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Prevalence of Intestinal Parasitic Infections among HIV/AIDS Patients in Sokoto, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors IJN, MOO and KJA were responsible for study concept and design and drafting of the manuscript. Author IGA and AOA were responsible for study concept and design, data collection, analysis and interpretation. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: In the developing countries where human intestinal parasites constitute a major public health problem, HIV/AIDS patients face very high risks of intestinal infections leading to gastroenteritis. Evidence from studies has shown that infection by intestinal parasites cause immune activation and dysregulation; and these have been found to be dominant factors in the pathogenesis of AIDS in Africa. This study was conducted to assess the prevalence of intestinal parasitic infections among patients with HIV/AIDS in Sokoto, Nigeria.
Methods: A cross-sectional study was conducted among 57 consecutively diagnosed HIV/AIDS patients in two tertiary healthcare facilities in Sokoto, Nigeria. A proforma was used to collect data on study subjects' socio-demographic characteristics. Stool samples were collected into sterile containers, labeled and examined (within 24 hours of collection) for cysts, ova or trophozoites of

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parasites using direct microscopy. Data were analyzed using the IBM Statistical Package for the Social Sciences (SPSS) Version 20 statistical computer software package.
Results: The mean age of the 57 participants was 34 ± 6 years, and majority of them (70.2%) were between 20 and 39 years. They were predominantly females (64.9%), and married (68.4%). Twenty two (38.6%) of the 57 participants had intestinal parasitic infections. There was no association ($p > 0.05$) between being infected with intestinal parasites and any of the participants' socio-demographic variables. The most prevalent parasites among the participants were *Hookworm* (14.0%), and *Entamoeba histolitica* (12.3%). Other parasites isolated include *Schistosoma mansoni* (5.3%), *Ascaris lumbriciodes* (5.3%) and *Hymenolepsis nana* (1.7%).
Conclusion: This study showed high prevalence of intestinal parasitic infections among HIV/AIDS patients in Sokoto, Nigeria. Patients with HIV/AIDS should be targeted for health education on prevention of parasitic infections, in addition to periodic deworming and prophylactic treatment for other parasitic infections.

Keywords: Prevalence; intestinal parasitic infections; HIV/AIDS patients.

1. INTRODUCTION

Despite all the interventions and enormous resources committed to halting the HIV/AIDS epidemic since its inception in 1981, the number of people living with it continues to increase steadily and has reached 38.8 million in 2015 [1]. Since the beginning of the epidemic, more than 70 million people have been infected with HIV virus and about 35 million people have died [2]. The disturbing aspect of it is the fact that sub-Saharan Africa remains the most severely affected with nearly 1 in every 25 adults (4.2%) living with HIV and accounting for two-thirds of the population living with HIV world-wide [2]. Demographic findings have varied greatly within different regions influenced greatly by social, behavioral, cultural and political factors. The character of the HIV/AIDS epidemic in different regions of the world has been influenced by the relative frequency of its various routes of transmission including sexual intercourse (vaginal and anal), mother to child (perinatally and through breast feeding), and contaminated needles and sharps (intravenous drug misuse, needle stick injuries, etc) [3].

The United Nations has projected that more than 80 million Africans could die from AIDS by 2025, and HIV infection could soar to 90 million, or more than 10 percent of the continent's population [4]. In Nigeria, the national prevalence rate for HIV/AIDS rose from 1.8% in 1991 to a peak of 5.8% in 2001, and then declined to 3.1% in 2013 [5]. Even with the decline in prevalence, the burden of HIV/AIDS remains high in Nigeria, as the country had both the second highest number of people living with HIV/AIDS, and second highest number of deaths from HIV/AIDS in the world in 2009 after South Africa [6].

Since the first AIDS case was described, a high prevalence of gastrointestinal alteration has been reported, especially diarrhoea associated with parasitosis [7]. This became more evident when a syndrome named "Slim Disease" characterized by an intense weight loss accompanied by chronic diarrhoea, prolonged fever and diffuse muscle weakness was observed in patients with HIV/AIDS [8]. Studies conducted in Zaire and Uganda have identified some pathogenic agents responsible for the "Slim Disease" such as *Isospora, Crptosporidium, Salmonella, Shigela* and *Camphylobacter* species with a prevalence of 60 – 80% among patients with HIV/AIDS [9].

Gastrointestinal infections are very common in patients with HIV infection or AIDS [10], and diarrhoea is a common clinical presentation of these infections. Reports indicate that diarrhoea occurs in 30-60% of AIDS patients in the developed countries and in about 90% of AIDS patients in the developing countries [11]. In the developing countries where human intestinal parasites constitute a major public health problem, HIV/AIDS patients face very high risks of intestinal infections leading to gastroenteritis [12].

