

Prevalence of intestinal parasites and associated risk factors among HIV/AIDS patients attending at anti-retroviral treatment (ART) clinic at Mizan-Tepi university teaching hospital, southwest Ethiopia

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Research Article

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Abstract

Background

Intestinal parasitic infections are still very common, especially in areas where immune-compromised patients like HIV/AIDS patients are high prevalent. Therefore, the aim of this study was to assess the prevalence of intestinal parasite and risk factor among HIV/ AIDS patients attending ART clinic in Mizan-Tepi university teaching hospital, Southwest Ethiopia.

Method

A cross -sectional survey was conducted from July to September, 2021. A total of 191 study subjects were participated in this study. A structured questionnaire was used for collecting socio-demographic and risk factors data. Stool sample was collected and processed using direct wet mount, formol-ether concentration technique and modified Ziehl-Neelson staining techniques. Data was analyzed using statistical package for social sciences (SPSS) Version 25 software and logistic regressions were applied to assess any association between explanatory factors and outcome variables.

Result

From a total of 191 stool samples, 67 (35.1%) were positive for intestinal parasites. The prevalence of intestinal parasites among patients on-ART was 31.5% (45/143) and 45.8% (22/48) among ART naïve group. *Entamoeba histolytica/dispar* (7.7%) and (12.5%) and *Giardia lamblia* (7.0%) and (10.4%) was the most predominant parasites detected both in ART and ART naïve groups ($p > 0.05$). Drinking untreated water (AOR = 0.13; 95% CI: 0.016–1.012), consuming raw food (AOR = 0.23; 95% CI: 0.025–2.108), eating unwashed raw vegetables (AOR = 2.26; 95% CI: 1.052–4.843); CD₄ count < 200cells/ mm³ (AOR = 0.22; 95% CI: 0.062–0.798), CD₄ count 200–500cells/mm³ (AOR = 0.40; 95% CI: 0.195–0.811), WHO stage II (AOR = 0.30; 95% CI: 0.156–0.589), WHO stage III (AOR = 0.32; 95% CI: 0.108–0.917) and viral load \geq 150 copies/ml (AOR = 0.44; 95% CI: 0.220–0.873) were showed significant association with prevalence of intestinal parasite.

Conclusion

In this study, higher rate of intestinal parasitosis were associated with hygienic practices like drinking untreated water, consuming raw food and eating unwashed raw vegetables and with some clinical findings such as lower CD4 counts, increased viral load and being WHO stage II & III. Therefore, public health measures and adherence to ART should be strengthened to improve the immune status and to reducing vulnerability of the patients for intestinal parasites.

Introduction

Parasitic infections, particularly intestinal parasites are among the most widespread of human infections worldwide and are the main threat in developing countries, as it has been noticeably heightened with the coexistence of large burden of HIV/AIDS and malnutrition in the area. It is estimated that as much as 60% of the World's population is infected with intestinal parasites which may play a significant role in morbidity due to intestinal infections [1–3].

Gastrointestinal problem resulting from opportunistic parasitic infection in HIV and AIDS infected subject has dramatically decreased in countries where antiretroviral agents are widely available. However, in most African countries, where patients have access to ART, intestinal pathogens still represent a frequent cause of diarrhea, wasting and weight loss. Evidence shows that HIV- infected patients are the most vulnerable risk group for acquiring parasitic infection, and about 85% of AIDS patients die as a result of AIDS related infections, rather than due to the HIV infection itself. These opportunistic infections most commonly occur in the later stages of HIV infection when numbering of CD4 T cells has declined mostly $< 200\text{mm}^3$ [4–7].

Despite ART improving the quality of life and reducing the occurrence of opportunistic infection due to immuno suppression, malnutrition, poor waste management, ignorance (illiteracy), unhygienic sources of drinking water and depleted CD4 counts among HIV/AIDS patients are the most common determinants of parasitic infection [6, 7].

