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Original Research Article

Intestinal Parasite Carriage in Seropositive Patients

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Abstract: ***Introduction*:** Human immunodeficiency virus (HIV) infection represents a major public health issue. The immunosuppression it induces promotes the development of numerous opportunistic infections responsible for significant mortality. Among these infections, intestinal parasitic infections are the main causes of severe chronic diarrhea in immunocompromised patients. The opportunistic parasitic infections most often implicated in the genesis of this diarrhea include coccidiosis and microsporidiosis. ***Objective*:** This study aims to determine the prevalence and risk factors of intestinal parasitosis in HIV-positive patients, a population particularly exposed to severe clinical forms due to their immune deficiency. ***Materials and Methods*:** This is a prospective descriptive study conducted over a three-month period, from November 2024 to February 2025, at the parasitology-mycology laboratory of the HMIMV in Rabat. Patients with positive HIV serology were included, whether or not they presented digestive symptoms. A parasitological examination of the stool was carried out for each patient, including, in addition to conventional techniques, modified Ziehl-Neelsen staining and the Baermann technique. Statistical analysis was performed using Jamovi software, version 2.6.13. ***Results*:** A total of 28 patients were included, with a mean age of 48.21 years and a male/female sex ratio of 8.33. The overall prevalence of parasitic infestations was 42.8%, consisting exclusively of protozoa. Among these, Blastocystis hominis represented 38% (n=5), intestinal coccidia 31% (n=4), amoebae 23% (n=3), and flagellates 8% (n=1). These results corroborate some studies highlighting the predominance of protozoa, parasites closely linked to fecal peril. Furthermore, no statistically significant association was observed between parasitism and the variables age, sex, CD4 count, or drinking water source, probably due to the small size of our sample. ***Conclusion*:** The intestinal parasitism observed in our patients is exclusively due to protozoa, which are hygiene indicators. Promoting hygiene measures, systematic coprological examinations, or, failing that, preventive antiparasitic treatment could help reduce the prevalence of parasitosis in this population.

Keywords: Intestinal Parasitic Infections – Opportunistic parasites – HIV – Coccidiosis.

A. INTRODUCTION

Globally, intestinal parasitic infections represent a real public health problem. Mainly caused by helminths and intestinal protozoa, these infections remain particularly frequent in tropical and subtropical regions, and more specifically in sub-Saharan Africa. This geographical distribution is explained by climatic conditions conducive to the proliferation of parasites, but also by structural factors such as poor hygiene, insufficient sanitation infrastructure, and the low socio-economic level of a large part of the population [1].

All of these determinants, both environmental, health and social, contribute to the endemicity and persistence of parasitic transmission, and remain highly complex.

According to estimates by the World Health Organization (WHO), approximately 3.5 billion people

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are infected with intestinal parasites, of which 450 million present clinical symptoms, with an estimated annual mortality of 155,000 deaths [2].

Intestinal parasitic infections are closely associated with the absence or inadequacy of sanitation infrastructure, including limited access to drinking water, inadequate disposal of human excreta, and a lack of latrines, as well as poor personal hygiene. As a result, they have become relatively rare in industrialized countries but remain common in developing countries, particularly in Morocco.

Furthermore, some so-called opportunistic intestinal parasitoses can manifest clinically in specific contexts of immunodepression, particularly in people living with the human immunodeficiency virus (HIV). The latter still constitutes a major global health challenge today, despite the numerous international and national initiatives implemented to slow its progression. In 2001, the United Nations held a special session of its General Assembly, recognizing HIV/AIDS as a global health crisis, and calling for increased mobilization of resources and efforts to combat the pandemic. This recognition resulted, among other things, in the sixth Millennium Development Goal (MDG) of the 2000 Millennium Declaration, which enabled the launch of a concerted global effort against the spread of the epidemic [3].

In developing countries, HIV remains a major public health problem. The immunosuppression it induces promotes the emergence of multiple opportunistic diseases, responsible for high morbidity and mortality [4]. Among these, opportunistic intestinal parasitoses are frequently the cause of persistent or recurrent diarrhea in people living with HIV [5].

Despite therapeutic advances, including the introduction of triple antiretroviral therapy, these intestinal parasitic infections remain common in HIV-positive patients. It is therefore recommended to perform systematic parasitological examinations of stools in these patients, even in the absence of diarrhea [6].

