# Prevalence of hospital acquired gastrointestinal protozoa parasites among in-patients of a missionary and private hospital in Awka, Southeastern Nigeria

Ishar, C.O*[1]., Ikeh, M.I[1]., Benedict, A.G[2]., Okeke, O. A[1]., Aghalu, U.C[1]., Offor, V.O[1]., Nnatuanya, I.O[1]

[1]Department of Zoology, Faculty of Biosciences, Nnamdi Azikiwe University, Awka, Nigeria.
[2]Department of Science Technology, Waziri Umaru Federal Polytechnic, Birnin Kebbi, Nigeria.

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**Corresponding Author: Ishar, C.O; co.ishar@spgs.unizik.edu.ng; +2348036164318*

## Abstract

Regardless of the efforts by health organizations and hospital personnel, research continues to report hospital acquired infections in admitted patients worldwide. This research was carried out to survey the prevalence of hospital acquired gastrointestinal protozoa parasites among admitted patients of Regina Caeli Specialist Hospital (missionary hospital) and Izunna Hospital and Maternity (private hospital) in Awka South LGA of Anambra State, Southeast Nigeria. Two samples each from 79 patients were collected and analyzed using direct wet mount and formol ether concentration technique. Other information concerning demography and risk factors were obtained with the aid of a structured questionnaire. Data obtained was analyzed using chi-square test and probability values ≤ 0.05 were considered significant. Out of the samples examined, 9(11.4%) were positive for hospital acquired gastrointestinal protozoa parasites. Hospital acquired gastrointestinal protozoa parasites were found to occur in all two hospitals with the missionary hospital having the highest occurrence rate of 66.7%. Males recorded the highest prevalence of 6(15.8%) compared to females 3(7.3%) while age group 50-59years had the highest prevalence of 28.6%. Patients from the male ward recorded a higher prevalence of 17.9%. Meanwhile patients whose occupation is farming had a higher prevalence of 25.0% while patients who only wash their vegetables/fruits sometimes before eating presented a higher prevalence of 18.2%. Prevalence of hospital acquired gastrointestinal protozoa parasite infection was strongly associated with duration of hospital stay (P< 0.000). Out of the four parasites identified, *Entamoeba histolytica* was the most prevalent with 5(55.6%). Consequently, regulation of patients' hospital stay, sanitation and better hygiene practices should be adopted and encouraged to prevent the spread of hospital acquired infection.

**Key words:** Prevalence, Hospital Acquired, Gastrointestinal Protozoa, Admitted Patients, Awka, Nigeria

## Introduction

Healthcare associated infection also known as nosocomial infection are medically related conditions that were not part of a patient's initial diagnosis on admission into the hospital (Cheng *et al*., 2020). It is totally and morally wrong that a patient already ravaged by sickness should add to the burden by acquiring newer infections in the hospital

where he/she is supposedly receiving treatment. Infections acquired in healthcare settings are among the main causes of death and increased morbidity among hospitalized patients (WHO 2002). In a hospital, pathogens responsible for nosocomial infection may either be from the patients' body or from or the environment, contact with hospital staff, needles or instruments (Alrifai *et al*., 2009). Intestinal protozoa infections have been recognized as one of the most common human infections, affecting more than 2 billion people of the world total population especially in the tropical and sub-tropical regions (Gyang *et al*., 2019). These parasitic infections are highly ubiquitous and are known to constitute the greatest single cause of illness globally (Akinbo *et al*., 2011). Infections are mainly transmitted by means of ingestion of food and water contaminated by protozoan cysts (Hadiza *et al*., 2019; Atu *et al*., 2014) as well as from person to person (Mohammed *et al*., 2014). Risk factors such as poor healthcare delivery, poverty, overcrowding, lack of safe drinking water, weather conditions and improper sanitary conditions and habits greatly influence distribution of gastrointestinal protozoa parasites (Ishar *et al*., 2022; Duedu *et al*., 2015). Increased cost of treatment, long term deleterious effects, malnutrition (Berhe *et al*., 2020), dysentery, liver abscess, loss of blood and nutrients, low level of circulating nutrients (Bin-Hameed & Alyazeedi, 2020) are some of the effects of protozoa and hospital acquired infections. Prevention and control of healthcare infections has thus been identified as a key priority, considering the serious threat it poses to patient safety worldwide (Ige *et al*., 2011). Although epidemiology of intestinal protozoa infections has been widely reported in different parts of the country, reports on the trends of hospital acquired infection is unfortunately lacking. However, there is an essential need for updated surveillance records of these hospital acquired infection at regular intervals to aid development of effective prevention and control strategies. Hence, this study was carried out to determine prevalence of hospital acquired gastrointestinal protozoa parasite infection in Awka, Southeastern Nigeria.

