Original Article

Prevalence of intestinal parasites in HIV/AIDS-infected patients with correlation to CD4+ T-cell count at hospital in Eastern India

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Abstract

Introduction: In developing nations, one of the most common reasons for death and illness is due to infections that are brought on by intestinal parasites. People who have HIV are more likely to contract parasites that are either well-established intestinal pathogens, like *Entamoeba histolytica, Giardia lamblia* and *Strongyloidesstercoralis,* or an opportunistic pathogen like Cryptosporidium, Isospora, Cyclospora and Microsporidia. Higher prevalence of intestinal parasitic infections occurs in patients with low CD4+ cell counts. Hence, this study had been performed to know the correlation of intestinal parasitic infection in HIV/AIDS patients with reference to CD4+ cell count. **Materials and Methods:** The study comprised 1477 HIV-positive patients who were treated at ART Centre of Rajendra Institute of Medical Sciences (RIMS), Ranchi. All participants provided verbal informed consent before specimens were collected. Blood and stool sample were used for the identification of parasite and CD4+ T-Cell count. **Results:** In patients living with HIV, the prevalence of intestinal parasite infection was 12.59 per cent. In a manner parallel, the prevalence of parasitic infections was found to be 10.29% among male HIV-positive patients and 2.31% among female HIV-positive patients. **Conclusions:** This study has shed light that low CD4+ T-cell count appears to be a factor for intestinal parasitic infections and development of diarrhoea. Regular screening and treatment of intestinal parasitic infections is very important in overall improvement in quality of life of HIV/AIDS patients. Nevertheless, sanitary hygiene practices and deworming are needed to enhance the control of infection in the affected areas.

Keywords: AIDS, CD4+ T-cell, HIV, intestinal parasites, prevalence

Introduction

Concerns about the threats that microbes offer to human health have been reignited in response to the emergence of new infectious diseases. There have been suggestions that some of these diseases, including tuberculosis, are making a comeback. One of these diseases is reportedly making a comeback. There are recently found infectious diseases that have occasionally been observed in humans before. These diseases include Cryptosporidiosis, Isosporiasis, Cyclosporiasis and Microsporidiosis. The origin of human diseases can be traced back to a large variety of different factors, and the particulars of these elements differ from one disease to another.[1] The variables may have been acquired from the environment, or they may be due to genetic immunological deficiencies on the side of the host. Either way, the host may have been susceptible to the variables. The AIDS epidemic is a good example of this

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phenomenon because it has made us more susceptible to the chance of acquiring opportunistic infections.[2] Those who have HIV are more likely to contract enteric infections, and some of these infections are more likely to be long-lasting, severe, recurrent and connected with extraintestinal symptoms. Individuals who are HIV-positive are also more likely to die from enteric infections. In developing nations, one of the most common reasons for death and illness is due to infections that are brought on by intestinal parasites. People who have HIV are more likely to contract parasites that are either well-established intestinal pathogens, like *E. histolytica, G. lamblia* and *S. stercoralis*, or an opportunistic pathogen like Cryptosporidium, Isospora, Cyclospora and Microsporidia. Both of these parasite groups can cause diarrhoea and other symptoms in infected individuals. Just a small percentage of immunocompetent patients who are infected with pathogenic intestinal parasites really end up with symptoms of the disease. Nevertheless, because of the spread of HIV and AIDS, this circumstance has undergone a substantial transformation. When it comes to HIV/AIDS patients, the rate of infection with a particular intestinal parasite is reliant on the endemicity of that particular intestinal parasite in the community as a whole.[2] Some studies have reported a higher prevalence of intestinal parasitic infections in patients with CD4+ cell counts below 250 cells/μl.[3] Other studies have reported an increased risk of helminth infection in HIV patients with higher CD4 cell count.[4] Meanwhile, few have failed to observe any significant association between the two components.[5,6] Variety of microorganisms has been isolated from HIV-infected patients with chronic diarrhoea either singly or in combinations.[7] Globally diarrhoea remains a leading cause of morbidity and mortality in the developing world and accounts for over 50 million deaths.[8] Due to coinfections in HIV-positive people, it should be mandatory to screen them for intestinal parasites.[9] In a cross-sectional study conducted in Kenya, HIV/AIDS patients had a prevalence rate of 50.8%.[10] A comparable study in Burkina Faso, West Africa, found a prevalence rate of 24.73%.[11] The results of the study among adult HIV patients in South Africa, where most HIV/AIDS cases are concentrated, showed a helminth infection prevalence rate of 36.1%.[12] The Eastern Cape study found a 25% prevalence of intestinal parasites in HIV/AIDS adults.[13]

Higher prevalence of intestinal parasitic infections occurs in patients with low CD4+ cell counts. Hence, this study had been performed to know the correlation of intestinal parasitic infection in HIV/AIDS patients with reference to CD4+ cell count.

