Original Article

**Gastrointestinal Parasitic Infestation in Human
Immunodeficiency Virus Positive and Negative Patients
Attending Clinics in a Tertiary Health Care Centre in
Benue State, Nigeria**

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ABSTRACT

Gastrointestinal parasitic infestation is usually asymptomatic thus goes unnoticed and untreated for long periods of time, often resulting in other serious health complications. In Human Immunodeficiency Virus (HIV) positive patients, the effects usually are more devastating owing to the fact that such patients are already immunocompromised. For this study, HIV positive patients were recruited from the Benue State University Teaching Hospital (BSUTH) Sexually Transmitted Diseases/Antiretroviral Treatment (STD/ART) clinic records while HIV negative patients were selected from other clinics by confirming their HIV status using Determine test strips to check for HIV antibodies; socio-demographic data was generated from questionnaires administered. Patients already placed on anti-helminths or anti-protozoan medicines were exempted from the study. Stool samples (n=550; 304 males 246 females) were examined for intestinal parasites using the standard parasitological procedures for direct wet mount and Formol-Ether Concentration methods. Gastrointestinal parasites were identified from 199 (36.2%) samples implying positive results for these infections: *Giardia lamblia* (3.8%), *Entamoeba histolytica* (8.9%), *Ascaris lumbricoides* (7.1%), *Entamoeba coli* (4.2%), *Trichuris trichuria* (3.3%), *Strongyloides stercoralis* (2.2%), *Taenia sp.* (1.8%), *Trichomonas hominis* (0.5%) and hookworms (2.9%). Out of this 199 only 55 (27.6%) were HIV positive; statistically there was a significant relationship between HIV status and the rate of parasitic infection ($P<0.05$). Personal hygiene practices, environmental sanitary conditions, overcrowding, limited access to clean potable water and poor drainage systems influenced gastrointestinal parasitic infection in both HIV positive and negative patients, HIV status may have increased intensity of gastrointestinal parasitic infection. The need for preventive awareness campaigns and mass chemoprophylaxis exercises cannot be overemphasized; government and private sector collaborations will have a wider coverage area and make a lot of impact.

Keywords: *Gastrointestinal parasites, HIV positive patients, HIV negative patients..*

INTRODUCTION

Intestinal parasitic infection is one of the major health problems in developing countries like Nigeria. It has been estimated to affect 3.5 billion people globally and 450 million

people develop illness as a result of such infections.¹ Intestinal parasites can be categorized into protozoan and helminthic infection -protozoa include *Entamoeba*, *Giardia*, *Trichomonas*,

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Cryptosporidium, *Isospora* and *Balantidium* species; and medically important helminths are *nematodes* (roundworms), *Cestodes* (tapeworms) and *Trematodes* (flukes).² These intestinal parasites have been found to infest both individuals with HIV and those without the infection although immunocompromised (HIV positive) individuals with depleted immunity have an abnormally high susceptibility to infection with even minimally pathogenic organisms.^{3,4} The high prevalence of gastrointestinal parasites in tropical countries including Nigeria is closely linked with poverty, poor environmental hygiene, improper waste disposal, inadequate water supply, sub-standard housing and lack of education.^{5,6} The general population survey in 2013 put Nigeria as the country with the third highest burden of HIV and AIDS in the world with an HIV prevalence rate of 3.4 %; this is slightly lower than the 3.6 % prevalence reported in 2007.⁷ At least 9 % of the 3.5 million people living in Benue State, Nigeria are believed to be living with HIV and 75 % of these individuals are rural dwellers.⁸ The statistics above show that Nigeria and indeed Benue State will have more people who are susceptible to gastrointestinal infection.

HIV infection leads to a loss of CD4+T cells thus leaving affected individuals mortally predisposed to various parasitic infections and sometimes multiple or co-infection. Intestinal parasitic infection plays important roles in the progression of HIV infection, by further disturbing the immune system while it is already engaged in the fight against HIV.⁹ Pathogenic intestinal parasitic infection such as *Cryptosporidium* sp., *Cyclospora* sp., *Entamoeba histolytica* and *Giardia lamblia* can last for months in immunocompromised (HIV) patients causing malabsorption of nutrients, gradual debilitation through dehydration, and metabolic abnormalities; they are also responsible for severe diarrhoea episodes.¹⁰ In developing countries, acute gastroenteritis caused by intestinal parasites is often a complex clinical presentation for medics and paramedics due to diagnostic and treatment regimen challenges. Consequently, it is the major cause of morbidity and mortality in millions of HIV patients annually.¹¹ Despite the use of combination antiretroviral therapy (cART), several HIV infected patients' still present gastrointestinal parasitic infection and its attendant complications.¹² This study seeks to compare gastrointestinal prevalence rates amongst HIV positive and negative individuals in the study area with the findings of other researchers of similar works. The study will also provide baseline information and empirical data for stakeholders involved in activities that seek to curb the

prevalence of gastrointestinal parasitic infection among populations, especially HIV positive patients.