## Materials and method

### Study Area

The study was conducted in two (2) hospitals within Awka metropolis. Awka is the capital of Anambra State and with a population of 371, 038 inhabitants according to the 2006 census (Nnaemeka and Nlekuwa, 2021). Located in the southeast region of Nigeria, the city lies within latitude 6° 12'45.68" N and longitude 7° 04'19.16" E. The area is characterized by 8 months of rainfall usually from March to October and 4 months of dryness from November to February yearly. Awka experiences varying temperature degrees of 27-30C between June and December and 32-34C between January annually (Nwadike *et al*., 2023).

### Study Design

The study was a longitudinal hospital-based study which was conducted for a period of six months (June-November) in Awka, Anambra State, Nigeria.

### Study Population

The study population consisted of only the admitted patients in the wards within the study hospitals. A total of 79 patients comprising 51 from Regina Caeli Specialist Hospital (Missionary Hospital) and 28 from Izunna Hospital and Maternity (Private Hospital)

**Ethical Approval**

Ethical approval to carry out this study was obtained from the Health Research Ethics Committee of Regina Caeli Specialist Hospital, Awka and was assigned reference number Reg.C/Spc.Hosp/Ethics.Cmte/08/21/001.

**Informed Consent**

Consent was sought from the patients or caregivers on behalf of those that were incapable of consenting as at the time of admission in the hospital and only those that consented were included in the study.

**Inclusion/Exclusion Criteria**

In-patients who consented to participate in the study as well as those who were able to provide their stool samples within 48 hours of hospital admission were included in the study. Patients whose stool samples revealed any protozoa parasite at the time of admission were automatically excluded from the study as well as out-patients who were visiting hospitals from their homes.

**Sample Collection**

Upon admission, consented patients were given well labelled, clean, and sterile specimen bottles in which to collect their faecal specimen. These were then arranged in a Giostyle cooler box containing ice packs and immediately transported to the Zoology laboratory of Nnamdi Azikiwe University, Awka for parasitological analysis. However, patients whose stool samples showed any protozoa infection as at the first time of examination were excluded from the study while those whose faecal samples revealed no protozoa infection were included in the study. Faecal samples were again collected and analyzed for the second time at the time of discharge of the patients from the hospitals.

**Sample Size**

The sample size used for this study was 79. This was determined using the sample size formular by Ishar *et al*. (2022).

n =

$$\frac{\frac{[\,Z^2\,x\,P(1-P)]}{e^2}}{1+\frac{(Z^2\,x\,P\,(1-P)}{e^2\;\;x\,N}}$$

N- is the population size (Hospital Bed Capacity)

n- is the sample size

z- is the standard of normal distribution at 95% (1.96)

e- is the margin of error at 5% (0.05)

P- is the standard of deviation (0.5)

**Laboratory Procedure**

The method involved in the laboratory analysis were direct wet mount and formol ether concentration technique. The procedures were performed as described by Cheesbrough, (2009).

**Data Analysis**

The data collated was subjected to statistical analysis using SPSS v22. Pearson chi-square was used to test for significant association between the study variables. Probability values <0.05 were considered significant

**Results**

From an initial total of 140 patients screened at time of admission for inclusion in this study, A total of 79 admitted patients comprising 51 from Regina Caeli Specialist Hospital (Missionary Hospital) and 28 from Izunna Hospital and Maternity (Private Hospital) were recruited and further examined for this study. From the total number of patients examined, 9 patients were diagnosed with hospital acquired gastrointestinal protozoa infection and an overall prevalence of 11.4%.

Hospital acquired gastrointestinal protozoa parasites was recorded in all the two (2) hospitals with Regina Caeli Specialist Hospital having the highest prevalence rate of 6(11.8%) occurring at a rate of 66.7% while Izunna Hospital and Maternity had 3(10.7%) occurring at 33.3% (Table 1).

**Table 1: Distribution of nosocomial intestinal protozoa infection with respect to hospitals**

| Hospital | Number examined | Number infected (%) |
|---|---|---|
| **RCSH** | **51** | **6(11.8)** |
| **IHM** | **28** | **3(10.7)** |
| **Total** | **79** | **9(11.4)** |
| **Pearson chi-square($\chi^2$)** | | **0.020** |
| **P-value** | | **0.888** |

Analysis of the samples revealed *E. histolytica, G. lamblia, T. hominis* and *C. parvum* as the four protozoa parasites responsible for infection in the two (2) hospitals. Among the four (4) parasites, *E. histolytica* was the most predominant parasite (55.6%) while *T. hominis* and *C. parvum* were rarely seen 11.1% (Table 2).