The main pathogens involved in these opportunistic parasitoses include Blastocystis hominis, coccidia (Cryptosporidium spp., Isospora belli), as well as protozoa such as Entamoeba coli and Endolimax nana, frequently identified in HIV-positive patients worldwide [7].

In this context, it is essential to better understand the prevalence of these infections and the risk factors associated with them in order to develop effective prevention and management strategies.

In Morocco, studies addressing this issue remain few in number. This research is part of this perspective and aims to contribute to the understanding of the epidemiology of intestinal parasitoses in people living with HIV. More specifically, it aims to assess the prevalence of opportunistic intestinal parasitoses as well as the associated risk factors in HIV-positive patients.

B. METHODS

This is a prospective descriptive study carried out at the Parasitology Mycology laboratory of the Mohammed V Military Teaching Hospital in Rabat, over a period of 4 months from November 2024 to February 2025. This study focused on stool parasitology examinations (SPE) of HIV-positive patients referred to the Parasitology and Medical Mycology Laboratory of the HMIMV in Rabat. The patients included were patients with positive HIV serology, with or without digestive signs. Each patient included in the study was previously given a dry, transparent, sterile and hermetically sealed container to collect stool samples. One or three samples, if possible, will be taken one day apart. The samples are sent to the Parasitology and Mycology laboratory within one hour. For each pot, we assigned a code to preserve anonymity. Upon arrival of each sample, the collected stools are examined according to the following steps:

- Macroscopic examination: note the appearance, color, consistency and possible presence of blood, mucus and adult forms of parasites.
- Microscopic examination in the fresh state (0.9% saline solution) to study the mobility and shape of vegetative forms of protozoa, to search for eggs or larvae of nematodes.
- Microscopic examination after staining (Lugol 2% or Merthiolate Iodine Formaldehyde) to study the morphology of parasites, in particular cystic forms of protozoa (amoeba nuclei).
- Modified Ziehl Neelson stain to highlight intestinal coccidia oocysts.
- Concentration techniques (Ritchie's physicochemical technique and Willis's physical technique). Slides are first read at low magnification (x100) to detect helminth eggs and larvae, then at medium magnification (x400) to look for vegetative and cystic forms of protozoa.
- Additionally, all stools produced contributed to a study using the Multiplex PCR technique (FilmArrayTM Gastrointestinal Panel).

Statistical Analysis:

Data were entered and analyzed using Microsoft Office Excel and Jamovi statistical analysis software, version 2.6.13.

C. RESULTS

1. Descriptive Analysis of the Study Population

During the study period, a total of 28 patients were included, for whom 28 stool parasitological examinations (SPE) were performed. The study population consisted mainly of military personnel (n = 25), with two military spouses and one civilian patient. The age of the participants ranged from 24 to 72 years, with a mean of 48.21 years and a median of 50 years. The sex ratio (M/F) was 8.33, corresponding to 25 men and 3 women.

2. Descriptive Analysis of the Infected Population

Among the 28 patients included in the study, 13 were found to be carriers of one or more intestinal parasites, representing an overall prevalence of 42.8%. Among these parasitized patients, 58.3% had polyparasitosis.

- **Distribution of parasitized patients according to age:** The distribution of infected patients by age group (Table 1).

Table 1: Prevalence of parasitism by age group

Age group (years)	24-34	35-65	> 66
Number of patients examined	4	22	2
Number of patients infected	3	9	1
Prevalence of intestinal parasitism (%)	75	40.9	50

