Original Article

Prevalence of parasitic infections in HIV-positive patients in southern Ethiopia: A cross-sectional study

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Abstract

Introduction: Intestinal parasitic infectionsare a major public health burden in tropical countries. Although all HIV/AIDS patients are susceptible to parasitic infections, those having lower immune status are at greater risk. The aim of this study was to determine the prevalence of intestinal parasitic infections in patients living with HIV/AIDS.

Methodology: This was a facility-based cross-sectional study. A total of 343 consecutively sampled HIV/AIDS patients from the HIV care clinic of Hawassa University Referral Hospital were included. Subjects were interviewed for demographic variables and diarrheal symptoms using structured questionnaires. Stool examinations and CD4 cells counts were also performed.

Results: The prevalence of intestinal parasitic infection was 47.8% among HIV/AIDS patients; single helminthic infection prevalence (22.7%) was higher than that the prevalence of protozoal infections (14.6%). About 54% of study participants had chronic diarrhea while 3.4% had acute diarrhea. The prevalence of intestinal parasites in patients with chronic diarrhea was significantly higher than in acute diarrhea ($p < 0.05$). Non-opportunistic intestinal parasite infections such as *Ascaris lumbricoides, Taenia* spp., and hookworm were commonlyfound, regardless of immunestatus or diarrheal symptoms. Opportunistic and non-opportunistic intestinal parasitic infection were more frequent in patients with a CD4 count of<200/mm3 (OR=9.5; 95% CI: 4.64-19.47) when compared with patients with CD4 counts of >=500 cells/mm3.

Conclusions: Intestinal parasitic infections should be suspected in HIV/AIDS-infected patients with advanced disease presenting with chronic diarrhea. Patients with low CD4 counts should be examined critically for intestinal parasites, regardless of diarrheal status.

Key words: CD4; HIV/AIDS; intestinal parasite; opportunistic parasite

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Introduction

Intestinal parasitic infections are among the most widespread of all chronic human infections worldwide and remain an important cause of morbidity and mortality in developing countries [1]. The rate of infection is remarkably high in sub-Saharan Africa, where the majority of human immunodeficiency virus (HIV) infections and AIDS cases are concentrated [2]. In Ethiopia, the ecology of intestinal parasitism is very wide [3]. Further, it has been estimated that over two million people have been infected [4]. Lack of sanitary facilities and health education are major reasons for the transmission of intestinal parasites [1].

HIV infection is a worldwide problem, having infected approximately 33.4 million people globally; sub-Saharan Africa accounts for more than half (22.4million) of this number [5]. In Ethiopia, the prevalence of HIV/AIDS is 2.4%, with variances across regions[6]. Intestinal parasitic infections, one of the major health problems in sub-Saharan Africa, are common in these patients.

The involvement of HIV/AIDS in gastrointestinal infection is common and is almost universal; significant disease occurs in 50-90% of patients, while diarrhea can be a presenting manifestation or a life-threatening complication in the course of the disease [7]. Several factors such as autonomic dysfunction, medication, immunedysregulation, and nutritional supplementation play a major role in diarrhea related to HIV/AIDS [8]. Microorganisms and parasites are

also the main etiological agents of diarrhea in HIV/AIDS patients. Parasitic protozoa such as *Cryptosporidium parvum, Isospora belli, Cyclospora* species, *Giardia intestinalis, Entamoebahistolytica,*, *Blastocystishominis*, and *Microsporidia* have been associated with acute and chronic diarrhea in HIV patients. The nematode species S*trongyloides stercoralis* can also cause diarrhea and overwhelming infestation in patients with suppressed immune status mainly due to HIV/AIDS. In addition, helminths such as *Ascaris lumbricoides, Taenia* spp*., Ancyclostoma duodenale*, and *Necator americanus* are commonly diagnosed in HIV/AIDS patients [7].

Investigations into the relationship between HIV/AIDS and enteric parasites in Asia and South America have indicated that several species of protozoa and parasites are involved in acute and chronic diarrhea in HIV/AIDS patients [9,10]. In Malaysia, Thailand, Cuba, and Brazil, reports have shown that opportunistic coccidian intestinal parasites and *S. stercoralis* were significantly more frequent in the low-immunity group of HIV-infected patients with diarrhea, while non-opportunistic intestinal parasite infections such as hookworms, *Opisthorchis viverrini*, and *Ascaris lumbricoides* were commonly found in HIV-infected people, regardless of immune status or diarrheal symptoms [10,11,16]. Findings from African countries such as Ivory Coast, Tanzania, and Ethiopia indicate a high prevalence of intestinal parasites in HIV/AIDS patients. *Cryptosporidium parvum* had the highest prevalence, followed by *Giardia intestinalis*, *Entamoeba histolytica*, *Isospora belli*, and *Blastocystis hominis* [9,13-15]. Helminth infection rate was also higher among HIV-seropositive subjects, with mainly *Strongyloides stercoralis* causing overwhelming infestation in such patients [17,18].