**Table 2: Prevalence of gastrointestinal protozoa parasites in the study hospitals**

| Protozoa parasites | RCSH | IHM | Total |
|---|---|---|---|
| ***E. histolytica*** | **5(55.6)** | **0(0.0)** | **5(55.6)** |
| ***T. hominis*** | **1(11.1)** | **0(0.0)** | **1(11.1)** |
| **G*. lamblia*** | **0(0.0)** | **2(22.2)** | **2(22.2)** |
| ***C. parvum*** | **0(0.0)** | **1(11.1)** | **1(11.1)** |
| **Total** | **6(66.7)** | **3(33.3)** | **9(100.0)** |

The data showed that majority of those infected were adults between 50-59years of age (28.6%) while age group 10-19 and 20-29years revealed no infection (0.0%) (Table 3).

**Table 3: Prevalence of hospital acquired intestinal protozoa infection with respect to age**

| Age group (years) | Number examined | Number infected (%) |
|---|---|---|
| **0-9** | **14** | **1(7.1)** |
| **10-19** | **7** | **0(0.0)** |
| **20-29** | **12** | **0(0.0)** |
| **30-39** | **15** | **3(20.0)** |
| **40-49** | **6** | **1(16.7)** |
| **50-59** | **7** | **2(28.6)** |
| **>60** | **18** | **2(11.1)** |

| | | |
|---|---|---|
| **Total** | **79** | **9(11.4)** |
| **Pearson chi-square($\chi^2$)** | | **6.008** |
| **P-value** | | **0.422** |

The prevalence of hospital acquired gastrointestinal protozoa parasites among males (15.8%) was greater than among females 7.3% (Table 4).

**Table 4: Distribution of hospital acquired intestinal protozoa infection with respect to sex**

| Sex | Number examined | Number infected (%) |
|---|---|---|
| **Male** | **38** | **6(15.8)** |
| **Female** | **41** | **3(7.3)** |
| **Total** | **79** | **9(11.4)** |
| **Pearson chi-square($\chi^2$)** | | **1.402** |
| **P-value** | | **0.236** |

Base on ward/unit admitted, male ward recorded the highest infection prevalence of 17.9% with paediatric ward having the lowest infection rate of 5.3% (Table 5).

**Table 5: Prevalence of hospital acquired intestinal protozoa infection according to ward/unit admitted.**

| Ward/Unit | Number examined | Number infected (%) |
|---|---|---|
| **Male** | **28** | **5(17.9)** |
| **Female** | **32** | **3(9.4)** |
| **Paediatric** | **19** | **1(5.3)** |
| **Total** | **79** | **9(11.4)** |
| **Pearson chi-square($\chi^2$)** | | **1.995** |
| **p-value** | | **0.369** |

According to vegetables/fruits washing habits, patients who were not consistent in washing their vegetables/fruits (i.e., sometimes) recorded the highest infection prevalence of (18.2%) while the least infection was found in patients who always wash the vegetables/fruits before eating 10.9% (Table 6).

**Table 6: Prevalence of hospital acquired intestinal protozoa infection among patients according to vegetable/fruits washing habit**

| Vegetable/fruits washing | Number examined | Number infected (%) |
|---|---|---|
| **Yes** | **55** | **6(10.9)** |
| **No** | **13** | **1(7.7)** |
| **Sometimes** | **11** | **2(18.2)** |
| **Total** | **79** | **9(11.4)** |
| **Pearson chi-square($\chi^2$)** | | **0.691** |

| | |
|---|---|
| **p-value** | **0.708** |

On the bases of duration of stay in the hospital, patients who were admitted between 21-25days, 26-30days and 30days were the most infected 100.0% while no infection occurred among patients who were only hospitalized for 0-5days 0.0%. This was highly statistically significant P=0.000 (Table 7).

Table 7: Intestinal protozoa infection with respect to duration on admission.

| Duration of stay (days) | Number examined | Number infected (%) |
|---|---|---|
| **0-5** | **27** | **0(0.0)** |
| **6-10** | **37** | **2(5.4)** |
| **11-15** | **6** | **0(0.0)** |
| **16-20** | **2** | **0(0.0)** |
| **21-25** | **1** | **1(100.0)** |
| **26-30** | **2** | **2(100.0)** |
| **>30** | **4** | **4(100.0)** |
| **Total** | **79** | **9(11.4)** |
| **Pearson chi-square($\chi^2$)** | | **60.258** |
| **P-value** | | **0.000** |