Intestinal parasitic worm infections are transmitted to humans through soil contaminated by human faeces, mostly in areas where sanitation is poor. Infection leads to anaemia, vitamin A deficiency, stunted growth, malnutrition, intestinal obstruction and impaired development. The most commonly reported intestinal parasites are *Ascaris lumbricoides*, hookworms, *Trichuris trichiuria*, *Giardia lamblia*, *Entamoeba histolytica* and *Schistosoma* species are the most common intestinal parasites. Among those opportunistic pathogens, *Isospora belle*, *Cryptosporidium parvum*, *Cyclospora cayetanensis* and *Microsporidia* specie increasingly reported as causes of enteritis and as opportunistic pathogen in immune compromised individuals [8–11].

As Ethiopia is one of the developing countries in the world it is categorized under a high prevalence of parasitic infections. According to the studies, the average prevalence of parasitic infections was 39.6% [12–15]. The estimated pooled prevalence of intestinal

parasitosis in HIV/ AIDS patients was 39.2% [16].The severity and magnitude of IP in HIV/ AIDS patients require attention and study, especially in the countries like Ethiopia where there was high HIV/AIDS and parasite prevalence. Therefore, this study was aimed to determine the magnitude of intestinal parasite among HIV /AIDS patient who are coming to ART clinic at Mizan-Tepi university teaching hospital, South Western Ethiopia. The finding will help to sensitize local and national responsible bodies as prerequisite for updating strategies in the prevention and control of intestinal parasitic infection among HIV/AIDS patients.

Methdology

Study Area and period

This study was conducted in Mizan-Tepi university teaching hospital from July to September 30, 2021. Mizan-Tepi university teaching hospital is found at 591Km, South west of Addis Ababa, capital city of Ethiopia. It is the second more than 139 bedded teaching hospitals in the Southwestern part of the country, providing services approximately for 5 million people from four zones such as BENCH SHEKO, KEFA, SHEKA and MAJANG as referral center. About 350 clients visit the hospital daily for different services and there were more than 750 HIV positive patients taking ART services.

Study design and subjects

A cross- sectional study design was conducted to determine the prevalence of intestinal parasites among HIV positive patients who are attending ART clinic in MTUTH south Western Ethiopia. Consecutive HIV/AIDS patients who come for ART services during study period were included. Those who are not willing to participate and those couldn't provide stool samples were excluded.

Sample size and sampling technique

The required sample size was calculated using single population proportion formula by assuming that confidence interval of 95%, margin error of 5%, and the prevalence of intestinal parasites among people with HIV/AIDS (p) as 13.9% [17], which is reported in previous study in Ethiopia.

$$\text{Therefore: } n = \frac{(Z \alpha/2)^2 p (1-p)}{d^2}$$

$$\text{Therefore: } n = \frac{(1.96)^2 \times 0.139 (1-0.139)}{(0.05)^2} = 184.$$

By assuming 4% non-respondent rate, the final sample size for this study was 191.

Data Collection

Social-demographic data

During implementation of data collections, the study subject was asked for their willingness in participation of the study. A structured questionnaire was utilized to collect socio-demographical (age, sex, residence, marital status, educational status) and other risk factors data such as hand washing practice, habit of consuming raw food, own domestic animals, availability and usage of latrine, shoe wearing habits, source and treatment of water for drinking. Patients were also asked for complaints of diarrhea. Data on WHO stage of HIV, viral load and level of CD4 + T cell count and antiretroviral treatment (ART) status was obtained from patients' medical records.

Laboratory sample collection and processing

A single fresh stool was collected with a labeled stool cup following standard procedures by laboratory technologist who worked at the ART clinic. The patients were provided with appropriate specimen container and applicator sticks to bring sufficient amount of stool specimen. Each sample were labeled with specific code number, and transported to the laboratory within 30 minutes of collection for parasitological analysis.

