A COMPARATIVE STUDY OF THE PREVALENCE OF HELMINTH PARASITES IN HIV SEROPOSITIVE AND HIV SERONEGATIVE INDIVIDUALS IN PLATEAU STATE, NIGERIA.

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ABSTRACT

From June to November, 2006, stool samples were collected from 818 individuals that are both HIV-seropositive and HIV-seronegative attending four hospitals in Plateau State, Nigeria and were examined for the presence of intestinal helminths. The aim of the study was to determine the prevalence of intestinal helminth parasites in HIV-seropositive subjects as compared to the HIV-seronegative individuals. Of the 818 individuals enrolled in the study, 261 were HIV-seropositive while 557 were HIV-seronegative. The study revealed helminth parasites to be more prevalent among the HIV-seropositive(33.3%) than in the HIV-seronegative (21.9%). We found some intestinal helminths parasites which were quite different from those reported earlier by other researchers in other regions of the world. This variability could be multifactorial. Diagnosis and treatment of intestinal helminths should be a routine part of HIV care in parasite-endemic developing countries and where this approach is logistically infeasible, mass deworming strategies may provide an appropriate alternative given the low cost and low toxicity of antihelminthics and the high prevalence rates of intestinal helminth infection expected.

Keywords: Intestinal Helminths, HIV-serostatus, Prevalence, Plateau state, Nigeria.

INTRODUCTION

One of the major health problems among HIV-seropositive patients is superimposed infection due to low immunity and intestinal parasitic infections, which is also one of the basic health problems in tropical region is common in these patients.(Eamsobhana and Boranintra, 1987). An overlapping distribution of the these pathogens becomes important because concomitant infection with HIV and helminths may potentiate the virulence of each within a coinfected host. (Bentwich *et al*, 2000; Bentwich, 2000).

Although helminth infections are ubiquitous in developing countries, their effect on the epidemiology of HIV infection, including the risk of HIV transmission and disease progression and management remains uncertain. (Bentwich *et al,* 1999; Cleric *et al*, 2001).

Understanding the role played by helminth parasites infections in HIV individuals and its eventual disease progression in developing counties is essential to effective provision of care for HIV patients. Although antiretroviral therapy (ART) is being introduced in resource-limiting settings, basic medical services remain limited, and preventable, endemic illnesses account for substantial morbidity among HIV-infected patients (UNAIDS, 2006). As a consequence of a possible impact on general morbidity, the idea of presumptively deworming large populations has received some support (Bentwich *et al,* 1999).

Given the high prevalence of intestinal pathogens in areas of the world hardest hit by HIV infection, it would be ideal if treatment of such co-infections also resulted in a decrease in HIV burden such that HIV disease progression and transmission could be modified (Hosseinipour *et al,* 2007). Wolday *et al*, (2002) reported that treatment of helminth infections may reduce plasma HIV RNA levels, but not all studies confirm this (Lawn *et al,* 2000; Brown *et al,* 2004; Modjarrad *et al,* 2005); and mortality in HIV-infected patients may be similar by helminth infection status (Brown *et al,* 2004).

However, the few studies published to date indicate that helmitnh infections may occur with equal frequency and intensity in HIV-infected and HIV-uninfected persons. (Feitosa *et al,* 2001; Fontanet *et al,* 2000). Hosseinipour *et al,* (2007), reported that helminth infections were more common in HIV-uninfected than in HIV-infected patients (39% vs. 17%). That among the HIV-infected patients, helminth infections were associated with higher CD4 cell counts but not with higher RNA levels.

In the present study, we determined the prevalence of intestinal helminth parasites in HIV-seropositive and HIV- seronegative individuals in Plateau state and estimated the differences in parasitic infestations between those in the semi-urban areas and those in urban areas, various ages, sexes and occupations.

MATERIALS AND METHODS

Study Area: The study was conducted in Plateau state, Nigeria located at latitudes 8^0 24^1 and 10^0 24^1 North and longitude 8^0 32^1 and 10^0 38^1 East from the month of June to November, 2006. Plateau state is boarded to the North West by Kaduna state, to the North East by Bauchi state, to the South West by Nassarawa state and to the South East by Taraba state (Plateau state, 2004). Plateau state records two seasons' i.e. the dry season (November to March) and rainy season (April to October). It is shared into 3 senatorial districts (North, Central and South) for political convenience and each of the senatorial districts harbours the various hospitals.