MATERIALS AND METHODS

Study Area

The study was carried out in Makurdi Local Government Area, the capital city of Benue State which is located within the Benue - Niger trough along the bank of the River Benue. The town is located between latitude 7° 30.7' 43" N and longitude 8° 30.8' 35" E. The mean monthly temperature is between 22°C- 38°C and the mean annual rainfall range is between 150mm-180mm. The town has a typical high tropical climate with two clearly marked seasons; rainy season which is prolonged and starts from the month of April to early October and the dry season that begins in late October and ends in March. During the prolonged rainy season, most areas become swampy due to the low water table of the town. The soil types include clay, sandy and loamy soils of which sandy and loamy soils are predominant. Peasant fishing and farming are the main occupations of the local indigenes (Tiv and Jukuns) of the area with a few into commercial farming of crops like yam, rice, guinea corn, Soya beans, maize, cassava and some vegetables like okra, tomatoes and pepper. It is a noteworthy fact that fishing is carried out throughout the year (during both seasons) because of the perennial nature of the Benue River. It is also important to note that potable water supply is a scarce commodity within and around the environs of Makurdi metropolis thus residents who cannot sink boreholes or wells, have to source for water from ponds, streams and sometimes directly from the River Benue. HIV positive patients were recruited from Sexually Transmitted Infection's (STI) clinic of the Benue State University Teaching Hospital (BSUTH) while HIV negative patients were selected from other clinics within the hospital. This hospital was selected because it has a cross section of patients, representative of the Benue population as it is a referral hospital for other hospitals within the state. This study was conducted over a period of five months (December, 2015 – April, 2016).

Ethical Consideration

Data collection was approved by the Health Research Ethics Committee of Benue State University Teaching Hospital, Makurdi. Participation was voluntary and based on informed written consent which was obtained from each study subject.

Data collected had no identifiers thus all diagnostic results were kept strictly confidential.

Sample Size and Collection

The study included 550 participants (304 males and 246 females). HIV positive patients were recruited from the STD/ART clinic records. All HIV positive patients attending the ART clinic, with or without diarrhea, willing to participate in the study were included while HIV negative patients were selected from other clinics within the hospital by confirming their HIV status using rapid diagnostic Determine® Test Strips (DTS) to check for HIV antibodies. The sampling technique used was random sampling. Subjects on specific anti-parasitic drugs for intestinal parasitism were excluded. All study subjects were interviewed on socio-demographic factors and a single stool sample was collected from each participant in clean sample bottles and taken to the laboratory. Study subjects were educated on how to collect the stool samples so as to prevent contaminating the stool with their urine.

Parasitological Examination of Stool Samples

Stool samples were examined both macroscopically, and using the standard parasitological procedures for direct wet mount and Formol-Ether Concentration methods; stool samples were examined microscopically for intestinal parasites. The Formol-Ether Concentration Technique was preferred over the zinc sulphate and saturated sodium chloride flotation techniques because it is rapid and can be used to concentrate a wide range of faecal parasites from fresh or preserved faeces. The risk of laboratory acquired infection from faecal pathogens is also minimized because organisms are killed by the formalin solution.^{13, 5}

Data Analysis

The data obtained was analyzed using simple percentages and test for significance. The prevalence was calculated in each case and expressed in percentages. Comparative analysis of the results was done using chi-square; $P < 0.05$ was considered statistically significant.

