



## Original

# The Prevalence of Intestinal Parasites in HIV Positive and HIV Negative Individuals in Kobo Health Center, Northeastern Ethiopia: Comparative Cross Sectional

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### ABSTRACT

**Aim:** The aim of the study was to assess the prevalence of intestinal parasitic infections and associated factors among HIV positive and negative individuals visiting Kobo health center. **Methods:** A comparative cross-sectional study was conducted from April 2014 to July 2014. Each participant was interviewed for socio-demographic variables and stool specimen was collected from each participant and examined by direct wet mount and formol ether concentration technique. Data was analyzed using SPSS version 16.0 statistical programs. **Results:** A total of 100 individuals was involved during the study of which 50 of them were HIV positive and the rest 50 were HIV negative individuals. According to our study, intestinal parasites were found in 8 (16%) among the HIV-infected and 5 (10%) among the HIV-negative individuals. Of the study participants who were living with HIV/AIDS, the majority (12%) of them infected with intestinal parasites were females. Among the HIV positive individuals *Ascaris lumbricoides* 5 (62.5%), 2 (25%) *Enterobius vermicularis* were common, whereas *Entamoeba histolytica* 4 (80%) was the predominant parasite among the HIV negative individuals. Besides, multivariate logistic regression of HIV positive individuals also showed that sex, poor personal hygiene habits, and younger age were significantly associated with having intestinal parasites. **Conclusion:** Routine examination of stool samples for parasites would significantly benefit not only the HIV-infected patients, but also the uninfected individuals from contributing to reduce morbidity and improved quality of life.

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## Introduction

Globally, about 3.5 billion people are infected with intestinal parasite and out of whom 450 million are suffering from its illness<sup>1</sup>. Intestinal parasites can be categorized into protozoa and helminth. Protozoa include *Entamoeba*, *Gardia*, *Trichomonas*, *Cryptosporidium*, *Isospora* and *Balantidium*. The medically important Helminths are *nematodes* (roundworms), *Cestodes* (tapeworms) and *Trematodes* (flukes)<sup>2</sup>.

According to the CDC report, the global prevalence of soil transmitted helminths is high. In recent estimates, about 807-1,121 million people are infected with *Ascaris lumbricoides*, 576-740 million by *hookworms*, and 604-795 million peoples by *whipworms*<sup>3</sup>. In developing countries, malnutrition, unhygienic conditions, improper disposal of sewage and lacks of potable water supply in rural and urban areas are responsible for the high rate of intestinal parasitic infections<sup>4</sup>. Hence, 250 million peoples were infected with *Ascaris lumbricoides*, 46 million with *Trichuris trichiura* and 151 million with *hookworms*<sup>2</sup>. Like in many other developing countries, intestinal parasites are widely distributed in Ethiopia largely due to the low level of environmental and personal hygiene, contamination of food and drinking water that results from improper disposal of human excreta<sup>5</sup>.

Intestinal parasites, as a major concern in most developing countries, have been pronounced with the concurrence of malnutrition and HIV/AIDS. Opportunistic parasitic infections are a common feature in HIV/AIDS infections where almost 80% of AIDS patients die of AIDS-related infections, including intestinal parasites rather than of the HIV infection itself<sup>6</sup>. Individuals with HIV/AIDS gets progressive decline and ultimate collapse of immune system functions which are characteristic of AIDS usually result in

morbidity and ultimately death due to opportunistic bacteria, virus and parasitic infections. In AIDS patients, opportunistic parasitic gastrointestinal infections cause severe diarrhoea profoundly compromising the absorptive function of the small intestine, and significant mortality<sup>7</sup>. Many individuals with high risk for HIV also live in areas where hyperendemic for intestinal parasitic infections, which are mainly acquired in childhood and remains as chronic infections in to adulthoods. Opportunistic infections caused by intestinal parasites also vary according to the geographical area and the endemic levels in each location<sup>8</sup>.