Ethical Clearance: - The ethical clearance committee of the Plateau State Specialist Hospital, Jos (Ref. No. PSSH/ADM/454/T/X) approved the study which also covers for General Hospitals Barkin Ladi, Pankshin and Shendam which are its Voluntary Counseling and Testing sites. Informed consent was obtained from all study participants according to the guidelines of the various centres.

Subject Selection And Sample Collection: The study population was eight hundred and eighteen (818) that were HIV seropositive and HIV seronegative. 261 were HIV seropositive while 557 HIV-seronegatives. The following demographic factors were also collected: age, sex, occupation e.t.c. Fresh stool samples were collected from these individuals into clean, dry wide-mouthed plastic containers with tight-fitting lids. Specimens were examined within 30minutes to 1hour of receipt and the individuals were advised to collect any adult worm expelled during the collection.

Examination of Samples

Macroscopic Examination: The standard method was used as described by Chesebrough (1998).

Direct Wet Mount: - The standard method was used as described by Chesebrough (1998).

Formol-Ether Concentration Method: It was carried out as described by Allen and Rilley (1990).

Statistical Analysis

Chi-square (χ^2) was employed to compare the frequencies of parasites in HIV-seropositive with that in HIV –seronegative individuals in relation to study areas, age group, sex and occupation.

RESULTS

The prevalence of intestinal helminths in HIV seropositive and HIV seronegative individuals in relation to sex is as shown on Table 1. In the HIV –seropositive and HIV-seronegative individuals, the males were more infected with the helminth parasites, with a 47.7% in the HIV seropositive and 23.6% in the HIV-seronegative as compared to the females with 23.0% in the HIV-seropositive and 20.3% in the HIV-seronegative. There was no significant difference (p>0.05) observed in the level of infection between the males and the females.

Table 2 shows the prevalence of intestinal helminths in both HIV-seropositives and HIV-seronegatives according to the study areas. Overall parasitic infections shows 33.3% of HIV-seropositives were infected while only 21.9% of the HIV-seronegatives were positive for helminth infection. *Ascaris lumbricoides* in HIV-seropositives was found to be 14.2% while it is 8.3% among the HIV seronegatives. *Schistosoma mansoni* was found to be 5.4% among the seropositives and 3.6% among the seronegatives. Statistical analysis shows there was no significant difference (p>0.05) of the level of intestinal helminth parasites found in individuals but a significant difference (p<0.01) was observed in the level of parasite infection among the various study centres.

Table 3 shows that the age group between 20-29 years had the highest parasitic infection at a rate of 40.7% in both the HIV seropositive and HIV-seronegative individuals. The least parasitic infection was observed in the age group 0-9years. A significant difference (p<0.001) was observed in the age grouping.

The farmers groups have the highest prevalence of helminth parasite infection in both HIV-seropositive and HIV-seronegative with the least being the primary school age pupil (0% in HIV-seropositive and 11.67% in the HIV-seronegative) as shown on Table 4. A significant difference (p<0.001) was found among the various occupation studied

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Table 1: Prevalence of Intestinal Helminths in HIV-seropositive and HIV-seronegative individuals in relation to sex

Helminths	SEX			
	HIV Seropositive		**HIV Seronegative**	
	Male n (%) 109(41.8)	Females n (%) 152(58.2)	Males n (%) 284(51.0)	Females n (%) 273(49.0)
A. lumbricoides	24(22.0)	13(8.6)	25(8.8)	21(7.7)
Hookworm	14(12.8)	16(10.5)	25(8.8)	26(9.5)
E. vermicularis	0(0)	0(0)	1(0.4)	0(0)
Taenia species	3(2.8)	0(0)	1(0.4)	0(0)
H. nana	3(2.8)	0(0)	0(0)	3(1.1)
S. mansoni	8(7.3)	6(4.0)	15(5.3)	5(1.8)
TOTAL	**52(47.7)**	**35(23.0)**	**67(23.6)**	**55(20.2)**

Sexes :(χ^2=0.49; df=1; p>0.05)