Materials and Methods

This study was carried out in the Department of Microbiology, Rajendra Institute of Medical Sciences, Ranchi, during January 2020 to March 2023 after taking permission from the ethical board. The observational study comprised 1477 HIV-positive patients who were treated at ART Centre of RIMS, Ranchi. Age of participants ranged from 20 to 66 years old in this study. All participants provided verbal informed consent before specimens were collected.

Methodology

The subjects' demographic information was collected using a structured questionnaire that had already been developed. Each participant had a blood sample taken and a stool sample taken. Ethylene di-amine tetra acetic acid containers were used for the blood samples, whereas clean, wide-mouthed containers were used for the stool samples. Microscopical examination of stool samples for the presence of eggs, cysts, or parasites was performed. Stool specimen was processed using direct technique (saline and iodine mounts) to identify trophozoite and cyst of protozoan parasites and using formol-ether concentration technique to detect eggs and larva of helminths. Modified acid-fast stain was used to detect oocysts of Cryptosporidium species, Cyclospora species and Isospora species. Oocyst of Cyclospora species and Cryptosporidium species had been shown in Figure 1. Next, 10% formol saline was used to store each fresh stool sample.

Flow cytometry was used to quantify the number of CD4+ T lymphocyte cells in the blood samples. To sum up, we added 18 μl of CD4 PE antibody to 18 μl of well-mixed whole EDTA blood in a Partec test tube, after a gentle stir, and letting it sit for 16 minutes at room temperature in the dark. During the incubation period, we stirred the mixture every 6 minutes. After thoroughly combining the antibody, sample and CD4 buffer, it was then operated in machine for result.

Statistical data

The statistical programme MedCalc was used to conduct a Chi-square test and an odds ratio (OR) analysis on the collected data.

Results

In patients living with HIV, the prevalence of intestinal parasite infection was 12.59 per cent. In a manner parallel, the prevalence of parasitic infections was found to be 10.29% among male HIV-positive patients and 2.31% among female HIV-positive patients ($P < 0.05$). When HIV-infected individuals with a CD4+ level of less than 250 cell/μl were compared to patients with a CD4+ count above 250 cell/μl, the prevalence of parasitic infection was 11.03% and 1.55%, respectively ($P < 0.05$) In HIV-positive patients, the presence of intestinal parasitic

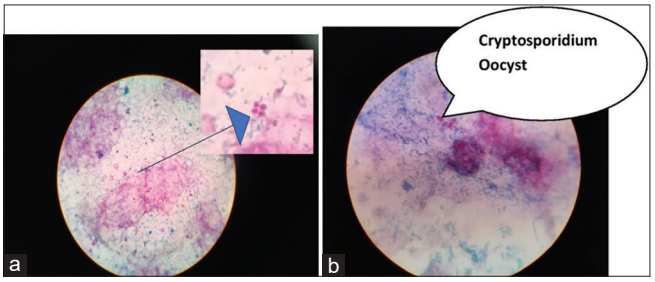

Figure 1: (a) Oocyst of Cyclospora spp. (b) Oocyst of Cryptosporidium spp.

infections was strongly correlated with diarrhoea, suggesting that the two conditions are related [Table 1].

The incidence of intestinal parasite infections is highly influenced by their socioeconomic condition with 69% bearing lower status. There was a statistically significant increase in the prevalence of parasitic infections among people who drank water from a municipal supply (32%) or a stream/river (68%), respectively ($P < 0.05$). No follow-up study related to municipal water supply was our limitation of study due to unavailability of resources. The most common parasite was *Ascaris lumbricoides,* followed by Cryptosporidium species [Table 2].

Only infections with *Ascaris lumbricoides* and Cryptosporidium were substantially linked to CD4+ count below 250 cells/μl ($P < 0.05$) [Table 3].