In Ethiopia, pathogenic and opportunistic intestinal parasites are common among HIV/AIDS positives<sup>9</sup>. Among the opportunistic protozoan parasite *C. parvum*, *I. belli* and *C. Cayetanensis* oocyst was isolated from 11%, 7.4% and 3.7% of HIV infected patients with chronic diarrhoea respectively. In Gondar, prevalence of intestinal parasitic among HIV positive patient was high among street dwellers. Among the AIDS patient, intestinal parasitic infection was found to be 67.6%. The highest prevalence was for *Ascaris lumbricoides* (36.8%) followed by hook worms (26.2%) and *Trichuris Trichuria* (21.0%). Generally, different reports indicated that the prevalence of parasitic infection is higher among HIV positive compared to HIV negatives<sup>10</sup>.

According to the information obtained from the Kobo town health office officials, the major health problems are HIV/AIDS, TB, Malaria, Intestinal parasites and diarrheal diseases. In addition to this, the prevention and control of HIV/AIDS in the Kobo town also reported that in the town there were more than 256 commercial sex workers and the infection by HIV/AIDS reaches more than 69 in 2013<sup>11</sup>. However, co-infection of HIV/AIDS with intestinal

parasite has not been studied in the study area. Therefore, this study was conducted to address the issues on the prevalence of intestinal parasitic infections among HIV/AIDS patients in contrast with HIV negative patients in North Wollo, Kobo health center. The study was intended to provide baseline information for different stakeholders participating on curbing the prevalence of parasitic infection among HIV positive patients in the study area.

## Materials and Methods

### Study setting

The study was conducted between April 01, 2014 to July 30, 2014 in the Kobo Health center which is found in Kobo town. Kobo is a town in northern Wollo, Amhara National, Regional State, North of Addis Ababa. Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), this woreda had a total population of 221,958 of whom 111,605 are men and 110,353 women<sup>12</sup>.

### Study design

A comparative cross-sectional study design was employed to assess the prevalence of intestinal parasites among HIV positive and HIV negative individuals.

### Study population

The study population was all patients visiting Kobo health center during the study period.

### Inclusion criteria

Individuals who were volunteered to participate were included in the study.

### Exclusion criteria

Individuals who were on parasitic treatments during the data collection period were excluded from the study.

### Sample size, sampling technique

The sample size of the study was determined conveniently to be 100 (of which 50 comprise HIV negative individuals and the remaining 50 were HIV positive) because of low patient flow in the health center. The HIV positive individuals were selected from the ART clinic and the rest HIV negative individuals were selected from the patients who came for another purpose. Both cases were selected conveniently.

### Data collection and laboratory investigation procedures

After determining the HIV status of the patients, all participants were supplied with labelled, clean and wide-mouth specimen containers (stool cups) and applicator stick to bring the desired amount of stool. With the provision of a specimen, each participant was interviewed for sociodemographic variables.

### Normal saline (wet mount)

The stool sample was examined macroscopically for the presence of any intestinal parasites, for consistency and for any other physical abnormalities. The stool sample was emulsified with 3-4ml of normal saline, then a drop of emulsified were placed on a glass slide, a few drops of iodine were added and covered with a cover slip. Then identification of trophozoites, larva, egg and cyst was examined under 10x and 40x objective lens<sup>13</sup>.

### Formal ether concentration

An ether sedimentation technique is very sensitive to identify Ova, cyst and larval stage of intestinal parasites. Hence, about 2gm of each stool sample was emulsified with 3-4ml of 10% formal saline, mixed thoroughly and passed through gauze. 3-4 ml of diethyl ether was added and mixed by inverting and intermittent shaking for 1 minute and centrifuged at 3,000 rpm

(revolution per minute) for 5 minutes. After centrifugation, the supernatant (the layer of ether, debris and formal saline) was discarded and the sediment (containing the parasite at the bottom of the test tube) was re-suspended in formal saline. Finally, the smear was prepared from the sediment and observed under light microscope with a magnification of 100x and 400x magnifications for the presence of ova, cyst and larval stage of intestinal parasites.

#### Data analysis

Data was analyzed using SPSS version 16.0 statistical programs. The data were cleaned and descriptive statistics using frequencies for each variable was computed. Besides, bivariate and multiple regression analyses were carried out to identify independent predictors. During the analyses, 95% CI for odds ratio (OR) and P-value < 0.05 were used in declaring statistical significance.