Table 2: Prevalence of Intestinal Helminths in HIV-seropositive and HIV-seronegative individuals according to study area

Helminths	STUDY AREAS									
	JOS		**B/LADI**		**PANKSHIN**		**SHENDAM**		**TOTAL**	
	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)
	117(40.9)	169(30.3)	46(20.5)	178(32.0)	40(32.3)	84(15.1)	58(31.5)	126(22.6)	261(31.9)	557(68.1)
A .lumbricoides	13(11.1)	10(5.9)	8(17.4)	15(8.4)	11(27.5)	7(8.3)	5(8.6)	14(11.1)	37(14.2)	46(8.3)
Hookworm	6(5.1)	5(3.0)	7(15.2)	24(13.5)	8(20.0)	7(8.3)	9(15.5)	15(11.9)	30(11.5)	51(9.2)
E.vermicularis	0(0)	0(0)	0(0)	1(0.6)	0(0)	0(0)	0(0)	0(0)	0(0)	1(0.2)
Taenia species	3(2.6)	1(0.6)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	3(1.2)	1(0.2)
H .nana	1(0.9)	0(0)	0(0)	0(0)	0(0)	2(2.4)	2(3.5)	1(0.8)	3(1.2)	3(0.5)
S. mansoni	5(4.3)	4(2.4)	2(4.4)	11(6.2)	3(7.5)	3(3.6)	4(6.9)	1(0.8)	14(5.4)	20(3.6)
TOTAL	**28(24.0)**	**20(11.8)**	**17(27.0)**	**51(28.7)**	**22(55.0)**	**19(22.6)**	**20(34.5)**	**32(25.4)**	**87(33.3)**	**122(21.9)**

At study sites: (χ^2 =15.91; df=3; p<0.01); Helminth parasites: (χ^2= 3.72; df=5; p> 0.05)

Table 3: Prevalence of Intestinal Helminths in HIV-seropositive and HIV-seronegative individuals with relation to age groups

Helminths	AGE GROUPS 0-9		10-19		20-29		30-39		40-49		≥50	
	HIV+ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)
	2(0.8)	32(5.8)	7(2.7)	108(19.4)	81(31.0)	168(30.2)	114(43.7)	151(27.1)	50(19.2)	63(11.3)	7(2.7)	35(6.3)
A. lumbricoides	0(0)	2(6.3)	2(28.6)	15(13.9)	12(14.8)	16(9.5)	17(14.9)	5(3.3)	6(12.0)	6(9.5)	0(0)	2(5.7)
Hookworm	0(0)	2(6.3)	0(0)	8(7.4)	13(16.1)	25(14.9)	15(13.2)	12(8.0)	1(2.0)	3(4.8)	1(14.3)	1(2.9)
E.vermicularis	0(0)	0(0)	0(0)	0(0)	0(0)	1(0.6)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
Taenia species	0(0)	0(0)	0(0)	0(0)	2(2.5)	0(0)	0(0)	1(0.7)	1(2.0)	0(0)	0(0)	0(0)
H. nana	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1(0.9)	2(1.3)	2(4.0)	0(0)	0(0)	0(0)
S. mansoni	0(0)	1(13.1)	1(14.3)	3(2.8)	6(7.4)	6(7.4)	5(4.4)	5(3.3)	1 (2.0)	3 (4.8)	1(14.3)	3 (8.6)
TOTAL	**0(0)**	**5(15.6)**	**3(42.9)**	**26(24.1)**	**33(40.7)**	**33(40.7)**	**38(33.3)**	**25(16.6)**	**11(22.0)**	**12(19.1)**	**2(28.6)**	**6(17.1)**

Age grouping: (χ^2=25.64; df=5; p<0.001)

Table 4: Prevalence of Intestinal Helminths in HIV-seropositive and HIV-seronegative individuals with relation to Occupation