RESULTS

The 550 (304 males and 246 females) comprised 197 HIV positive patients, 103 HIV negative individuals and 250 subjects whose status was unknown. A total of 199 subjects tested positive for intestinal parasitic infection with prevalence of 36.1%; out of which 55 (27.6%) were HIV positive and

34(17.1%) HIV negative. Out of the 250 with unknown status, 110(55.3%) tested positive to parasitic infection. There was a significant association between HIV status and the rate of parasitic infection ($P < 0.05$) (Table 2). The most frequently observed intestinal helminths (Table 1), were *A. lumbricoides* 39 (7.1%), *T. trichiura* 18 (3.3%), hookworms 16(2.9%), *S. stercoralis* 12(2.2%) and *Taenia spp.* 10(1.8%). The most frequently observed protozoans were *E. Histolytica* 49 (8.9%), *Entamoeba coli* 23 (4.2%), *G. lamblia* 21 (3.8%) and *T. hominis* 3 (0.5%). Out of the 199 HIV positive patients examined, 55(27.9%) had co-infection with gastrointestinal parasites. Source of drinking showed no association with infection (Table 3) however the environmental factor of waste disposal and personal hygiene habit of hand washing did exemplify significance (Tables 4 and 5). The overall prevalence of intestinal parasites as it relates to sex showed that males 131(65.8%) were generally more infected than the females 68(34.2%), (Figure 1). There was a strong statistical relationship ($P < 0.05$) with the prevalence of gastrointestinal parasites in relation to age. The age group 16 - 30 years showed highest prevalence 48.7%, followed by 31 years and above 40.2% (Fig. 3).

Table 1: Distribution of gastrointestinal parasites amongst the study population

Parasites	HIV Status			Prevalence (%)
	Positive (n=197)	Negative (n=103)	Unknown (n=250)	
Helminths				
<i>Ascaris lumbricoides</i>	8	5	26	(7.1)
Hookworms	4	2	10	(2.9)
<i>Trichuris trichiura</i>	-	-	18	(3.3)
<i>Strongyloides stercoralis</i>	4	4	4	(2.2)
<i>Taenia sp</i>	7	3	-	(1.8)
Protozoans				
<i>Entamoeba histolytica</i>	13	10	26	(8.9)
<i>Entamoeba coli</i>	11	6	6	(4.2)
<i>Giardia lamblia</i>	5	4	12	(3.8)
<i>Trichomonas hominis</i>	3	-	-	(0.5)

Table 2: HIV status of Respondents and Parasitic infection

HIV status	Number examined	Number positive	Prevalence %
Positive	197	55	27.9
Negative	103	34	33.0
Unknown	250	110	44.0
Total	550	199	36.1

$$\chi^2 = 12.9, df = 1, P < 0.05$$

Table 3: Prevalence (%) of gastrointestinal parasites in relation to source of drinking water

Source of drinking water	Total Responses	Number infected (HIV positive)	Number infected (HIV negative)
Borehole	147	25 (17.0)	12 (8.1)
Pipe-borne	57	7(12.3)	10 (17.5)
Well	21	7(33.3)	1 (4.7)
River	7	2 (28.5)	0 (0.0)
Sachet water	42	5 (11.9)	8 (19.0)
Tank	26	9 (34.6)	3 (11.5)
Total	300	55 (18.3)	34 (11.3)

$$\chi^2 = 5.56, df = 5, P > 0.05$$

Table 4: Prevalence of gastrointestinal parasites in relation to waste disposal practices

Waste disposal habits	Total Response	Number infected (HIV positive)	Number infected (HIV negative)
Pit burying	162	15 (9.3)	13 (8.0)
Burning	73	17 (23.3)	6 (8.2)
Open dumping	65	23 (35.4)	15 (23.1)
Total	300	55 (18.3)	34 (11.3)

$\chi^2 = 19.91$, $df = 2$, $P < 0.05$

Table 5: Prevalence of gastrointestinal parasites in relation to hand washing habits

Hand washing habits	Total Responses	Number infected (HIV positive)	Number infected (HIV negative)
Before eating only	163	21 (12.9)	11 (6.7)
After toilet use only	73	17 (23.3)	9 (12.3)
Both before eating and after toilet use	64	17 (26.6)	14 (21.9)
Total	300	55 (18.3)	34 (11.3)

$\chi^2 = 19.91$, $df = 2$, $P < 0.05$

Figure 1: Prevalence of gastrointestinal parasites in relation to sex

$\chi^2 = 14.06$, $df = 1$, $P < 0.05$

Figure 2: Prevalence of gastrointestinal parasites in relation to symptomatic history

