



Evaluation of *Entamoeba histolytica* on Food and Non-Food Contact Surfaces among Students Residing in School Hostels at the Obafemi Awolowo University, Ile-Ife, Nigeria

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Abstract

Amoebiasis stands as a prominent contributor to parasitic-related fatalities on a global scale, an estimated 50 million instances of invasive *Entamoeba histolytica* disease manifest annually, potentially leading to up to 100,000 deaths. The study examines the presence of *E. histolytica* on food and non-food contact surfaces among students residing within the hostel of the Obafemi Awolowo University. During the study, 50 samples were randomly collected from different rooms of 7 halls of residence. The study was carried out to determine prevalence of amoebiasis infection among students residing in the halls of residence at the Obafemi Awolowo University. Samples were collected using sterile swab sticks from surfaces in both food contact and non-food contact. Sterile water was added to each of the swab sticks and centrifuged. The saline and iodine preparations from the sediment were examined under microscope using x10 and x 40 objective lens for cyst of the parasite. The result of this study shows a high prevalence of *E. histolytica* parasites of 22%. Of the hall of residence, the highest prevalence was observed at Fajuyi Hall (8%), followed by Moremi Hall (6%) and Akintola Hall (4%), while the lowest prevalence rate was observed at ETF Hall and PG Hall both at 2%. The prevalence of the *E. histolytica* parasite among surfaces directly in contact with food was 18%, while the overall prevalence of *E. histolytica* parasites of non-food contact stood at 4%. On food contact, Moremi hall has the highest prevalence of *E. histolytica* with 4% on plate, Fajuyi 2% on both pot and frying pan, while 2% were observed on spoon and grater in Akintola respectively. On non-food contact, 2% prevalence was observed on gas cooker and on table top in both Fajuyi and Moremi halls. The high prevalence of *E. histolytica* can be attributed to the poor hygiene of students and the contamination from the source of purchase of food items and water source. Therefore, it is recommended that the student populace be sensitized on personal hygiene, mode of transmission of the parasite and information on the preventive measures should be passing across to the student in order to prevent further transmission of the parasite.

Keywords: *Entamoeba histolytica*; Food and Non-food contact; Prevalence; Hygiene

Abbreviations: OAU: Obafemi Awolowo University; MOT: Mode of Transmission.

Introduction

Intestinal parasites continue to pose significant public health challenges in economically disadvantaged nations, where prevalent inadequate adherence to proper food hygiene practices persists Macpherson, & Saidin, et al. [1,2]. Studies have shown that amoebiasis stands as a prominent contributor to parasitic-related fatalities on a global scale Mirelman, Martínez Palomo, et al. & Kretschmer [3-5]. According to Stanley [6] amoebiasis claims the lives of approximately 40,000 to 100,000 individuals annually across the world. The primary pathogenic agent attributed to amoebiasis disease is *Entamoeba histolytica* Faust, et al. & Moran, et al. [7,8]. On a global scale, an estimated 50 million instances of invasive *E. histolytica* disease manifest annually potentially leading to up to 100,000 deaths Marion, et al. [9]. This merely represents the visible aspect, as only a minority ranging from 10% to 20%, of infected individuals develops noticeable symptoms [10].

The transmission of the pathogen occurs via the ingestion of amoebic cysts, primarily facilitated by the consumption of contaminated food and water sources Gerba, et al. & Godswill A [11,12]. Individuals engaged in food handling, including those responsible for food preparation and service, who exhibit suboptimal personal hygiene practices, could potentially pose a risk of disseminating intestinal parasites within a community Yimam, et al. [13]. Hence, the primary objective of this systematic review and meta-analysis was to consolidate a comprehensive prevalence estimate of intestinal parasites. Additionally, the study aimed to examine the presence of *E. histolytica* in relation to hygiene-related factors particularly on surfaces that come into contact with food and those that do not come into contact with food [14]. This study was conducted among students dwelling in the halls of residence of the Obafemi Awolowo University.

Materials and Methods

Study Area

The research was carried out at the residential halls of the Obafemi Awolowo University (OAU). The University comprises 9 halls of residential, but of the 9 halls of residential, 7 halls of residential were purposely selected for this research. OAU is a teaching and research-based institution of learning located in the ancient town of Ile-Ife, Osun State, Nigeria. The university campus spans approximately 5,000 acres (20 km²), encompassing a site that includes 13,000 acres (53 km²) of university-owned land. The university experiences an average temperature

peak of 28.8°C during February and approximately 24.5°C in August. OAU encompasses 13 faculties as well as two colleges (Postgraduate College and College of Health Sciences). The university provides both undergraduate and postgraduate programs, covering a diverse range of fields of specialization including humanities, arts, natural sciences, social sciences, medical sciences, engineering and technology. OAU is a mixed-gender institution of learning, with over 35,000 students. Purposely selected halls for this research comprises 3 female halls of residence (Akintola Hall, Alumni Hall and Moremi Hall), 3 male all of residence (Angola Hall, ETF Hall and Fajuyi Hall) and a postgraduate hall of residence (mixed of both male and female).