Helminths	OCCUPATION															
	Civil Servants		Armed Forces		House wives		Business		Applicants		Students		Farmers		Pupil	
	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)	HIV +ve n (%)	HIV-ve n (%)
	41(15.7)	74(13.3)	5(1.9)	1 (0.2)	81(31.0)	118(21.2)	57(21.8)	45(8.1)	17(6.5)	34(6.1)	28(10.7)	174(31.2)	30(11.5)	68(12.2)	2(0.8)	43(7.7)
A. lumbricoides	9(22.0)	3(4.1)	2(40.0)	0(0)	6(7.4)	8(6.8)	6(10.5)	4(8.9)	(29.4)	2(5.9)	2(7.1)	17(9.8)	7(23.3)	10(14.7)	0(0)	2(4.7)
Hookworm	3(7.3)	7(9.5)	2(40.0)	0(0)	12(14.8)	8(6.8)	6(10.5)	2(4.4)	(11.7)	1(2.9)	0(0)	17(9.8)	5(16.7)	14(20.6)	0(0)	2(4.7)
E. vermicularis	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1(0.6)	0(0)	0(0)	0(0)	0(0)
T. species	1(2.4)	1(1.4)	0(0)	0(0)	0(0)	3(2.5)	1(1.8)	0(0)	0(0)	0(0)	0(0)	0(0)	1(3.3)	0(0)	0(0)	0(0)
H. nana	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	2(7.1)	0(0)	1(3.3)	0(0)	0(0)	0(0)
S. mansoni	0(0)	0(0)	0(0)	0(0)	3(3.7)	2(1.7)	1(1.8)	3(6.7)	1 (5.9)	0(0)	5(17.9)	6(3.5)	4(13.3)	8(11.8)	0(0)	1(2.3)
TOTAL	**13(31.7)**	**11(14.9)**	**4(80.0)**	**0(0)**	**21(25.9)**	**21(17.8)**	**14(24.6)**	**9(20.0)**	**8(47.1)**	**3(8.8)**	**9(32.1)**	**41(23.6)**	**18(60.0)**	**32(47.1)**	**0(0)**	**5(11.6)**

Occupation: (χ^2=30.21; df=7; p<0.001)

DISCUSSION

The prevalence of intestinal helminthiases showed that out of the six parasites recovered, *Ascaris lumbricoides* was the most prevalent followed by hookworm, then *S .mansoni* and the least being *E. vermicularis*. These are the most common parasites in Sub-Saharan Africa and other developing regions. This is in agreement with Modjarrad *et al,* (2005) in Lusaka, Zambia who also reported a high prevalence of *A. lumbricoides* in their study. It is also in agreement with Okodua *et al,* (2003) in their studies on intestinal parasites in HIV patients in Southwestern, Nigeria. But disagrees with those of Lindo *et al,* (1998) who reported *Trichuris trichiura* (21.1%) as the most prevalent in San Pedro Sula, Honduras in Central America. *A. lumbricoides* was found to be more common in the four categorized regions Urban (Jos) and semi-urban towns (Barkin Ladi, Pankshin, and Shendam). *E. vermicularis* was not recorded in the urban area but in one of the semi-urban areas (Barkin Ladi) and in an HIV-seronegative individual.

From the study, intestinal helminth parasites were found to be more common among the HIV-seropositive as against the HIV-seronegative individuals (33.3% vs. 21.9%). This is in agreement with Okodua *et al,* (2003) in their study in Western Nigeria but at variance with Hosseinipour *et al,* (2007) who reported that helminth infections were more common in HIV-uninfected than in HIV-infected patients (39% vs. 17%) in their study in Lilongwe Malawi. Okodua *et al,* (2003) in Abeokuta, Nigeria reported *Ascaris lumbricoides* (20%), *A. duodenale* (5.7%), *E. histolytica* (5.7%), *E. coli*(5.7%, *C. parvum* (5.7%) were detected more frequently, while Lindo *et al,(*1998) reported *T. trichiura* (21.1%), Hookworm (17.3%) and *S. stercoralis* (7.7%) from the stool samples of HIV infected individuals. In our study, we found in both HIV-seropositive and HIV-seronegative, *A. lumbricoides* (14.2% vs. 8.3%), Hookworm (11.5% vs. 9.2%), *S. mansoni* (5.4% vs. 3.6%), *Taenia species* (1.2% vs. 0.2%), *Hymenolepis nana* (1.2% vs. 0.5%) and *E. vermicularis* (0% vs.0.2%) in that order of prevalence. The difference could be as a result of environmental and behavioural pattern of the people in these regions. In Abeokuta for instance, the environment being a tropical one favours the survival of most intestinal helminthes and cysts of protozoan. The people also have a habit of eating with bare hands which might have been contaminated with ova and/or cysts from the environment while majority of the people in Honduras are low income earners (Escobedo and Nunez, 1999) and it is possible that they walk bare-footed most time which might predispose them to infection by filariform larvae. In our study zone (North central Nigeria), apart from the environment which is tropical and favour the survival of intestitinal parasites, eating with bare hands contaminated with the cysts/ova of these parasites, low income earners and also walking bare-footed, most are pig-rearers/pork eaters and are also exposed to slow running waters which they constantly wade through for bathing and also fetch for drinking. This affirms the report by Chessbrough (1998) that the high prevalence of intestinal parasites recorded among the HIV-seropositve could be attributed to the low income status of these patients.