#### Ethical considerations

The study protocol was approved by Research and Community service, ethical committee of Mekelle University, college of Health Sciences. Permission to conduct the research was also obtained from the Kobo Health Center. After informing the participants about the objective and procedure of the study, written or oral informed consent was obtained from each participant (guardian).

#### Result

A total of 100 individuals was involved during the study of which 50 of them were HIV positive and the rest 50 were HIV negative individuals. According to our study, intestinal parasites were found in 8(16%) of the stool samples from HIV-infected persons compared with 5 (10%) of those from HIV-negative individuals. This clearly shows that there is a statistical

significant difference in the prevalence of intestinal parasites between the two groups of individuals ( $P < 0.05$ ). Furthermore, the result also suggested that no protozoan parasite were detected among HIV positive individuals. However, all (100%) of the HIV negative individuals who had intestinal parasitosis were positive for protozoan parasites. Of the study participants who were living with HIV/AIDS, the majority (12%) of them infected with intestinal parasites were females. In contrast, participants belonging to the age group 6-14 years and living with HIV/AIDS were free of intestinal parasitosis. HIV infected farmers were more infested with intestinal parasites than students and employed individuals (Table 1).

#### Species specific prevalence

The species specific prevalence of parasites among HIV positive individuals was 5 (62.5%) for *Ascaris lumbricoides*, 2 (25%) for *Enterobius vermicularis* whereas the predominant parasitic species among the HIV negative individuals were *Entamoeba histolytica* 4 (80%) and *Giardia lamblia* which accounted only for 20 % of the total parasites (Table 2).

#### Association of intestinal parasites with sociodemographic factors

Univariate analysis of socio demographic factor in relation to prevalence of intestinal parasite was done. Age of the respondents was significantly associated with infestation by the intestinal parasite ( $P < 0.05$ ). Hygienic habit and gender were also significantly associated with intestinal parasitosis among sero positive individuals. Education and the participants' job were not associated with having intestinal parasite among HIV patients.

Multivariate logistic regression of HIV positive individuals also showed that sex (female: OR =0.107, 95% CI: 0.01024-

0.22976), poor personal hygiene habits (OR = 0.145, 95% CI: 0.118, 0.458), and younger age (age less than 44 years; OR = 0.057, 95% CI: 0.02036, 0.14036) were significantly associated having intestinal parasites.

## Discussion

According to this study, the overall prevalence of intestinal parasites shows a significant difference between HIV negative and HIV positive individuals. This agrees with the fact that HIV infection would increase the risk of intestinal helminthic infection<sup>9,14</sup>. Similar finding is also evident in a research conducted in Kenya, where helminthic parasites such as hookworm species and *A. lumbricoides* were more prevalent among HIV positive individuals<sup>15</sup>. However, the percentage (prevalence) of intestinal parasites was not that much as expected and this might be due to the fact that HIV/AIDS positive individuals participating in this study were ART users. Studies indicated that HIV sero-positive individuals who are attending ART have less intestinal parasitic infection than those sero-positives who are not attending ART<sup>16</sup>. Besides, the advancement of patient's life standard may account some part for the result. Furthermore, using ART may be related to the nonexistence of common opportunistic intestinal parasites such as *Cryptosporidium parvum*, *Isospora belli*, and *Microsporidia* species in this study. The same result was also obtained in a study conducted in Dessie where ART users have low prevalence of intestinal parasites<sup>17</sup>.

The prevalence of *E. vermicularis* and *Taenia* species may be related to individuals feeding habit and their personal hygiene. Different studies also suggested that the two groups of parasites have a ubiquitous distribution and have resistant eggs. The helminthic parasite *A. lumbricoides* was the most prevalent,

followed by *E. vermicularis* during this study. This is supported by studies conducted in Gondar where *A. lumbricoid* was the highly prevalent species among HIV/AIDS positive patients<sup>10</sup>. The ubiquitous distribution, the durability of eggs under a variety of environmental conditions, the high number of eggs produced per parasite, and poor socioeconomic conditions may be related to the high prevalence of *A. lumbricoides*<sup>18</sup>. Because of the aforementioned reasons, the parasite is abundant in highland and arid areas where there is a shortage of rain water including our study area<sup>19</sup>.