Table 1: Prevalence of parasite infection

	Positive	Infected patients	Prevalence	*P*
HIV patients	1477	186	12.59	
Gender				
Male	1144	152	10.29	<0.05
Female	333	34	2.31	
CD4 count cell/μl				
Below 250	1301	163	11.03	<0.05
Above 250	176	23	1.55	
Diarrhoea	1477	479	32.43	

Table 2: Number of parasites isolated in HIV-positive patients

Parasite	Number	Percentage
Ascaris lumbricoides	56	30.11
Cryptosporidium spp.	42	22.58
Hookworm	38	20.43
Isospora belli	15	8.06
Trichuris trichiura	9	4.83
Giardia intestinalis	9	4.83
Strongyloides stercoralis	7	3.76
Taenia spp.	6	3.22
Entamoeba histolytica	4	2.15
Total	186	

Discussion

In countries with high burden of people living with HIV/AIDS (PLHA), parasitic infections continue to be a major cause of illness and death.[14] Parasitic intestinal infections were significantly more likely to occur in people with HIV infection, according to the current study. The prevalence of 12.59% among HIV-infected individuals falls between the 11.4 and 19% reported by several authors in others country.[15] Some researchers found rates very high (55%) as compared to this study.[16] Although our study featured a greater sample size than that reported by other authors, the discrepancy may have been caused by chance. While gender did not play a role in the development of intestinal parasite infections in non-HIV subjects, it played a major role in the development of these illnesses in patients with HIV. This result contradicts the work of Mohammad *et al*.[10] Intestinal parasitic infections in PHLA were associated with a considerably decreased CD4+ count compared to HIV-seronegative patients.[16] Resistance to intestinal parasite infections is primarily mediated by cellular immunity. As a result, HIV-infected people are more likely to get opportunistic intestinal parasite infections due to the virus's effect on their CD4+ level. It is widely acknowledged that people with HIV who have a CD4+ count of less than 250 cells/μl are at increased risk for developing opportunistic infections. Intestinal parasite infections were shown to be more common in participants with CD4+ counts <250 cells/μl ($P < 0.05$).

This study's findings may be explained by the fact that diarrhoea is a common symptom of HIV infection and a prominent indicator of the development of AIDS due to opportunistic infections. Among HIV-positive patients, we discovered a strong correlation between diarrhoea and intestinal parasite infections. Results were found to be similar by other study.[17] People varied widely depending on their occupation, with 50% highest among craftspeople. Since they are often working in remote areas without access to clean water or food, artisans are more prone to consume these items while working. They probably also lack a solid educational foundation and practise mostly subpar hygiene. This may explain why this population is disproportionately affected.[18]

Intestinal parasite infections were more common in HIV patients who got their water from natural water sources such streams and

Table 3: Role of CD4+ count in parasitic infection among HIV-positive patients

Parasitic	CD4+ count (cells/μl)			OR (95% CI)	*P*
	Below 250	Above 250	Total		
A. lumbricoides	52	4	56	1.74 (0.98-1.99)	0.61
Cryptosporiduim spp.	40	2	42	17.25 (13.58-39.25)	<0.05
Hookworm	33	5	38	0.87 (0.22-1.98)	0.74
Isospora belli	13	2	15	4.12 (3.01-10.69)	<0.05
Giardia intestinalis	8	1	9	1.22 (0.077-0.24.58)	0.37
Trichuris trichiura	4	5	9	1.69 (0.99-4.36)	0.74
Strongyloides stercoralis	6	1	7	1.69 (0.96-2.87)	0.34
Taenia spp.	5	1	6	2.44 (0.77-21.36)	0.21
Entamoeba histolytica	2	2	4	0.21 (0.02-3.69)	0.21
Total	163	23	186		

rivers (68%) than municipal supplies (32%). With the prevalence of practises like bathing, defecating and washing in streams and rivers, these waterways should not be relied upon as a clean supply for household use. In a similar vein, municipal water may be tainted because it typically comes from an unidentified source. Thus, it is likely that these water supplies are the origin of intestinal parasite diseases. This could help explain the results of the current study. In contrast to our results, Ikeh *et al*.[19] found that the prevalence of intestinal parasite infections in HIV-positive patients was not affected by the source of water. *A. lumbricoides* was the most common of 100 different intestinal parasites found in HIV-infected people. *A. lumbricoides* is the most common intestinal parasite in this study as well. Cryptosporidium was isolated in 22.58% of HIV patient. Other authors have reported very similar results.[19] In those living with HIV, this study found an *Isospora belli* prevalence of 8.06%. In spite of this, a few publications highlighted a parallel predominance.[19]

Conclusion

We came to the conclusion that 12.59% of HIV-seropositive patients had intestinal parasite infections and it was significantly higher in patients with CD4 cell count below 250 cells/μl. Hence, low CD4 cell count appeared to be a risk factor for infection with intestinal parasites and the development of diarrhoea in HIV/AIDS. Regular screening and treatment of intestinal parasitic infections is very important in overall improvement in quality of life of HIV/AIDS patients. Nevertheless, sanitary hygiene practices and deworming are needed to enhance the control of infection in the affected areas.

