ORIGINAL ARTICLE

SEASONAL VARIATION OF INTESTINAL PARASITIC INFECTIONS AMONG HIV-POSITIVE PATIENTS IN BENIN CITY, NIGERIA

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ABSTRACT

BACKGROUND*: There are a number of conflicting studies on the prevalence of intestinal parasitic infections in HIV infection with regards to different seasons. This study was conducted to determine seasonal influence on the prevalence of intestinal parasitic infections in HIV-positive persons in Benin City, Nigeria.*
METHODS*: Stool specimens from 2000 HIV-positive patients and 500 controls (HIV-negative individuals) were examined for ova, cysts or parasites using standard procedures.*
RESULTS*: More intestinal parasitic infections were observed in the rainy season (17.6%) than the dry season (12.3%) (OR = 1.526, 95% CI = 1.184, 1.967, p = 0.0013). Male patients (18.3) had more episodes of intestinal parasitic infections than their female (13.7) counterparts (OR = 1.403, 95% CI = 1.092, 1.803, p = 0.0096).*
CONCLUSION*: Cryptosporidium species and Strongyloides stercoralis were the only parasitic agents that were associated with rainy season.*
Keywords: Season, Intestinal Parasites, HIV

INTRODUCTION

Despite the worldwide efforts at controlling the menace of acquired immunodeficiency syndrome (AIDS), the number of infected persons is growing as well the number of deaths. In 2008, Nigeria recorded 0.28 million deaths resulting from HIV disease and the infection rate was put at 4.6 million (1). Superimposed infections due to defective immunity are a major health problem among HIV-positive persons. Intestinal infection, which is also one of the basic health problems in tropical regions, is common in these patients (2). Intestinal parasitic infections in HIV-infected patients are common in many regions and populations across Nigeria and represent a lasting public health challenge (3). The spectrum of opportunistic infections among HIV-infected persons varies from one region to another (4). Amongst these opportunistic infections, opportunistic protozoan infections are the most serious ones causing severe morbidity and mortality (5). There are a number of conflicting studies on the prevalence of intestinal parasitic infections in HIV infection with regards to different seasons. Some authors observed seasonal variations in the prevalence of intestinal parasitic infections in HIV persons (5, 6), while Kurniawan *et al*. (7) reported no seasonal influence. There is paucity of information on seasonal influence on the prevalence of parasitic infections in HIV-positive persons in Benin City. Hence, this study was conducted to determine seasonal influence on the prevalence of intestinal parasitic infections among HIV-positive persons in Benin City, Nigeria.

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MATERIALS AND METHODS

The cross sectional study was carried out at the University of Benin Teaching Hospital, Benin City – a teaching hospital with a referral status and center for United States President's Emergency Plan for AIDS Relief (PEPFAR). A total of 2,500 subjects consisting of 2,000 HIV-positive patients attending HIV clinics and 500 apparently healthy HIV non-infected individuals that served as controls were included in this study. Verbal informed consent was obtained prior to specimen collection.

Specimen collection and processing: Single stool specimen was collected from each patient in a clean wide-mouthed container. Freshly voided stool specimens were processed using formol-ether concentration technique and examined microscopically for ova, cysts or parasites using saline and iodine mounts on grease free slides (8). Part of the stool specimen was preserved in 10% formal-saline and from this a concentrated smear was made on a grease-free slide, fixed with methanol and stained by a modified Ziehl-Neelsen stain as described by Akinbo *et al*. (3). This was used to detect oocyst of *Crystosporidium* species, *Isospora belli, Cyclospora cayetanensis*.

The rainy season was defined as the period between the months of April and September and the dry season between October and March.

Statistical analysis: The frequency of data was analyzed using chi square (x^2) test and odd ratio (OR) was calculated for each potential risk factor using the statistical software INSTAT® (GraphPad Software Inc., La Jolla, CA, USA).

Before the study was conducted, the Ethical Committee of the University of Benin Teaching Hospital, Benin City, Nigeria, had approved the protocol of this study.

RESULTS

Generally, more intestinal parasitic infections were observed in the rainy season (17.6%) than the dry season (12.3%) (OR = 1.526, 95% CI = 1.184, 1.967, p = 0.0013). In the same vein, male patients (18.3) had more episodes of intestinal parasitic infections than their female (13.7) counterparts (OR = 1.403, 95% CI = 1.092, 1.803, p = 0.0096). The effect of gender on the prevalence of intestinal parasitic infections was observed only in the dry season where males had significantly higher prevalence of intestinal parasitic infections (p = 0.031). Among the intestinal parasitic agents, *Crptosporidium* species and *Strongyloides stercoralis* were associated with higher prevalence in the rainy season (Table 1).

Table 1: Effect of gender and season on the prevalence of intestinal parasitic infections among HIV patients.