There was no protozoan parasitic infection among HIV positive individuals, and all cases of protozoan infection were found among the HIV negative individuals which may be related to factors including the small size effect, the improvement of an individual's life standard and increasing in awareness among the HIV positive individuals.

HIV Sero-positive females were found to be highly associated with prevalence of intestinal helminthic infections. This study goes in agreement with studies conducted in China and Kenya<sup>15,20</sup>. The result may be due to the fact that most females are in a close in touch with routine household activities which facilitate the chance to be infected with intestinal parasites.

The study revealed that second risk factor in the prevalence of intestinal helminths was poor personal hygiene. It is supported by studies conducted in Nigeria and in some parts of Ethiopia<sup>21</sup>. The above fact is obviously related with intestinal parasites are significantly influenced by the participants personal hygiene and related behaviors.

The other factor associated with higher prevalence of intestinal helminths in our study was younger age, especially lying



between the ages of 14 to 25 years and/or above as depicted by different studies that younger age are highly associated with intestinal helminths<sup>10</sup>. This could be associated with the tendency of youngsters to be involved in different activities which make them vulnerable to intestinal parasitic infection.

#### Limitations of the study

Our study was limited by small sample size and the number of stool samples analyzed per person. Besides, since our study was cross sectional, we could not establish cause and effect relationships.

#### Conclusion and Recommendations

Although our study was limited by small sample size and the number of stool samples analyzed per person, it was confirmed that HIV positive individuals were found to be highly infected with intestinal helminths when compared to HIV negative individuals. Risk factors such as, sex, poor personal hygiene and age were highly associated with the parasitic infection among HIV positive individuals indicating for targeted prevention of the diseases among these groups which needs targeted hygiene promotion, Intestinal parasite infections surveillance and treatment. Generally, routine examination of stool samples for parasites would significantly benefit not only the HIV-infected patients, but also the uninfected individuals from contributing to reduce morbidity and improved quality of life.

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#### Conflict of interest

We declare that we have no conflict of interest.

#### Contribution of authors

All authors contributed equally in all aspects of this study.

#### References

1. Teklemariam Z, Abate D, Mitiku H, Dessie Y. Prevalence of Intestinal Parasitic Infection among HIV Positive Persons Who Are Naive and on Antiretroviral Treatment in Hiwot Fana Specialized University Hospital, Eastern Ethiopia. *ISRN AIDS*. 2013: 1-6.
2. World Health Organization (WHO). Intestinal Parasites (2000).
3. CDC (Center of disease control) (2013) accessed on 09.03.2014.
4. Kumie A, Ali A. An overview of environmental health status in Ethiopia with particular emphasis to its organization, drinking water and sanitation: a literature survey. *Ethiop J Health Dev*. 2005; 19:89–103.
5. Shah UV, Purohit BC, Chandralekha D, Mapara MH. Co-infection with *Cryptosporidium*, *Isospora* and *S. stercoralis* in a patient with AIDS- a case report. *Ind J Med Micr*. 2005; 21:137–138.
6. World Health Organization. Report of the WHO informal consultation on the lack of chemotherapy for the control of morbidity due to soil transmitted nematodes, 1996.
7. Meamar AR, Relaian M, Mohraz M, Zahabium F, Haaighi R, Kia EB. A comparative analysis of intestinal parasitic infections between HIV/AIDS patients and Non-HIV infected individuals. *Iranian J parasitology*. 2007; 2(1):1-6.
8. Cimerman S, Cimerman B, Salomaolewi D. Enteric parasitic and AIDS. *Sao- Paulo med J/Rev palmed*. 1999; 117(6):266-273.
9. Awol M, Gebre Selassie S, Kassa T, Kibru G. Prevalence of intestinal parasites in HIV infected adult patients in south western