**Discussion**

The findings of this study reveal a prevalence of 11.8% in the missionary hospital (RCSH) and 10.7% in the private hospital (IHM) and an overall prevalence of 11.4% of hospital acquired gastrointestinal protozoa parasite infection prevalence among the 79 patients examined. This overall prevalence is similar to the work of Alrifai *et al*. (2009) who reported prevalence of 11.1% in Tikrit Teaching Hospital Iraq. However, this result is higher than earlier studies conducted by Akinbo *et al*. (2011) (5.4%) and Hadiza *et al*. (2019) (9.2%) in Benin, Edo and Kaduna states in Nigeria respectively. The overall prevalence is also lower than the prevalence of 54.4% by Mohammed *et al*. (2014) and 86.2% by Gyang *et al*. (2019) in Makoko area of Lagos, Nigeria. The observed disparity in prevalence rates could be attributed to difference in sample size, poor personal hygiene, poor sanitation, health status and type of laboratory procedure used (Atu et al., 2014; Alrifai *et al*., 2009). The occurrence of hospital acquired gastrointestinal protozoa parasites in the sampled hospitals affirms reports by various scientists who documented hospital acquired infections in different parts of the world. The slightly higher prevalence of 11.8% seen in the missionary hospital can be due to the fact that it is a more equipped, admits larger number of patients and renders more health services. These factors lead to the constant influx of patients, handling of various medical conditions and hospitalization. This in turn increases the chances of contamination and cross-contamination of the hospital environment, patients, visitors and medical personnel. A breakdown of the implicated protozoa parasites revealed *Entamoeba histolytica* to be the most prevalent (55.6%) followed by *G. lamblia* (22.2%), *T. hominis* and *C. parvum* were the least encountered (11.1%) each. These findings agree with the work of Odo *et al*. (2016) who reported higher prevalence of *E. histolytica* 10.5% followed by *G. lamblia* 8.5% and Berhe *et al*. (2020) that also documented *E. histolytica* 39.7% as the most predominant parasite in their study. The result

however differs from the work of Shezana *et al*. (2012) who reported *G. lamblia* 19.8% as the most prevalent protozoa parasite followed by *E. histolytica* 2.5% in Pakistan. The variations in parasite prevalence could be due to the hygiene practices and dominant microorganisms in the region Alrifai *et al*. (2009). Base on the result of this study, duration of hospital stay was found to be statistically associated with protozoa infection (P=0.000). Consequently, patients who stayed for longer duration on admission are at greater risk of acquiring nosocomial gastrointestinal protozoa parasites. This outcome conforms with the result of (Duedu *et al*., 2015) and Ishar *et al*. (2022) who both reported higher prevalence among patients hospitalized for longer duration P=0.284 and 0.000 respectively. The prevalence of 17.9% though not statistically significant (P=0.369) observed in the male ward was the highest among the three (3) wards examined with paediatric ward having the least prevalence of 5.3%. This can be explained by the more active nature of male patients strolling around and outside hospital premises immediately they begin to feel better, thus increasing their chances of acquiring or transmitting infectious pathogens. This assertion differs from the result of Ige *et al*. (2011) that documented higher prevalence of 4.4% in the surgical ward with obstetric ward having the least prevalence of 1.4%. In the age distribution of hospital acquired gastrointestinal protozoa parasites, infection was highest within the age group 50-59 years (28.6%) and lowest (0.0%) in the 10-19- and 20-29-years age group respectively (P=0.422). This age group prevalence contradicts the studies by Hameed & Alyazeedi, (2020), and Ogbuagu *et al*. (2009) that reported higher prevalence of 44% (7-8 years), least 16.2% (14-15 years) and highest 56.3% in >10 years and lowest (30.0%) in the ≥60 years bracket respectively. The highest prevalence within the 50-59 years age group can be due to the fact that the immune system declines as one gets older, thereby becoming less resistant to parasitic infections. Gender wise, nosocomial protozoa infection was higher in males 15.8% than females 7.3%. This is in-line with the submissions made by Mohammed *et al*. (2014) and Hameed & Alyazeedi, (2020) who also reported higher prevalence among the male gender than females. However, this result is in contrast to the work of Ishar *et al*. (2022) that reported higher infection in female patients (16.2%) than male patients (13.3%). Although statistically insignificant, (P=0.708), numerous research conducted worldwide has identified vegetables/fruits as a potential source of parasitic infection if not well handled. In this study, infection occurred more in patients who only wash their vegetables/fruits sometimes before eating (18.2%). This finding has no doubt, highlighted the importance of proper washing of vegetables/fruits before consumption especially in hospital surroundings where many pathogens are airborne and can thus contaminate them even without physical contact.

## Conclusion

Hospital acquired gastrointestinal protozoa parasites was found to be present in all two hospitals studied with an overall prevalence of 11.4%. the study reveals the missionary hospital (RCSH) with the highest prevalence rate of 11.8% of hospital acquired gastrointestinal protozoa parasites. *Entamoeba histolytica* was found to be the most predominant parasite (55.6%). Among all the risk factors considered, only duration of hospital admission was statistically significant P=0.000. hospitals are therefore urge to setup infection control units, practice safer healthcare procedures and enlighten

staff and patients on the need for good personal hygiene.

**Study limitations**

The high financial cost, unwillingness of many in-patients to participate in the study as well as poor cooperation from medical personnel poised great challenge during the conduct of this study.

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**Conflict of interest**

None declared by the authors

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