Since the types of intestinal parasites infecting humans vary from one locality to another and such a study has not been conducted in the Ethiopian region, there is a need to clarify the magnitude of the problem and to develop a plan for intervention. Hence, this cross-sectional study was designed to investigate the magnitude of intestinal parasitic infection in HIV/AIDS patients attending the HIV care clinic of Hawassa Teaching and Referral Hospital in south Ethiopia.

Methodology

Study area

Hawassa University Referral Hospital **(**HURH) is located in Hawassa City, the capital of the Southern Nations and Nationalities People's Regional State (SNNPRS), located 275 kilometres south of Addis Ababa, the capital of Ethiopia. Established in 2005, it is the only referral and teaching hospital in the region. The hospital provides various types of health services.

Study design

After being approved by the institutional ethical committee, this cross-sectional study was conducted between August and December 2008, examining consecutively selected 343 HIV/AIDS patients visiting the hospital. Informed consent and socio-demographic, clinical, and laboratory data were obtained from the study subjects using a pre-tested and structured questionnaire and laboratory analysis of stool and blood samples. The main variables included in the questionnaires were age, sex, and presence of diarrheal diseases.

Sample collection and processing

Patients with confirmed HIV/AIDS who had not received any anti-protozoal and anti-helmintic in the past three weeks were enrolled in the study. Both blood and stool samples were collected from these participants. Five milliliters of EDTA blood from each subject was collected for the CD4 cells count. The CD4 cells count determination was performed by an automated flow cytometry analyzer, FACS Calibur (Becton Dickinson, Franklin Lakes, USA). All subjects were categorized by their immune status according to the 1993 revised classification system for HIV infection by CD4 T-cell categories. Stool samples for parasitological investigation were collected from each study subject in leak-proof plastic containers and were processed by both simple direct mount and concentration technique in the Microbiology and Parasitology laboratory unit of HURH. In the direct mount technique, match stick head stool was mixed with a drop of normal saline and examined microscopically. Concentration of parasites was made using formol-ether concentration technique followed by microscopic examination.

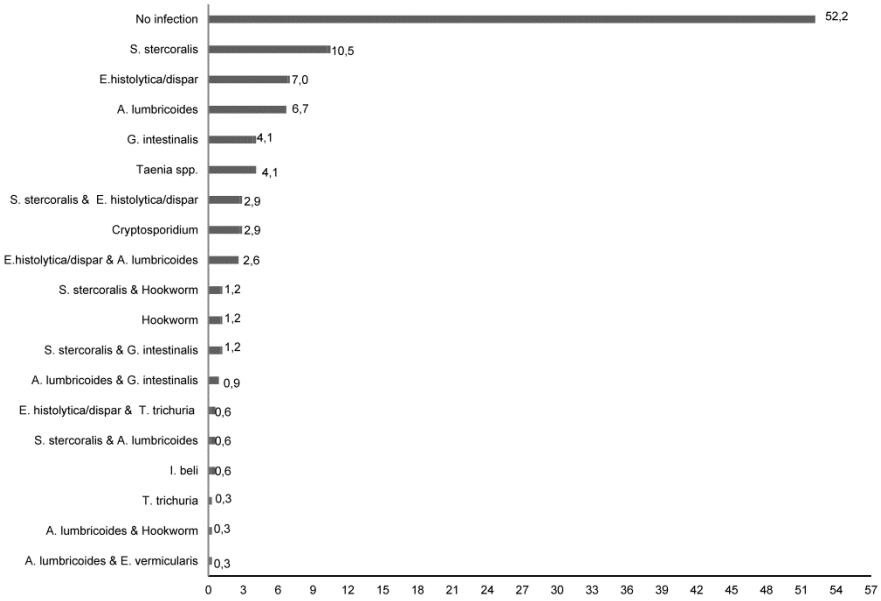
Statistical analysis

The data were entered and statistical analyses were done using SPSS version 16.0. Prevalence and odds ratios were calculated. Observed differences in data were considered significant and noted in the text if $p < 0.05$.

Results

During the six-month study period, a totalof 343 subjects were enrolled andexamined for intestinal

Figure 1: Prevalence of intestinal parasites among HIV/AIDS patients in Hawassa Teaching and Referral Hospital, 2008



parasites. Theage range of the study subjects was 15 to 60 years. There were 113 (32.94%) males (Table 1). The majority of study participants (n = 290; 84.5 %) had low incomes (earned less than 1.25 USD per day). Among the study population, 164 (47.8%) had at least a single parasitic infection. Thirty-six (10.6%) had dual infections (Figure 1).

More than half of the study participants (n = 185; 53.9%) had chronic diarrhea, and 11 (4.3%) had acute diarrhea. The prevalence of parasitic infection was higher in patients with chronic diarrhea than in patients with acute diarrhea (55.7% vs. 17.3%).

Patient classification by the CD4 cells count categories in relation to intestinal parasite infection showed a relatively higher prevalence of intestinal parasitic infection in those patients having lower CD4 cells counts (CD4 < 200/µL) (Table 2). The odds of having any parasitic infections were 2.08 (95% CI 1.09, 4.00) times higher among patient with low CD4 (< 200 cells/mm3) counts when compared with those who had CD4 counts between 200 and 349 cells/mm3. Chi square for the linear trend revealed that infection with any kind of parasites significantly increased as the CD4 cells declined (χ^2 for linear trend test = 60.71, p < 0.001).