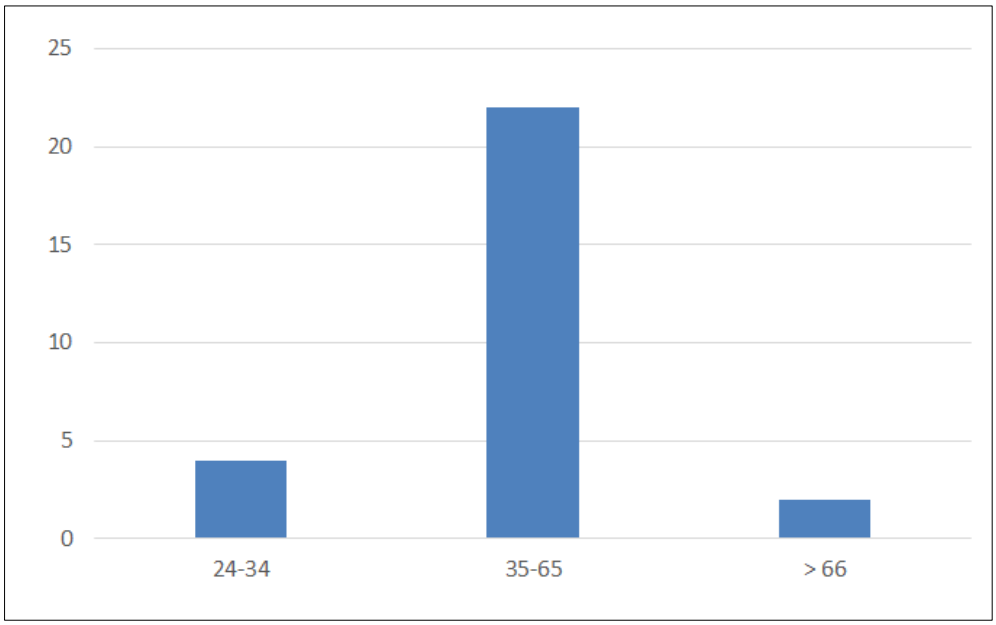

Figure 1: Intestinal parasite prevalence by age

- **Distribution of parasitized patients according to sex:** In parasitized patients, a clear male predominance was observed, with a male/female sex ratio of 12.

Table 2: Distribution of parasitized patients according to sex

Sex	Male	Female
Number of patients examined	25	3
Number of patients infected	12	1
Prevalence of intestinal parasitism (%)	48	33.33

- **Distribution of parasitized patients according to water supply method:** According to the data collected during the interview, the majority of patients reported consuming water from the same source, namely tap water. Due to this homogeneity, this factor was not retained as a discriminating variable in the analysis of parasite distribution.

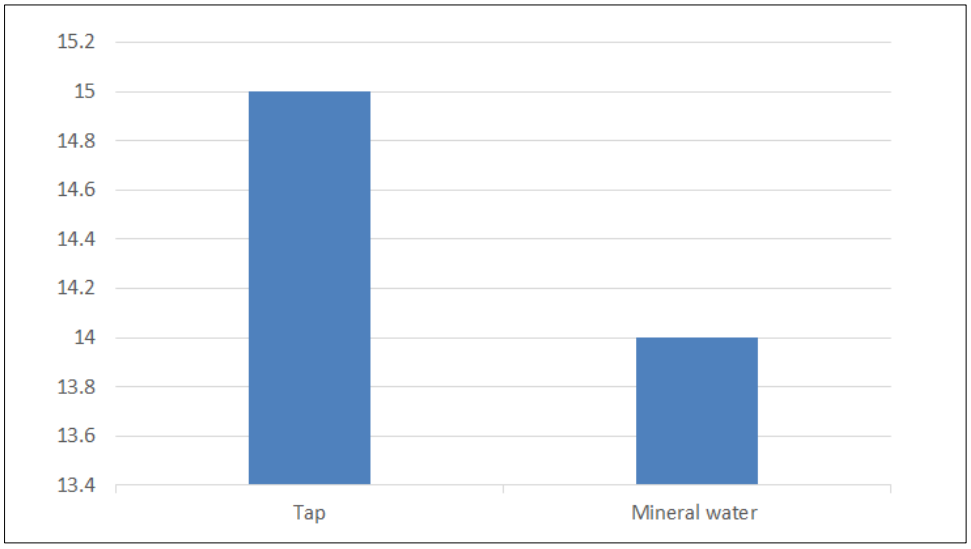

Figure 2: Distribution of parasitized patients according to water supply method

- **Distribution of parasitized patients according to clinical symptoms:** Of all the patients examined, 75% presented clinical signs. In these symptomatic patients, the coprological examination was positive in 39.28% of cases and negative in 32.14% of cases.

In parasitized patients, the most frequently reported clinical symptomatology was diarrhea (75%), followed by fever (25%) and deterioration of general condition (17.85%).