Among the various sexes, the men harbour most of the helminth parasites than their females counterpart even with a comparison in HIV-seropositive and in HIV-seronegative (47.7% vs. 23.6% in men) and (23% vs. 20.2% in women). This could be attributed to consistent exposure of the men to using of bare hands in carrying out farming and other laborious works and without proper washing of the hands use same for eating-a common phenomenon in Central Nigeria.

Of the various age groups studied, we found out that the helminth parasites were most common among the adult ages from 20years to above 50years. In this adult group of HIV-seropositves and HIV-seronegatives we had: 20-29 years (40.7% vs. 40.7%), 30-39years (33.3% vs. 16.6%), 40-49years (22.0% vs. 19.1%) an above and equal 50years (28.67% vs. 17.1%). This agrees with Modjarrad *et al,* (2005) who reported the prevalence of helminthiases within an adult HIV-infected population in Lusaka, Zambia to be 24.9% greater than in other previous reports, Fontanet *et al,* (2000) in Ethiopia reported more than 70% of adults with intestinal helminth infections regardless of HIV serostatus. In contrast, fewer than 5% of HIV-infected persons in rural

Tanzanian cohort were infected with intestinal helminthes (Tarimo *et al,* 1996). Among HIV-infected adults in Northern India, the prevalence of helminth infection was 1% (Mohandas *et al,* 2002). In contrast, approximately half of an urban Honduran HIV-seropositive cohort of similar size had at least one type of geohelminth infection (Lindo *et al,* 1998). Results from other urban HIV-infected communities in Latin America yielded helminth frequencies of 2-20% (Feitosa *et al,* 2001; Cimerman *et al,* 1999). The reason for this variability is most likely multifacotorial. Although these studies used formol-ehter concentration methods, they were still limited by small size sample and reliance on examination of only one stool specimen per participant. Behavioural and ecologic patterns may also contribute to the differences in parasite distribution (Broker *et al,* 2003; Criscione and Blouin, 2004).

The study found out that children below the age of 20years were less infected with the helminth parasites. This is in agreement with Modjarrad *et al,* (2005) who after careful examination of association between helminth infection and school children (6-14years old) or young children (≤ 5years old) found out results did not differ appreciably.

In accordance with the occupation of the individual, we found out that farmers in both the HIV-infected and HIV-uninfected had the highest rate of helminth parasites infection (60.0% vs. 47.1%) and they are of low socioeconomic status. This finding contradicts other studies that report an inverse correlation between measures of socioeconomic status and risk of helminth acquisition (Olsen *et al,* 2001; Tshikuka *et al,* 1995). It is possible that individuals of lower socioeconomic status were more likely to be subjected to routine mass deworming campaign than were more affluent and educated participants. Also the reason for the high prevalence of helminth parasites among this group could be attributed to environmental factors and also due to poor hygienic practice as is customary of most African settings where the standard of living is often uniformly poor across the population.

The cross-sectional study design also limits our ability to comment on helminth acquisition, association, CD4 cell count and to make any direct comparison with local rural populations because the study was conducted entirely in an urban and semi-urban environment.

The high percentage of helminth parasites in both the HIV-infected and HIV-uninfected (33.3% vs. 21.9%) suggests that diagnosis and treatment of intestinal helminthes should be a routine part of HIV care in parasite-endemic developing countries. Where this approach is logistically infeasible, mass deworming strategies may provide an appropriate alternative given the low cost and toxicity of antihelminthics and the high prevalence rates of intestinal helminth infection expected.

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