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Conflicts of interest

There are no conflicts of interest.

References

1. Mathur MK, Verma AK, Makwana GE, Sinha M. Study of opportunistic intestinal parasitic infections in human immunodeficiency virus/acquired immunodeficiency syndrome patients. J Glob Infect Dis 2013;5:164-7.
2. Barsoum RS. Parasitic infections in transplant recipients. Nat Clin Pract Nephrol 2006;2:490-503.
3. Alakpa GE, Fagbenro-Beyioku AF. Cyclosporacayetanensis and intestinal parasitic profile in stool samples in Lagos, Nigeria. Acta Protozool 2002;41:221-7.
4. Nkenfou CN, Nana CT, Payne VK. Intestinal parasitic infections in HIV infected and non-infected patients in a low HIV prevalence region, West-Cameroon. PLoS One 2013;8:e57914.
5. Kipyegen CK, Shivairo RS, Odhiambo RO. Prevalence of intestinal parasites among HIV patients in Baringo, Kenya. Pan Afr Med J 2012;13:37.
6. Bamba S, Cissé M, Sangaré I, Zida A, Ouattara S, Guiguemdé RT. Seroprevalence and risk factors of Toxoplasma gondii infection in pregnant women from Bobo Dioulasso, Burkina Faso. BMC Infect Dis 2017;17:482.
7. Mkhize BT, Mabaso M, Mamba T, Napier CE, Mkhize-Kwitshana ZL. The interaction between HIV and intestinal helminth parasites coinfection with nutrition among adults in KwaZulu-Natal, South Africa. Biomed Res Int 2017;2017:9059523.
8. Adeleke OA, Yogeswaran P, Wright G. Intestinal helminth infections amongst HIV-infected adults in Mthatha General Hospital, South Africa. Afr J Prim Health Care Fam Med 2015;7:910.
9. Büyükbaba Boral O, Uysal H, Alan S, Nazlican O. Investigation of intestinal parasites in AIDS patients. Mikrobiyol Bul 2004;38:121-8.
10. Mohammad RZ, Ah JM, Mostafa R, Ahmed RM, Siavash V, Minoo M. Prevalence of intestinal parasitic pathogens among HIV-positive individuals in Iran. Jpn J Infect Dis 2004;57:268-70.
11. Moura H, Fernandes O, Viola JP, Silva SP, Passos RH, Lima DB. Enteric parasites and HIV infection: Occurrence in AIDS patients in Rio de Janeiro, Brazil. Mem Inst Oswaldo Cruz 1989;84:527-33.
12. Omalu ICJ, Yako AB, Duhlinska DD, Anyanwu GI, Pam VA, Inyama PU. First detection of intestinal microsporidia in Nigeria. Online J Health All Sci 2005;4:1-5.
13. Ikeh EI, Obadofin MO, Brindeiro B, Baugher G, Frost F, Vanderjagt D, *et al*. Intestinal parasitism in rural and areas of north central Nigeria: An update. Intern J Microbiol 2006;2:1-12.
14. Ifeoma A, Apalata T, Aviwe B, Oladimeji O, Abaver DT. Prevalence of intestinal parasites in HIV/AIDS-infected patients attending clinics in selected areas of the Eastern Cape. Microbiol Res 2022;13:574-83.
15. Walson JL, Stewart BT, Sangaré L, Mbogo LW, Otieno PA, Piper BK, *et al*. Prevalence and correlates of helminth co-infection in Kenyan HIV-1 infected adults. PLoS Negl Trop Dis 2010;4:e644.
16. Assefa S, Erko B, Medhin G, Assefa Z, Shimelis T. Intestinal parasitic infections in relation to HIV/AIDS status, diarrhea and CD4 T-cell count. BMC Infect Dis 2009;9:155.
17. Njunda AL, Assob NJC, Nsagha DS, Nde FP, Kamga FHL, Asangbeng TE, *et al*. Low prevalence of helminth infection among HIV patients in Cameroon. Research and Reviews JMB 2012;1:6-11.
18. Feitosa G, Bandeira AC, Sampaio DP, Badaró R, Brites C. High prevalence of giardiasis and strongyloidiasis among HIV-infected patients in Bahia, Brazil. Braz J Infect Dis 2001;5:339-44.
19. Ibrahim AK, Ikeh EI, Malu AO, Okeke EN, Damen JG. Intestinal parasitosis in human immunodeficiency virus (HIV) infected adults with chronic diarrhea at Jos University Teaching Hospital, Nigeria. The IJPD 2007;2:1559-4629.