- Ethiopia. *Ethiop. J. Health Dev.* 2003; 17(1):71-78.
10. Moges F, kebede Y, Degu G, Triuneh M, Gedefaw G. Infection with HIV and Intestinal parasites among street Dwellers in Gondar city, North West Ethiopia. *Jpn J Infect Dis.* 2006 Dec; 59(6):400-3.
  11. HIV/AIDS prevention and control office, Kobo Wereda, North Wollo, 2013.
  12. Central Statistical Agency, Ethiopia, 2007.
  13. World Health Organization. Basic Laboratory Methods in Medical Parasitology, Geneva, 1991.
  14. Wiwanitkit V. Intestinal parasitic infections in Thai HIV-infected patients with different immunity status. *BMC Gastroenterol.* 2001; 1:3.
  15. Walson JL, Stewart BT, SangareL, Mbogo LW, Otieno PA, et al. Prevalence and Correlates of Helminth Co-infection in Kenyan HIV-1 Infected Adults. *PLoS Negl Trop Dis.* 2010; 4(3):e644.
  16. Adamu H, Petros B. Intestinal protozoan infections among HIV positive persons with and without Antiretroviral Treatment (ART) in selected ART centers in Adama, Afar and Dire-Dawa, Ethiopia. *Ethiop. J. Health Dev.* 2009; 23 (2):133-140.
  17. Missaye A, Dagneu M, AlemuA, Alemu A. Prevalence of intestinal parasites and associated risk factors among HIV/AIDS patients with pre-ART and on-ART attending Dessie Hospital ART Clinic, Northeast Ethiopia. *AIDS Research and Therapy.* 2013; 10:7.
  18. Seltzer E. Ascariasis. In: Guerrant RL, Weller PF, editors. *Tropical Infectious Diseases: Principles, Pathogens and Practice.* 1st ed., Philadelphia: *Churchill Livingstone*; 1999. P.553.
  19. Warren KS, Mahmoud AA. Algorithms in the diagnosis and management of exotic diseases. xxii. ascariasis and toxocariasis. *J Infect Dis.* 1977; 135:868.
  20. Tian LG, Chen JX, Wang TP, et al. Co-infection of HIV and intestinal parasites in rural area of China. *Parasites & Vectors.* 2012; 5:36.
  21. Akinbo FO, Okaka CE, Omoregie R. Prevalence of intestinal parasitic infections among HIV patients in Benin City, Nigeria. *Libyan J Med* 2010; 5:5506.

**Table 1.** Socio demographic characteristics and intestinal parasite distribution among HIV positive and HIV negative individuals, Kobo Health Center, 2014

Variables	HIV positive	Infected with parasite	HIV negative	Infected with parasite
<b>Sex</b>				
Male	20(40%)	2(25%)	12(24%)	2(40%)
Female	30(60%)	6(75%)	38(76%)	3(60%)
<b>Age (in years)</b>				
6-14	3(6%)	0(0%)	4(8%)	1(20%)
15-24	11(22%)	3(37.5%)	14(28%)	2(40%)
25-44	28(56%)	3(37.5%)	25(50%)	2(40%)
>45	8(16%)	2(25%)	7(14%)	0
<b>Educational status</b>				
Illiterate	18(36%)	2(25%)	20(40%)	2(40%)
Primary	30(60%)	3(37.5%)	20(40%)	3(60%)
Secondary	1(2%)	2(25%)	4(8%)	0
Higher education	1(2%)	1(12.5%)	6(12%)	0
<b>Occupation</b>				
Farmer	26(52%)	3(37.5%)	12(24%)	3(60%)
Student	0(0%)	0%	25(50%)	0%
Employed	6(12%)	2(25%)	5(10%)	1(20%)
Housewife	18(36%)	3(37.5%)	8(16%)	1(20%)
<b>Sanitation</b>				
Clean	16(32%)	3(37.5)	19(38%)	2(40%)
Not clean	34(68%)	5(62.5)	31(62%)	3(60%)

**Table 2.** Species specific distribution of intestinal parasites among HIV positive and HIV negative study subjects, Kobo Health Center, 2014

Parasite	HIV positive (n=50)	HIV negatives (50)
	% (No of positives )	% (No of positives )
<i>Ascaris lumbricoides</i>	62.5% (5)	0%(0)
<i>Enterobius vermicularis</i>	25% (2)	0%(0)
Taenia species	12.5% (1)	0%(0)
<i>Entamoeba histolytica</i>	0% (0)	80%(4)
<i>Giardia lamblia</i>	0% (0)	20%(1)