Evidence from studies has shown that infection by intestinal parasites cause immune activation, and dysregulation; and these have been found to be dominant factors in the pathogenesis of AIDS in Africa [13,14]. Another study also found that intestinal parasitic infections have interaction with immunological effectors such as T-cell subsets CD4+ and CD8+ [15]. These submissions were corroborated by the findings in a study by Wolday et al [16] that reported a significant correlation between the number of excreted worm eggs and viral load; and a

significant reduction of plasma HIV viral load among those cured of the infections as compared with those in which the infections persisted. Other studies in Nigeria and Ethiopia have also reported significantly higher prevalence of intestinal parasitic infections in HIV/AIDS patients as compared to HIV-seronegative individuals [17,18]. The findings in these studies showed that helminth infections may enhance HIV multiplication, increase plasma viral load and cause immune system activation and dysregulation, thereby contributing to HIV/AIDS disease progression. A recent study by Mulu et al. [19], found significant decline in serum IgE level 12 weeks after deworming of both symptomatic and asymptomatic patients with HIV-helminths co-infection; this indicates a tendency to down-regulate Th2 immune response, and it provides additional supportive evidence that deworming positively impacts HIV/AIDS disease progression.

Despite the large number of patients on antiretroviral treatment in the two tertiary health care facilities in Sokoto, Nigeria, little is known about the burden of intestinal parasitic infections among them. The enormity of the burden of HIV/AIDS in sub-Saharan Africa, particularly in Nigeria, and the prominent role played by intestinal parasites in AIDS pathogenesis, morbidity and mortality, therefore make it imperative to determine the prevalent intestinal parasitic infections among patients with HIV/AIDS in Sokoto, Nigeria. The findings would be useful in designing strategies for the prevention and control of intestinal parasitic infections among this 'at risk' group of patients.

2. MATERIALS AND METHODS

This was a cross-sectional study among 57 consecutively diagnosed HIV/AIDS patients at the two tertiary healthcare facilities (Usmanu Danfodiyo University Teaching Hospital, and Sokoto State Specialist Hospital) in Sokoto, Nigeria. All patients confirmed to have HIV/AIDS were considered eligible; those who have taken antibiotics and antihelminthic drugs prior to enrolment were excluded from the study.

A proforma was used to collect data on study subjects' socio-demographic characteristics. Stool samples were collected into sterile containers, labeled and examined (within 24 hours of collection) for cysts, ova or trophozoites of parasites using direct microscopy for wet preparation and iodine preparation. The results were entered into a data sheet.

Institutional ethical clearance was obtained from the Ethical Committee of UDUTH, Sokoto, Nigeria, and the Sokoto State Ministry of Health. Permission to conduct the study was obtained from the Management of the two hospitals used as study centers. Informed consent was also obtained from the participants before data collection.

Data were analyzed using the IBM Statistical Package for the Social Sciences (SPSS) Version 20 statistical computer software package. Frequency distribution tables were constructed; and cross tabulations were done to examine the relationship between categorical variables. The chi-square test was used to compare differences between proportions. All levels of significance were set at $p < 0.05$.

3. RESULTS

3.1 Socio-demographic Characteristics of Participants

The mean age of the 57 participants was 34 ± 6 years, and majority of them (70.2%) were between 20 and 39 years. They were predominantly females (64.9%), married (68.4%) and practiced Islam as religion (78.9%). Only about half of them (49.1%) had formal education, and a larger proportion of participants were either artisans (26.3%), or were engaged in business (21.1%) as shown in Table 1.

3.2 Prevalence of Intestinal Parasitic Infections among Participants

Twenty two (38.6%) of the 57 participants had intestinal parasitic infections (Fig. 1). There was no association ($p > 0.05$) between being infected with intestinal parasites and any of the participants' socio-demographic variables.

The most prevalent parasites among the 57 participants were hookworm (14.0%), and *Entamoeba histolitica* (12.3%). Other parasites isolated include *Schistosoma mansoni* (5.3%), *Ascaris lumbriciodes* (5.3%) and *Hymenolepsis nana* (1.7%) as shown in Table 2.

Table 1. Socio-demographic characteristics of participants

Variables	Frequency(%) n = 57
Age group (in years)	
20 -29	18 (31.6)
30 -39	22 (38.6)
40 -49	13 (22.8)
50 -59	3 (5.2)
60 and above	1 (1.8)
Sex	
Male	20 (35.1)
Female	37 (64.9)
Marital status	
Single	18 (31.6)
Married	39 (68.4)
Religion	
Islam	45 (78.9)
Christianity	12 (21.1)
Education	
Informal (none and qurranic only)	29 (50.9)
Formal (primary to tertiary)	28 (49.1)
Occupation	
Housewife	10 (17.5)
Civil servant	9 (15.8)
Business	12 (21.1)
Farmer	3 (5.3)
Student	2 (3.5)
Artisan	15 (26.3)
Unemployed	6 (10.5)

Table 2. Distribution of intestinal parasite species among participants

Parasite specie	Frequency (%) n = 57
None (normal stool)	35 (61.4)
Ascaris lumbricoides	3 (5.3)
Entamoeba histolitica	7 (12.3)
Hookworm	8 (14.0)
Schistosoma mansoni	3 (5.3)
Hymenolepsis nana	1 (1.7)