Sample processing

Then stool sample was examined both macroscopically and microscopically. Macroscopically its appearance was observed while microscopically it was examined using direct saline and iodine wet mount smear preparation, formol- ether concentration and modified Ziehl- Neelson technique [18, 19]. During microscopic examination of intestinal parasite their diagnostic stage was identify based on their shape, color and motility.

Data Analysis

Data were entered into SPSS Version 25 software for analysis. Frequency distributions and descriptive statistics such as the number and percent of intestinal parasites in relation to different variables were determined. Bivariate and multivariate analyses were performed to assess the association or crude and adjusted odd ratio of parasitic infections with the independent variables. A statistical test result was declared as significant when its *P* value was less than 0.05 and crude and adjusted odds ratios with 95% confidence intervals (CI) were reported.

Result

Socio-demography of the study subject

A total of 191 subjects were participated in this study. Of these, 113 (59.2%) were females and 89 (46.6%) were age group of 35-50 years. Majority, 103 (53.9%) and 133 (69.6%) of study participants were urban residence and married, respectively. About 65 (34.0%) of the study participants were complete their primary school and 44 (23.0%) were working as house wives (Table-1).

Intestinal parasites among HIV/AIDS patients with ART and ART naïve group

In this study, a total of 191 stool samples were tested for the detection of intestinal parasites (IPs). Of these samples, 143 (75.0%) of them were taken from HIV/AIDS patients who were on-ART and the rest 48 (25.0%) were taken from ART naïve group. Accordingly, the overall prevalence of IPs was 67 (35.1%). The prevalence of IPs among HIV/AIDS patients who were on-ART was 45 (31.5%) and 22 (45.8%) among ART naïve group. The distribution of intestinal parasites was not statistically significant differences

between ART and ART naïve group ($\chi^2 = 3.256$; P -value > 0.05). *Entamoeba histolytica/dispar* (7.7%) and (12.5%) and *Giardia lamblia* (7.0%) and (10.4%) was the most predominant parasites detected in HIV/AIDS patients who were on-ART and ART naïve group, respectively. The prevalence of opportunistic intestinal parasites among ART and ART naïve group were 1.4% and 4.2%, respectively for *Cryptosporidium* spp and 2.1% of *Isospora belli* were detected only in ART naïve group (Table-2).

Prevalence of intestinal parasites in relation with Socio-demographic characteristics of study participants

In this study, analysis with binary logistic regression showed that, place of residence and marital status of the study participants were identified as the major socio-demographic determinants of intestinal parasite among HIV/AIDS patients. Being rural residence were 61% (COR = 0.39; 95% CI: 0.205-0.755; p -value = 0.005) more likely to had intestinal parasite than those of urban residence and being single by marital status were almost 3.38 times (COR = 3.38; 95% CI: 1.202-9.488; p -value = 0.021) more likely to harbour intestinal parasite than married one. Other socio-demographic characteristics, such as sex, age and educational status were did not show association with intestinal parasitic infection (Table- 1).

Intestinal parasites in relation with CD4 level, viral load, ART status and WHO stages

In this study, after multivariate analysis, having CD4 counts < 200cell/mm³ and 200-500cell/mm³, being WHO stage II and III and viral load ≥ 150 copies/ml were significantly associated with intestinal parasitic infection. As shown in Table-3, HIV/AIDS patients whose CD4 counts < 200cell/mm³ and 200-500 cell/mm³ are 78% (AOR = 0.22; 95% CI: 0.062-0.798; p -value = 0.021) and 60% (AOR = 0.40; 95% CI: 0.195-0.811; p -value = 0.011) more likely to be infected for intestinal parasite than those with CD4 counts > 500 cell/mm³. Concerning HIV/AIDS patients with viral load ≥ 150 copies/ml are 56% (AOR = 0.44; 95% CI: 0.220-0.873; p -value = 0.019) more likely to have parasite than those who having viral load <150 copies/ml. Regarding WHO stage being Stage II and WHO stage III are 70% (AOR = 0.30; 95% CI: 0.156-0.589; p -value = 0.001) and 68% (AOR = 0.32; 95% CI: 0.108-0.917; p -value = 0.034) more likely to have parasite than those patients with WHO stage I (Table-3).

