Progressive decline in immunologic response destines HIV-infected patients vulnerable to myriad opportunistic infections (OI). Diarrhea is one of the major complications, occurring in ~90% of patients living with HIV/AIDS in developing countries. Numerous studies have outlined the emergence of important opportunistic intestinal coccidian parasites, notably Cryptosporidium spp. and Isospora belli. While cryptosporidiosis has no effective treatment available to date, isosporiasis can effectively be treated with trimethoprim–sulfamethoxazole (TMP-SMX). Therefore, we investigated the parasitic etiology of diarrhea in HIV-infected patients admitted with diarrheal symptoms between January 2003 and December 2006 at the YRG Center for AIDS Research and Education (YRG CARE), Chennai, a tertiary AIDS care center in southern India.

Patients’ HIV status was determined by double-ELISA method following World Health Organization, Geneva, and National AIDS Control Organization, New Delhi (WHO/NACO) guidelines. A single fresh stool specimen was collected in a clean, dry, wide-mouthed container. Direct wet mounts were examined under 100× and 400× magnification for intestinal parasites. Presence of I. belli and Cryptosporidium spp. oocysts was confirmed by examining the formalin–ether concentrated stool specimen by modified AFB staining. Strict quality-control procedures were followed adhering to NABL guidelines for all investigations.

Data were analyzed using Microsoft Excel and Epi Info version 3.3.2 statistical software for revealing statistical significance. χ² test for trend analysis was used to observe the proportion of Cryptosporidium spp. and I. belli from 2003 to 2006. A P value ≤ 0.05 was considered significant.

Of the 245 study subjects analyzed, 87 cases (35.1%) harbored a single parasite, while 5 (2%) presented mixed infection. Coccidian enteric parasites were the leading cause of parasitic diarrhea in 71 (29%) cases, and other parasitic pathogens were detected in 15 (6.1%) cases as a single etiological agent. I. belli was the most frequently encountered parasite found in 64 (26.1%) stool specimens followed by Entamoeba histolytica/dispar in 8 (3.3%) cases and Cryptosporidium in 7 (2.9%) specimens. Helminth infection was involved in 10 (4%) specimens. Bacterial and viral causes of diarrhea were not determined in the present study.

There was an increase in the number of diarrheal cases admitted each year, which was due to increasing numbers of new patients. A statistically significant increase in the number of cases of I. belli (p = 0.00037, χ² test for trend) and a decline in the number of cases of Cryptosporidium spp. (p = 0.00001) during the study were also observed (Table 1). The reasons for these changes are unclear, and we do not have data on place of residence, changes in patient population, or weather conditions (rainfall and temperature) that might explain the observed trends.

Despite prophylactic treatment with TMP-SMX, I. belli was the most commonly encountered parasite in our study. Indeed, the frequency of isosporiasis in patients with AIDS is likely to be underestimated due to prophylactic administration and treatment with TMP-SMX for PCP and other infections. One double-strength TMP-SMX (160 mg/800 mg) daily is standard prophylaxis against PCP, but some investigators have proposed higher doses for prophylaxis and the treatment of isosporiasis. Thus, an inadequate dose of TMP-SMX could explain the high proportion of I. belli in diarrheal stools and conceivably could have led to emergence of drug resistance. In addition, patients may have been unable to adhere to the prophylactic regimen, but we do not have data on adherence.

The isolation rate of I. belli was relatively high in our study (26.1%) compared with other studies (0–14%) and in

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of diarrheal cases admitted</th>
<th>I. belli positivity</th>
<th>Cryptosporidium spp. positivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>25</td>
<td>3 (12%)</td>
<td>4 (16%)</td>
</tr>
<tr>
<td>2004</td>
<td>34</td>
<td>6 (17.6%)</td>
<td>1 (2.9%)</td>
</tr>
<tr>
<td>2005</td>
<td>55</td>
<td>15 (27.3%)</td>
<td>1 (1.8%)</td>
</tr>
<tr>
<td>2006</td>
<td>131</td>
<td>40 (30.5%)</td>
<td>1 (0.8%)</td>
</tr>
</tbody>
</table>
Agreement with recent studies conducted in India.\textsuperscript{1,4,7} Interestingly, other studies have reported Cryptosporidium spp. as the predominant etiological agent in HIV-associated diarrhea.\textsuperscript{2,6,8,9} Further epidemiologic investigations and laboratory-based assessments of drug susceptibility are needed to explain our observations and provide the scientific basis for improved approaches to prevention of these infections.

Received February 12, 2007. Accepted for publication August 15, 2007.

Acknowledgment: The American Society of Tropical Medicine and Hygiene (ASTMH) assisted with publication expenses.

Authors' addresses: R. Vignesh, P. Balakrishnan, E. M. Shankar, K. G. Murugavel, S. Hanas, A. J. Cccelia, S. P. Thyagarajan, Suniti Solomon, and N. Kumarasamy, YRG Center for AIDS Research and Education (YRG CARE), Voluntary Health Services Campus, IT Corridor, Taramani, Chennai 600113, India; E-mail: kumarasamy@yrgcare.org.

Reprint requests: N. Kumarasamy, YRG Center for AIDS Research and Education (YRG CARE), Voluntary Health Services Campus, IT Corridor, Taramani, Chennai 600113, India, E-mail: kumarasamy@yrgcare.org

REFERENCES