4. DISCUSSION

Majority of the participants in this study (70.2%), were aged 20-39 years, with a mean age of 34 $\pm$ 6 years. This is similar to the finding in a study conducted in Abeokuta, Nigeria [20] that obtained a mean age of 32 years. Young people have been identified as a special risk group for HIV/AIDS, particularly in Nigeria, as a result of the high prevalence of HIV/AIDS related risk behavior (such as unprotected casual sex, intravenous drug abuse, etc) among them [5]. In this study, majority of the participants (64.9%) were females. This can be attributed to the fact that most female patients get to visit the hospital for medical attention after the death of their partners. In addition, the female reproductive system makes them more susceptible; being the receptive part in heterosexual intercourse is believed to contribute to increased prevalence of infection in women. Majority of the patients in this study were married (68.4%), this could be related to the cultural predisposition to early marriage in the predominantly Muslim population in the study area; majority of the patients in this study were also Muslims (78.9%).

The prevalence of intestinal parasitic infections among HIV/AIDS patients in this study was 38.6%. While this is lower than the recorded 42.9% in Abeokuta [20], 44.6% reported in Abuja [21], and 44.8% reported in Ethiopia [22], it is higher than the 9.5% reported in Jos [23]. Previous community based studies that examined intestinal parasitic infections in Sokoto, Nigeria (the study area), and other parts of the country were conducted majorly among children. While the 74.8% prevalence of intestinal parasitic infections obtained in a study among primary school pupils in Sokoto, Nigeria [24] is higher the 38.6% prevalence of intestinal parasitic infection among the HIV/AIDS patients in this study, it is in consonance with the high prevalence of intestinal parasitic infections obtained in studies conducted among children across Nigeria, including Gwagwada (67.2%) [25], and Port-Harcourt (84.6%) [26]. Similar to the 38.6% prevalence of intestinal parasitic infections obtained in this study, a study among patients on admission at the Accident and Emergency Unit of the Nnamdi Azikwe University Teaching Hospital, Nnewi, Nigeria [27], also reported 38.62% prevalence of intestinal parasitic infections. The high prevalence of intestinal parasitic infections reported in studies conducted among children in Sokoto, and other cities across Nigeria, as compared to adults, could be related to the prevalent poor environmental hygiene and unsanitary waste disposal practices (which provide breeding grounds for disease vectors) in Sokoto, Nigeria [28], and other cities across the country [29,30], with children being particularly at risk of exposure to their hazards.

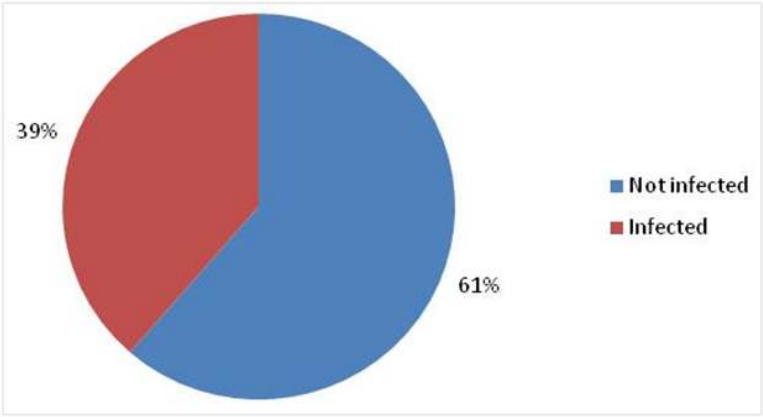

Fig. 1. Prevalence of intestinal parasitic infections among participants

The prevalence of *Schistosoma mansoni* in this study (5.3%) is similar to that reported in Abuja, Nigeria [21]. Similarly, the 14.0% prevalence of *Hookworm* in this study is similar to the 13.33% obtained in a study in Thailand [31]. *Entamoeba histolytica* prevalence of 12.3% in this study is lower than the 19.7% obtained in Abuja, Nigeria [22] and 17.8% obtained in Abeokuta [20], but it is higher than the 5.7% that was obtained in Owerri, Nigeria [32]. *Ascaris lumbricoides* prevalence of 5.3% in this study is lower than the 17.0% obtained in Abuja, Nigeria [21]. The variations observed in these studies may be attributed to differences in the disease state of the patients, sanitary habits, soil contact pattern, nutritional status and domestic water sources. The high prevalence of intestinal parasitic infections among the HIV/AIDS patients in this study underscores the need to consistently educate them on prevention of parasitic infections at every follow-up visit to the hospital, in addition to prophylactic treatment for parasitic infections.

5. CONCLUSION

This study showed high prevalence of intestinal parasitic infections among HIV/AIDS patients in Sokoto, Nigeria. Patients with HIV/AIDS should be targeted for health education on prevention of parasitic infections, in addition to periodic deworming and prophylactic treatment for other parasitic infections.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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