Prevalence of intestinal parasites in relation with environmental and hygienic practices of study participants

In this study, among those studied variables related with environmental and hygienic practices of study participants, drinking untreated water, consuming raw food and eating unwashed raw vegetables were significantly associated with intestinal parasitic infection among HIV/AIDS patients in the multivariate logistic analysis. Those HIV/AIDS patients who was drinking untreated water are 87% (AOR = 0.13; 95%

CI: 0.016-1.012; p -value = 0.035) more likely to be infected with intestinal parasite than those whose drinking treated water. Those HIV/AIDS patients consuming raw food are 77% (AOR = 0.23; 95% CI: 0.025-2.108; p -value = 0.017) more likely to have parasite than those who have not consuming raw food. In addition, those patients eating unwashed vegetables are 2.26 times (AOR = 2.26; 95% CI: 1.052-4.843; p -value = 0.021) more likely to have parasite than those consuming unwashed raw vegetables (Table-4).

Table 1: Prevalence of intestinal parasites in relation with socio-demographic characteristics of HIV/AIDS infected patients (N=191)

Characteristics	Total N (%)	Parasitic infections		COR (95% CI)	<i>P</i> -value
		Positive N (%)	Negative N (%)		
Age groups					
15- 34	67 (35.1)	24 (35.8)	43(34.7)	0.99 (0.333-2.524)	0.990
35-50	89 (46.6)	31(46.3)	58 (46.8)	1.16 (0.4398-3.356)	0.789
> 50	35 (18.3)	12 (17.9)	23 (18.5)	Ref	
Gender					
Male	78 (40.8)	31(46.3)	47(37.9)		
Female	113 (59.2)	36 (53.7)	77 (62.1)	1.41 (0.773-2.575)	0.262
Residence					
Urban	103 (53.9)	35 (52.2)	68 (54.8)	Ref	
Rural	88 (46.1)	32 (47.8)	56 (45.2)	0.39 (0.205-0.755)*	0.005
Marital status					
Married	133 (69.6)	41(61.2)	92 (74.2)	Ref	
Single	58 (30.4)	26 (38.8)	32 (25.8)	3.38 (1.202-9.488)*	0.021
Educational Status					
Illiterate	14 (7.3)	4 (6.0)	10 (8.1)	2.11(0.141-31.587)	0.587
Read and write	41 (21.5)	15 (22.4)	26 (21.0)	2.19 (0.115-41.600)	0.603
Primary school	65 (34.0)	23 (34.3)	42 (33.9)	0.89 (0.130-6.059)	0.902
Secondary school	53 (27.7)	19 (28.4)	34 (27.4)	1.04 (0.140-7.689)	0.971
College and above	18 (9.4)	6 (9.0)	12 (9.7)	Ref	
Occupation					
Gov't employer	27 (14.1)	8 (11.90	19 (15.3)	Ref	
Farmer	36 (18.8)	14 (20.9)	22 (17.7)	0.66 (0.228-1.917)	0.447
House wife	44 (23.0)	15 (22.4)	29 (23.4)	0.81 (0.289-2.291)	0.697
Merchants	34 (17.8)	12 (17.9)	22 (17.7)	0.77 (0.261-2.284)	0.640
Student	9 (4.7)	2 (3.0)	7 (5.6)	1.47 (0.250-8.698)	0.669

Daily laborers	41 (21.5)	16 (23.9)	25 (20.2)	0.66 (0.233-1.856)	0.429
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Table- 2: Prevalence of intestinal parasites in relation with ART status