$\chi^2 = 0.08$, $df = 1$, $P > 0.05$

Figure 3: Gastrointestinal parasitic prevalence distribution and age

$\chi^2 = 0.00$, $df = 2$, $P < 0.05$

DISCUSSION

This study mainly illustrates the gastrointestinal parasitic infestation of HIV positive patients though it also elaborately demonstrates the existence of several gastrointestinal parasites amongst some patients' attending the Benue State University Teaching Hospital (BSUTH), Makurdi. The study shows an overall parasitic prevalence of 36.1 % for both HIV positive and negative patients. This is slightly higher than the 26.9 % as reported by Omudu *et al.*, in a study they carried out in some communities of Benue State¹⁴ and the 35.8 % reported by Shimelis *et al.*, in a study conducted in Southern Ethiopia.¹⁵ Gastrointestinal parasites were identified from 199 samples implying positive results for a number of these gastrointestinal parasites as stated in the results above and out of this 199 only 55(27.6%) were HIV positive; statistically there was a significant relationship between HIV status and the rate of parasitic infection ($P < 0.05$). The overall gastrointestinal parasitic prevalence of 27.6 % reported by this study for HIV positive patients is slightly higher than the 23.8 % prevalence reported by a similar 2012 study carried out by Cornelius and his associates in Kenya.¹⁶ Usip *et al.*, and Pennap *et al.*, in similar studies also carried out in Nigeria reported very high prevalence rates of 64.5 % and 88.5 % respectively.^{17, 18} It is evident therefore that HIV positive patients are predominantly prone to these parasitic infections; this may be attributed to their vulnerability to other predisposing factors due to their compromised immunity.

The prevalence of parasitic infection amongst populations is a function of several diverse factors that transcend the integrity of the hosts' immunity. Environmental factors are a group of such factors and this study also illustrated their implication

with the infection rates. The study did not exemplify a significant association between source of drinking water and parasitic infection ($P>0.05$). It is important to note that even if the sources were not directly contaminated, the handling up until the time of consumption may have introduced contamination thus infection. Waste disposal practices and hand washing habits however show this association ($P<0.05$); this may be ascribed to fact that one's hygiene of personal space is not enough to prevent infection. Pathogenic microorganisms are no respecter of personal boundaries thus hygiene must be approached holistically to yield the desired results and prevent the occurrence and spread of such infection. A 2014 and 2015 study carried out by Utume *et al.*, agrees with the findings of this study. Utume and associates in their studies highlighted that poor hygienic practices especially hand hygiene promote not just intestinal protozoan and helminthic diarrheal infections but also bacterial diarrheal infection.^{19, 5}

Sex and age (figures 1 and 3) are significantly associated with infection as portrayed by this study ($P<0.05$) however, a number of predisposing risk factors in addition to other attributes like sample size and age range of test participants, may be more responsible for this significance as reported. Other researchers have also failed to clearly identify the role of sex and age in parasitic infection.^{20, 21} Further studies can be done to present empirical data that specifically highlight the roles of sex and age in gastrointestinal parasitic infection.

This study did not establish a significant correlation between HIV status and the symptomatic or asymptomatic nature of infection as is evident in Figure 2 ($P>0.05$); however, there is an urgency to eradicate parasitic infection especially in HIV positive patients due to the asymptomatic nature of these infections which makes it difficult to adequately treat. Continued exposure to this opportunistic infection does weary the already compromised immune system of HIV positive individuals thus reducing their life expectancy drastically.^{14, 22, 23, 24, 25 & 26}

CONCLUSION

The study illustrates a relatively high prevalence of gastrointestinal parasitic infection in both HIV positive and negative patients as compared to the reports of other researchers. The variation in prevalence rates may be attributed to factors such as study area, sensitivity of the method of parasitic determination, sample size, age of participants, seasonal variations and/or time of study, stage of infection and

endemicity of parasites in the study area. Nonetheless, gastrointestinal parasitic infections are easily transmissible and fast becoming a major public health concern. The urgent need to control infection spread and adequately treat infected persons, especially the immunocompromised cannot be overemphasized.

Based on the findings of this study, it is therefore recommended that public and private manufacturers of anti-parasitic drugs should form partnerships and collaborations that will aim to create proper awareness, offer free diagnostic services and treatment regimens to individuals living in communities at the "end of the road"; as members of such communities are often ignorant and heavily parasitized. These same public-private partnerships should also sponsor research that will provide more empirical data to serve as the guide for designing and implementing intervention programmes.

Limitation

We had limitations with study subjects selected from other clinics within the hospital who refused to submit blood samples for the confirmation of their HIV negative status.

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Conflict of Interest

None declared.

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