potable water and adequate sanitary facilities are expected to improve hygiene and reduce human-water contact in the study area. The knowledge, attitude and practices of community members relating to both diseases also need to be refined.

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