Study Population

Samples were collected using a random sampling method from fifty (50) rooms of all the 7 halls of residence. The selected room occupants exhibiting a wide spectrum of living habits. The primary focus of this study was to determine the proper hygiene of the occupants of the halls of residence at the Obafemi Awolowo University.

Specimen Collection

Prior to the commencement of the research work, permission and informed consent was taken from the student. Samples were collected using sterile swab sticks under strict aseptic conditions. The samples were obtained from surfaces in both food contact and non-food contact. The category of food contact surfaces comprises of various items, namely plates, pots, frying pans, cups, bowls, knives, forks, spoons, spatulas and handheld graters, which were collected from both washed and unwashed items. The non-food contact surfaces encompassed gas cookers, hot plates, cupboards and the floor space surrounding the cooking area, plate racks and tabletops.

Sample Examination

Sterile Peptone water was added to each of the swab sticks and centrifuged. The saline and iodine preparations from the sediment were examined under microscope using x10 and x 40 objective lens. The utilization of iodine preparation was especially crucial for the accurate identification of protozoan cysts.

Data Analysis

Data collected were analyzed using Chi-square test to determine association between variables. Values were considered significant at $P < 0.05$.

Results

Table 1, shows the presentation of data collected from a sum of 50 rooms across different halls. A large bulk of samples were collected from Moremi Hall (14/50) representing 28% of the total number of samples collected, while 10 samples were collected from Fajuyi Hall (10/50) representing 20% of the total number of samples collected. The lowest samples for the study were obtained from Alumni Hall 2% (1/50).

The overall prevalence rate of the *E. histolytica* recorded was 22%. The highest prevalence was observed at Fajuyi Hall (8%), followed by Moremi Hall (6%) and Akintola Hall (4%). The lowest prevalence rate was observed at ETF Hall and PG Hall both at 2%. There is no prevalence discovered at both Alumni Hall and Angola Hall. However, there is no significant difference for the presence *E. histolytica* in food contact ($X^2 = 4.101$, $p = 0.663$) and non-food contact ($X^2 = 2.133$, $p = 0.907$) samples collected from all the Hall of residence (Table 1).

Hall	Number Examined (%)	Number Positive (%)	Number (Food contact) (%)	Number (Non-food contact) (%)
AKT	7(14.0)	2(4.0)	2(4.0)	0(0.0)
ALM	1(2.0)	0(0.0)	0(0.0)	0(0.0)
ANG	5(10.0)	0(0.0)	0(0.0)	0(0.0)
ETF	6(12.0)	1(2.0)	1(2.0)	0(0.0)
FAJ	10(20.0)	4(8.0)	3(6.0)	1(2.0)
MOR	14(28.0)	3(6.0)	2(4.0)	1(2.0)
PG	7(14.0)	1(2.0)	1(2.0)	0(0.0)
TOTAL	50(100.0)	11(22.0)	9(18.0)	2(4.0)

Key: AKT= Akintola, ALM= Alumni, ANG= Angola, ETF= Education Trust Fund, FAJ= Fajuyi, MOR= Moremi, PG=Post Graduate Hall.

Table 1: The prevalence of *Entamoeba histolytica* in halls among Food contact and Non-food contact surfaces in Obafemi Awolowo University.

Table 2, the prevalence of *E. histolytica* parasites in relation to surfaces that come in contact with food. The prevalence of the *E. histolytica* among surfaces directly in contact with food was 18%. Notably, the highest prevalence was recorded on plates at 10%, while 2% prevalence was recorded for each of the pots, spoons, handheld graters and frying pans. There is no statistically significant difference in the prevalence of *E. histolytica* on the surfaces that come into contact with food ($X^2 = 4.101$, $p = 0.663$). On plates, Moremi hall recorded highest prevalence of 4%, Fajuyi and ETF halls

recorded 2% prevalence each. In the case of pot and frying pan, 2% prevalence was recorded at Fajuyi hall whereas there was no prevalence recorded at other halls of residence. In Akintola hall of residence, 2% prevalence were both recorded on spoon and grater while no prevalence was recorded on other halls of residence. Statistical report from Table 2 shows that there is no significant difference in the prevalence of *E. histolytica* in respect to the plate ($X^2 = 2.169$, $p = 0.903$), pot ($X^2 = 4.082$, $p = 0.666$), spoon ($X^2 = 6.268$, $p = 0.394$), grater ($X^2 = 6.628$, $p = 0.394$) and frying pan ($X^2 = 4.082$, $p = 0.666$).