Discussion

HIV infection is a major global public health problem; the sub-Saharan region of Africa has the highest rates of the disease [2]. A large number of adults with HIV/AIDS have chronic diarrhea [11]. In patients infected with HIV/AIDS, intestinal parasitic infections are among the leading causes of morbidity and mortality.

Deterioration of the immune system due to HIV infection predisposes patients to numerous opportunistic infections, among which gastrointestinal parasitic infection, which usually presents with diarrheal symptoms, is universally recognized.

The results of this study indicated that pathogenic and opportunistic intestinal parasites are common among HIV/AIDS patients with chronic diarrhea. This finding was in agreement with other studies donein Ethiopia [14,15,17] and other African countries [21,22,18].

The overall prevalence of intestinal parasites in HIV/AIDS patients in this study was 47.8%, which was in agreement with results obtained in southwestern Ethiopia (41% and 44 .8%) [3,14], and in Brazil (40%) [25], but lower than the prevalence found in northwestern Ethiopia (67.6%) and central Ethiopia (70%) [26,23] and in in Thailand (50%) [11]. Among patients with chronic diarrhea, the opportunistic protozoan parasite *C. parvum* was isolated; this finding was in agreement with studies done in Ethiopia(11%), Cuba (11.9%), and India (11%) [14,10,27]. Other opportunistic parasites such as *C. catyenesis* were not identified in this study, due possibly to the use of a single stool specimen.

The prevalence of *Entamoeba histolytica*/*dispar* (7%)was similar to the prevalence found in Nigeria

Table 1: Age and sex distribution of study participants.

Variable		No	%
Age in years	15-24	64	18.70%
	25-34	149	43.40%
	35-44	91	26.50%
	45-60	39	11.40%
Sex	Male	113	32.94%
	Female	230	67.06%
	Total	***343***	***100.00%***

Table 2: Univariate analysis of CD4 cells count level as determining factor of parasitic infections.

Parasite		*OR (95% CI)*	
Present	***Absent***		
18 (25.35%)	53 (74.65%)	***1(reference)***	
29 (28.15%)	74 (71.85%)	1.15	(0.58, 2.29)
46 (60.52%)	30 (39.48%)	4.51	(2.23, 9.14)
71 (76.34%)	22 (23.66%)	9.5	(4.64, 19.47)

(5.7%) and Malaysia (6.7%) [18,24], greater than the prevalence found in Brazil (3.3%) [25], but lower than found in Ethiopia in other studies (10.3% and 24.6%) [3,23]. Similarly, the prevalence rate of *Giardia lamblia* (4.1%) was in agreement with rates found in Ethiopia (3.8%) and Brazil (3.5%) in other studies [3,25]. The prevalence was greater than that found in Nigeria (2.9%) [18], and lower than that found in Malaysia (8.3%) and Brazil (16%) [16,25]. In general, such prevalence of these non-opportunistic parasites in the present study could have been the effect of water and food contamination, or it could have been due to poor personal hygiene.

The 10.5% prevalence of the nematode *S. stercoralis* was similar to the prevalence found in other studies in Ethiopia (11.5% and 13.0%) [18], but lower than the prevalence found in Brazil (30.1%) [25], and greater than found in other studies in in Ethiopia (5.1%) and Brazil (2%) [23,25]. The high prevalence might be because *S. stercoralis* has been shown to be endemic in developing countries, where it is associated with situations that lead to immunodeficiency, including HIV infection [28]. The life cycle of this helminth favors self-infection, with the possibility of hyper infection and spreading, both of which are aggravated in conditions of immunosuppression [29]. The prevalence of *Ascaris lumbricoides* (6.7%), was lower than that found in other studies in Ethiopia (22.2%), Nigeria (20%), and Brazil (15.6%), [23,18,24] but greater than the prevalence found in another study in Brazil (2.5%) [25].

From the findings, chronic infection with helminthes explains some of the elements of chronic immune activation that may also be found in HIV infection [12]. This type of immune activation has been suggested as a major factor for the increased susceptibility and progression of HIV infection in Africa and other developing countries [13].

The CD4 cells counts of the study's subjects negatively correlated to the parasite count. Individuals with a CD4 cells count of less than or equal to 200/μL had the highest prevalence of parasitic infection.

Conclusions

In conclusion, both opportunistic and non-opportunistic intestinal parasite infections are highly prevalent in HIV-infected patients in tropical Africa, particularly in patients with lower immune statuses. Routine examination of stool samples for intestinal parasites is recommended, irrespective of diarrheal status, in the management of HIV-infected patients, as it can reduce morbidity and mortality associated with intestinal parasitic infection.

The study had some potential limitations. First, the stool examinations were done only once and may not have accurately depicted the parasite prevalence. Second, the study was facility-based and thus could be difficult to generalize to the general public.

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