Parasites detected	ART status		Chi-square (χ^2)	<i>P</i> -value
	On-ART N (%)	ART naïve group N (%)		
<i>Entamoeba histolytica/dispar</i>	11 (7.7)	6 (12.5)	1.999	0.157
<i>Giardia lamblia</i>	10 (7.0)	5 (10.4)	0.582	0.445
<i>Ascaris lumbricoides</i>	9 (6.3)	3 (6.25)	0.00	0.991
<i>Cryptosporidium spps</i>	2 (1.4)	2 (4.2)	1.343	0.247
<i>Isospora belli</i>	0	1 (2.1)	2.995	0.084
<i>Trichuris trichiuria</i>	4 (2.8)	2 (4.2)	0.603	0.437
<i>Hymenolepis nana</i>	2 (1.4)	0	0.678	0.410
<i>Schistosoma mansoni</i>	4 (2.8)	2 (4.2)	0.603	0.437
<i>Strongyloides stercoralis</i>	1 (0.7)	0	0.337	0.561
<i>Hook worm</i>	1 (0.7)	1 (2.1)	0	0.440
<i>Taenia spps</i>	1 (0.7)	0	0	1.000
Double infections	3 (2.1)	2 (4.2)	-	-
Total	45 (31.5)	22 (45.8)	3.256	0.071

Table- 3: Prevalence of intestinal parasites in relation with CD4 level, viral load, ART status and WHO stages of HIV/AIDS patients

Variables	Total N (%)	Intestinal parasites		COR (95% CI)	AOR (95% CI)	<i>P</i> value
		Positives N (%)	Negatives N (%)			
CD4 levels						
<200cell/mm ³	15 (7.9)	8 (11.9)	7 (5.7)	0.31(0.100-0.934)	0.22(0.062-0.798)	0.021
200-500cell/mm ³	87 (45.5)	36 (53.7)	51 (41.1)	0.49(0.261-0.935)	0.40(0.195-0.811)	0.011
>500cell/mm ³	89 (46.6)	23 (34.30)	66 (53.2)	Ref	Ref	
ART status						
On ART	143 (74.9)	45 (67.2)	98 (79.0)	Ref		
ART naïve	48 (25.1)	22 (32.8)	26 (21.0)	0.54 (0.278-1.059)	—	0.071
Viral load						
< 150 copies/ml	129 (67.5)	37 (55.2)	92 (74.2)	Ref	Ref	
≥150 copies/ml	62 (32.5)	30 (44.8)	32 (25.8)	0.43(0.229-0.843)*	0.44(0.220-0.873)*	0.019
WHO stage						
Stage I	96 (50.3)	21 (31.3)	75 (60.5)	Ref	Ref	
Stage II	75 (39.3)	36 (53.7)	39 (31.5)	0.35(0.170-0.706)*	0.30(0.156-0.589)*	0.001
Stage III	17 (8.9)	8 (11.9)	9 (7.2)	0.28(0.088-0.853)*	0.32(0.108-0.917)*	0.034
Stage IV	3 (1.8)	2 (3.0)	1 (0.8)	0.22(0.016-3.166)	0.14 (0.012-1.620)	0.116

NB: *: statistical significance association; **Ref:** Reference categories

Table 4: Prevalence of intestinal parasites among HIV positive patients with regard to their environmental conditions and hygienic practices (N = 191)