Season	**Male**		**Female**				
HIV patients	**Number tested**	**Number positive**	**Number tested**	**Number positive**	**OR**	**95% CI**	**P value**
Rainy	415	81	712	117	1.233	0.901,1.687	0.218
Dry	253	41	620	66	1.623	1.066,2.473	0.031*
Non-HIV Patients							
Rainy	126	6	139	11	0.568	0.204,1.582	0.713
Dry	83	8	152	6	2.561	0.857,7.652	2.098

On the other hand, intestinal parasitic infection was not associated with seasonal variation among HIV non-infected persons (OR = 0.703, 95% CI = 0.338, 1.462, p = 0.450), although the prevalence is higher (7.53%) in the dry season compared to the rainy season (5.41%) (Fig 1). Only *Ascaris lumbricoides* and hookworm were recovered from non-HIV patients and neither were significantly associated with seasonal variations (OR = 0.821 95%CI = 0.357, 1.889; p = 0.805 and OR = 0.439 95% CI = 0.097, 1.984; p = 0.480 respectively) (Table 2).

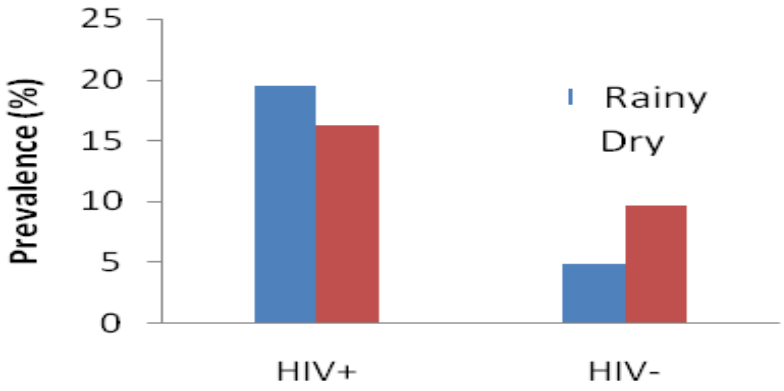

Figure 1: Effect of seasonal variation on prevalence of intestinal parasites

Table 2: Effect of season on the prevalence of parasitic infections in HIV-infected patients

Organism	**Rainy**	**Dry**	**OR**	**95% CI**	**P value**
E. histolytica	8	4	1.560	0.4679, 5.198	0.662
G. intestinalis	0	2	0.155	0.007, 3.240	0.373
Isospora belli	19	9	1.653	0.744, 3.672	0.291
Cryptosporidium	62	18	2.777	1.630, 4.730	0.0001*
A. lumbricoides	71	48	1.161	0.796, 1.693	0.5
Hookworm	42	32	1.022	0.639, 1.633	0.929
S. stercoralis	20	3	5.261	1.558, 17.767	0.006*
T. trichiuris	8	10	0.620	0.243, 1.577	0.438
Taenia spp	1	3	0.259	0.027, 2.492	0.449

DISCUSSION

Seasonal variations are known to affect the prevalence of a number of infections (9). With the advent of HIV a number of opportunistic intestinal parasitic infections have been reported (3). Although, a recent report (5) relates intestinal coccidian infection to seasonal variations, there is paucity of reports on effect of seasonal variations on the prevalence of intestinal parasitic infections among HIV patients. Intestinal parasitic infection is significantly associated with rainy season among HIV patients. Furthermore, rainy season may facilitate conditions and risk factors that predisposed to intestinal parasitic infections. Indeed, other parasitic infections such as malaria parasitaemia have been reported to have higher prevalence in the rainy season (10). Male HIV patients are significantly at risk of acquiring intestinal parasitic infections and the reason for this association may be adduced to more males being exposed than females based on occupational grounds. Surprisingly, the association of gender and intestinal parasitic infections was observed only in the dry season and the reason for this observation is unclear.

Considering the parasitic agents in relation to seasons, *Cryptosporidium* species and *Strongyloides stercorlis* were the only parasitic

agents that were associated with rainy season. The finding of *Cryptosporidium* in association with rainy season had been noted (5) and its transmission is via different routes such as water, person-to person, contact with animal, and etc (11). During the rainy season cattle are seen roaming and grazing freely and as a result defaecate on soil. These faeces are washed into nearby streams, and rivers by flood of rain. Consumption of this contaminated water can lead to cryptosporidial infection and indeed, prevalence of cryptosporidial infection has been reported to be higher among HIV patients that used streams and rivers as a source of water (11).

In resource poor settings such as Nigeria, many people walk and play in open field barefooted, especially in the rainy season and these habits increase the chances of *Strongyloides stercoralis* infection. This may explain the association of *S. stercoralis* with rainy season in this study. Although, a similar mechanism of infection is also utilized by hookworm, the reason for the lack of association between hookworm and season is unclear.

There was no significant association between intestinal parasitic infection and seasonal variation among the non-HIV patients and the reason for this finding is unclear. *Ascaris lumbricoides* and hookworm infections were the only intestinal parasites recovered from the non- HIV patients.

Conclusively, intestinal parasitic infections are associated with rainy season among HIV patients. *Cryptosporidium* species and *S. stercoralis* were the parasitic agents associated with rainy season. This data will be useful in the epidemiology of intestinal parasitic infections in HIV patients as well as in their management.

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