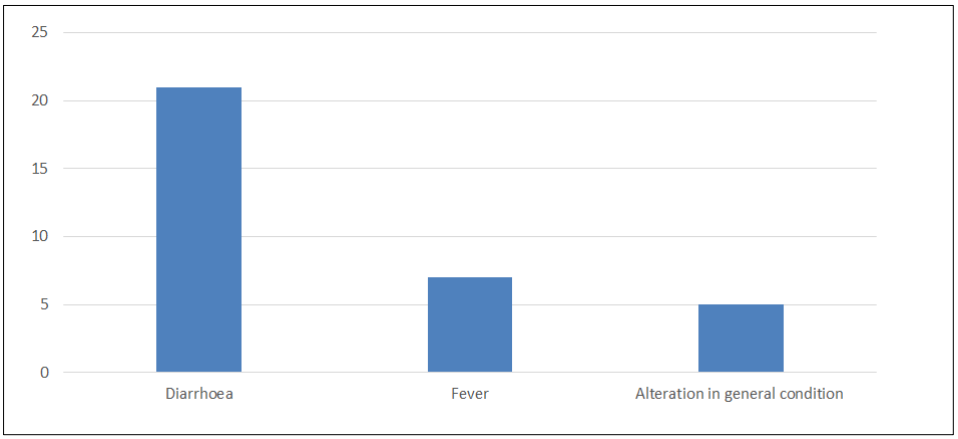

Figure 3: Distribution of parasitized patients according to clinical symptoms

- **Distribution of parasitized patients according to CD4 count:** According to the CD4 count, the patients were divided into parasitized and non-parasitized patients:

Table 3: Distribution of parasitized patients according to CD4 count

CD4 count	Number of positive cases	Percentage (%)	Number of negative cases	Percentage (%)
> 500	1	7.69%	2	13.3%
200-500	1	7.69%	7	46.6%
< 200	11	84.61%	6	40%

3. Study of Collected Parasitoses

- **Distribution of Protozoa:** Analysis of the results shows that all cases of intestinal parasitism identified in our study were exclusively of protozoan origin, representing 100% of the parasites isolated (n = 13). These protozoa are distributed as follows: amoebae, with 3 cases (23%); flagellates, 1 case (8%); coccidia, 4 cases (31%); and Blastocystis hominis, which is the most frequent species with 5 cases (38%) (Figure 1).

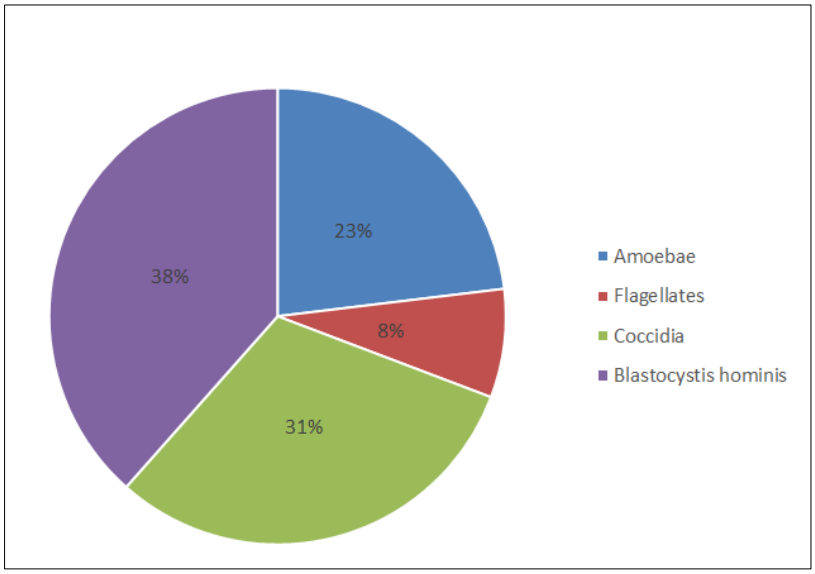

Figure 4: Distribution of different protozoa

Table 4: Summary of the incidence of different parasites

Protozoa	Parasites	Number of cases	Specific parasite index (%)
Amoebas	*Entamoeba coli*	2	15.38%
	Endolimax nana	1	7.69%
Flagella	*Giardia intestinalis*	1	7.69%
Coccidia	*Cryptosporodium sp*	3	23.07%
	Isospora belli	1	7.69%
	Blastocystis hominis	5	38.46%

4. Distribution of parasite species according to CD4 count: Our study revealed a high parasite prevalence of 76.92% in patients with CD4 counts below 200 cells/mm³ (Table 5).