Variables	Total N (%)	Parasitic Infections		COR (95% CI)	AOR (95% CI)	<i>P</i> value
		Positive N (%)	Negative N (%)			
Presence of toilet						
Yes	180 (94.2)	64 (95.5)	116 (93.6)	Ref	—	
No	11 (5.8)	3(4.5)	8 (6.4)	1.47 (0.377- 5.741)	—	0.259
Eating meal without hand washing						
Yes	9 (4.7)	2 (3.0)	7 (5.6)	1.94 (0.392- 9.635)	—	0.180
No	182 (95.3)	65 (97.0)	117 (94.4)	Ref	—	
Source of water						
Tape water	171 (89.5)	59 (88.1)	112 (90.3)	Ref	—	
River/spring water	20 (10.5)	8 (11.9)	12 (9.7)	0.79(0.306- 2.040)	—	0.626
Treatment of water before drinking						
Yes	16 (8.4)	1 (1.5)	15(12.1)	Ref	Ref	
No	175 (91.6)	66 (98.5)	109 (87.9)	0.11 (0.014- 0.853)*	0.13(0.016- 1.012)*	0.035
Contact with animal feaces						
Yes	55 (28.8)	16 (23.9)	39 (31.4)	0.68 (0.347- 1.346)	—	0.160
No	136 (71.2)	51(76.1)	85 (68.6)	Ref	—	
Consuming raw food						
Yes	181 (94.8)	66 (98.5)	115 (92.7)	0.63(0.563- 0.704)*	0.23(0.025- 2.108)*	0.017
No	10 (5.2)	1(1.5)	9 (7.3)	Ref	Ref	
Habit of eating unwashed vegetables						

Yes	38 (19.9)	20 (29.8)	18 (14.5)	2.51(1.215- 5.166)*	2.26(1.052- 4.843)*	0.021
No	153 (80.1)	47 (70.2)	106 (85.5)	Ref	Ref	
Contact with any water body						
Yes	48 (25.1)	14 (20.9)	34 (27.4)	0.70(0.344- 1.421)	—	0.321
No	143 (74.9)	53 (79.1)	90 (72.6)	Ref		
Habit of walking on bare foot						
Yes	17 (8.9)	7 (10.4)	10 (8.1)	1.33(0.482- 3.671)	—	0.581
No	174 (91.1)	60 (89.6)	114 (91.9)	Ref		

NB: *: statistical significance association; **Ref:** Reference categories

Discussion

This study was a hospital based cross- sectional study which was conducted to assess the prevalence of intestinal parasites among HIV/AIDS patients at southwest district of Ethiopia. Accordingly, the overall prevalence of intestinal parasites was 35.1% which was higher than study findings in different parts of Ethiopia in which the average prevalence of intestinal parasites among HIV/AIDS patients was 18.2% [20–23]. However, this finding is lower than a finding in Nekemte (73.3%) [24], Gondar (45.3%) [25], Ethiopia. As compared with other developing countries, this finding is higher than a study finding in Mozambique (26.4%) [26], India (27.6%) [27] and Colombia (29.2%) [28]; however, lowers than study findings in Nigeria (68.2%) [29], Gabon (42.6%) [30], Cameroon (57.5%) [31] and Kenya (50.9%) [32]. The observed variations may be explained by the difference in geographic location, the difference in sample size, awareness and hygienic practices of the population in the preventions of intestinal parasite infections and moreover the variation in immune status of the study participants. In addition, the observed variations may be influenced by study period in which nowadays there is a better awareness of the patients about intestinal parasite infection and their cause.

In this study, the prevalence of intestinal parasite among ART and ART naïve group was (31.5%) and (45.8%) which was in line with study finding in Northern Ethiopia, Dessie and Gondar, in which the higher proportion of intestinal parasite were observed in ART naïve group [21, 25]. This higher prevalence in ART naïve group might be explained by the immune status of the study participants. In fact, ART improving the quality of life and reducing the occurrence of opportunistic infection due to immuno suppression. In addition, ART patients might be followed through laboratory screening for intestinal parasites and may

get deworming and better awareness in adopting prevention and treatment measures against intestinal parasites.

Although there is no statistical significant difference in the overall detected parasitic species between ART and ART naïve group, *Entamoeba histolytica/dispar* and *Giardia lamblia* was the most predominant parasites detected both in ART and ART naïve groups in this study. However, the prevalence of *Cryptosporidium* spp in ART and ART naïve groups was 1.4% and 4.2%, respectively. This finding is in line with other study finding in Ethiopia [17, 21, 25] and Colombia [28], in which higher predominance of non-opportunistic intestinal parasites were reported. The higher proportion of non-opportunistic intestinal parasites indicates that, ART may also be contributed to the reduction of opportunistic intestinal parasites infections.