Hall	Number on (Food contact)	Number on Plate (%)	Number on Pot (%)	Number on Spoon (%)	Number on Grater (%)	Number on Frying pan (%)
AKT	2(4.0)	0(0.0)	0(0.0)	1(2.0)	1(2.0)	0(0.0)
ALM	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
ANG	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
ETF	1(2.0)	1(2.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
FAJ	3(6.0)	1(2.0)	1(2.0)	0(0.0)	0(0.0)	1(2.0)
MOR	2(4.0)	2(4.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
PG	1(2.0)	1(2.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Total	9(18.0)	5(10.0)	1(2.0)	1(2.0)	1(2.0)	1(2.0)

Key: AKT= Akintola, ALM= Alumni, ANG= Angola, ETF= Education Trust Fund, FAJ= Fajuyi, MOR= Moremi, PG=Post Graduate Hall.

Table 2: The prevalence of *Entamoeba histolytica* among Food contact surfaces in halls of residence in Obafemi Awolowo University.

Table 3 shows the result of the prevalence of positive *E. histolytica* relative to surfaces that are not in direct contact with food (Non-Food contact). From Table 3, it was evident that the overall prevalence of *E. histolytica* parasites stood at 4%. Specifically, the prevalence was equivalent for both

Gas cookers and Tabletop, each having 2%. No statistically significant difference exists in the prevalence of *E. histolytica* among the non-food contact surfaces. ($X^2 = 2.133$, $p = 0.907$), Gascooker ($X^2 = 4.082$, $p = 0.666$) and Tabletop ($X^2 = 2.624$, $p = 0.854$).

Hall	Number (Non-food contact) (%)	Number (Gas cooker) (%)	Number (Tabletop) (%)
AKT	0(0.0)	0(0.0)	0(0.0)
ALM	0(0.0)	0(0.0)	0(0.0)
ANG	0(0.0)	0(0.0)	0(0.0)
ETF	0(0.0)	0(0.0)	0(0.0)
FAJ	1(2.0)	1(2.0)	0(0.0)
MOR	1(0.0)	0(0.0)	1(2.0)
PG	0(2.0)	0(0.0)	0(0.0)
Total	2(4.0)	1(2.0)	1(2.0)

Key: AKT= Akintola, ALM= Alumni, ANG= Angola, ETF= Education Trust Fund, FAJ= Fajuyi, MOR= Moremi, PG=Post Graduate Hall.

Table 3: The prevalence of *Entamoeba histolytica* among Non-food contact surfaces in halls of residence in Obafemi Awolowo University.

Discussion

Intestinal parasites continue to pose significant public health challenges in economically disadvantaged nations, where prevalent inadequate adherence to proper food hygiene practices persists Macpherson [1] Studies have shown that amoebiasis affects approximately 50 million people worldwide, contributing to roughly 100,000 annual fatalities [6].

In this study, the prevalence of *E. histolytica* was 22%. This was higher than the one reported by Kemal, et al. [15] on the Predictors of Intestinal Parasitic Infection among Food Handlers Working in Mada Walabu University, Ethiopia where the prevalence of *Entamoeba histolytica* was 7.6% and lesser to the one reported by Simon-Oke Iyabo, et al. [16] on the prevalence of *Entamoeba histolytica* among primary school children in Akure, Ondo State, where the highest prevalence of 95.0% was recorded among children who buy food from food vendors. 26.7% was recorded among school age children in Lafia in Nasarawa State Reuben, et al. [17] 12.6% and 17.0% were recorded among children, respectively in Anambra Nigeria Dawet, et al. [18]. Moreover, the highest prevalence of 72% for *E. histolytica* among other intestinal parasites was reported among food vendors in Abeokuta [19].

The prevalence of *E. histolytica* was significantly higher (18%) in the samples of food contact collected from halls of residence in the Obafemi Awolowo University compared to samples of non-food contact (4%), this can be attributed

to improper poor sanitary practices, washing of food items, hands and plates, spoons, shortage of good water supply and low standard of personal hygiene among the student. Notably, the highest prevalence 10% was recorded on plates while 2% prevalence was recorded for each of the pots, spoons, handheld graters and frying pans. There is no statistically significant difference in the prevalence of *E. histolytica* on the surfaces that come into contact with food. The result of the prevalence of positive *E. histolytica* parasites relative to surfaces that are not in direct contact with food stood at 4% which source of contact are from both Gas cookers and Tabletop with 2% prevalence each.

Conclusion

Entamoeba histolytica continues to be one of the most important health challenges in Africa. The higher rate of presence of *E. histolytica* observed from the food contact in this study might be attributed to possible contamination from the source of purchase of various food and items which the student got from markets and stores. Also, poor hygiene among students at various Halls of Residence at the Obafemi Awolowo University which includes improper handling of cooking utensils. Another source might be the use of polluted water for cooking and washing kitchen utensils. Human infection tends to be prevalent in regions characterized by substandard sanitary conditions, insufficient water treatment and lower socio-economic status.

Therefore, it is recommended; that the student populace is sensitized on personal hygiene, mode of transmission of

this parasite. Information on the preventive measures should be passing across to the student in order to prevent further transmission of the parasite.

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