In this study, intestinal parasitic infections occurrence was significantly higher in patients with CD₄ count < 200 cell/mm³, which is in line with other study findings [20–25, 33]. Unlike others, in our study the occurrence of intestinal parasitic infections was also significantly higher in patients with CD₄ count 200–500 cell/mm³. However, other study in Ethiopia reported that CD₄ count < 500cell/µl was significantly associated with opportunistic intestinal parasitic infections [34]. In fact, immuno-deficient patients are more vulnerable in acquiring intestinal parasites and are unable to clear the infection once it is established [33, 35].

In this study, being WHO stage II and III were also significantly associated with intestinal parasitic infection. The occurrence higher intestinal parasitic infection in patients with WHO stage III was in line with other study finding [21, 36]. Similarly, in this study, viral load ≥ 150 copies/ml was also significantly associated with intestinal parasitic infection, which also is reported in other study [22]. The higher the viral load, may be related with low level of CD4 count and advanced WHO stage, which leads to the quicker a person's immune system will be damaged, increasing their chances of catching infections that the body would normally fight off very easily. Some studies reported that, baseline CD4 count of 500cells/µl or more was significantly associated with viral load reductions or suppression [37–39].

In this study, environmental and hygienic practices of study participants like drinking untreated water, consuming raw food and eating unwashed raw vegetables were found to be significantly associated with intestinal parasitic infections. Significant association of consuming raw unwashed raw vegetables and drinking untreated water with intestinal parasitosis is also reported in other studies in Ethiopia [17, 23, 40]. Therefore, a combination of public health and clinical strategies is required in the prevention and control of intestinal parasites. The efforts should be focused not only on the treatment of infected individuals but also on the other contributing risk factors.

In this study, only saline and iodine wet mount, formol-ether concentration and modified Ziehl-Neelsen staining method was used for the detection of intestinal parasites. Thus the added yield of intestinal parasites may be an underestimate as we have not used water-ether sedimentation method for *Microsporidia* and other methods like molecular techniques and immuno flouscent techniques which are

sensitive for parasites. In addition, patients may be got deworming and/or diagnosed for parasites and treated as well before.

Conclusion

In this present study, high prevalence of intestinal parasites among HIV infected patient in was observed. Higher rate of intestinal parasitosis were associated with hygienic practices like drinking untreated water, consuming raw food and eating unwashed raw vegetables and with some clinical findings such as lower CD4 counts, increased viral load and being WHO stage II & III. Increasing accessibility of antiretroviral therapy for HIV infected patients may help to reduce or suppress the viral load to lower or an undetectable level and boost the immune status in reducing vulnerability of the patients for acquisition of intestinal parasites. In addition, utilization of water treating chemicals and stool examination in the follow-up of patients with HIV/AIDS attending ART clinic and raising awareness about the prevention and control of intestinal parasites and prompt treatment are necessary.

Abbreviations

AIDS: Acquired Immuno Deficiency Syndrome, **ART:** Anti-Retroviral Treatment, **CD₄:** Cluster differentiation,
HIV: Human immunodeficiency Virus, **IP:**Intestinal parasite

Declarations

Ethical approval and consent to participate

Ethical approval was obtained first from Mizan- Tepi University Ethical committee. Legal permission was obtained from hospital administrative (COE). Informed consent was obtained from the parents for the study participation. **All methods were performed in accordance with the relevant guidelines and regulations.**

Consent for publications

“Not applicable”

Availability of data and materials

“All the data supporting our findings were incorporated within the manuscript”.

Competing Interests

“The authors declare that they have no competing interest”.

Authors' contributions

Both authors were participated in the study design and recruitment. MA* analyzed the data and drafted the manuscript. All the authors have contributed to the manuscript and approved the final version.

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