Table 5: Distribution of parasite species according to CD4 count

		< 200 elements/mm3		200-500 elements/mm3		> 500 elements/mm3	
	Parasite	Number	%	Number	%	Number	%
AMOEBAS	*Entamoeba coli*	2	15.38%	0	0	0	0
	Endolimax nana	1	7.69%	0	0	1	7.69%
FLAGELLATE	*Giardia intestinalis*	1	7.69%	0	0	0	0
	Blastocystis hominis	2	15.38%	1	7.69%	1	7.69%
COCCIDIES	*Cryptosporidium sp*	3	23.07%	0	0	0	0
	Isospora belli	1	7.69%	0	0	0	0

D. DISCUSSION

Intestinal parasitic infections remain a significant cause of morbidity and mortality in developing countries, particularly among people living with HIV [8]. This cross-sectional epidemiological survey was conducted among 28 HIV-positive patients, with a mean age of 48.21 years.

According to the results obtained, the overall prevalence of intestinal parasites in this population was 42.8%, a rate comparable to those reported in Kenya (50.9%) [9], and in different regions of Ethiopia: Jimma (44.8%) [10], Jimma University Specialist Hospital (45.0%) [11] and Hawassa (47.8%) [12]. This rate, however, appears to be higher than those observed in other Ethiopian regions such as Kombolcha, Dessie, Gondar and Kobo, as well as in Benin and Makurdi in Nigeria (13.9%, 17.6%, 20%, 16%, 18% and 20.9% respectively) [13–16]. Conversely, it remains lower than those reported in Burkina Faso (73.3%) [17], Cameroon (57.48%) [18], Shahura (56.9%) [19], and Casablanca (80%) [20]. These variations could be explained by sociodemographic, epidemiological or methodological differences, in particular the sample size, which is smaller in our study.

Analysis of parasitosis according to age did not reveal any statistically significant difference in our

series. However, in general, the frequency of opportunistic parasitosis in HIV-positive patients tends to increase with age, in parallel with the evolution of immunosuppression [20]. The majority of intestinal parasites were found in patients aged 35 to 65 years, an age group corresponding to the socioeconomically active and potentially more exposed group, as also highlighted by a study conducted in Jimma (Ethiopia) [21]. This vulnerability could be explained by more frequent social contacts, insufficient personal hygiene or the sharing of objects favoring transmission.

Regarding the distribution by sex, the prevalence of intestinal parasites was higher in men (48%) than in women (33.33%), a result corroborated by several studies including that of Juliette Pavie, which highlighted a slight male predominance [22].

Our study also revealed an increased frequency of intestinal coccidiosis in patients with a CD4 count below 200 cells/mm³. This finding is consistent with the literature, which indicates a strong correlation between opportunistic parasitosis and the degree of immunosuppression, particularly the CD4 lymphocyte count.

As observed in Morocco [23, 24], and Tunisia [25], intestinal parasitic infections in our series were exclusively due to protozoa. No cases of helminthiasis were detected. This predominance of protozoa is widely documented in the literature, particularly in relation to insufficient hygiene conditions and orofecal contamination linked to contaminated water or food [26, 27]. The transmission of protozoa, generally in cystic form, is indeed facilitated by the consumption of untreated water, which could explain their high frequency, especially since the majority of our patients consumed tap water [28].

Among the parasites identified, Blastocystis spp. was the most common. Although its pathogenic role remains controversial, its detection in coprology may be relevant, particularly in immunocompromised patients. Several studies conducted over the last decade identify it as an emerging and widespread parasite [29]. The pathogenicity of Blastocystis spp. remains debated, with some reports linking it to digestive disorders (diarrhea, inflammatory bowel disease, ulcerative colitis), although no definitive proof has been established. This variability in clinical manifestations could be related to the genetic diversity of the species [30]. Patients living with HIV, due to their immunosuppression, seem particularly exposed to symptomatic forms [31]. In our series, the prevalence of Blastocystis spp. was 38.46%, of which 75% of carriers presented with diarrheal episodes. Unlike other studies on HIV-positive populations, in which this parasite was not always identified, Angel Arturo Escobedo and Li-Guang Tian reported a prevalence of 25.3% [32].

Intestinal coccidia, on the other hand, were identified in 23.07% of cases, which is comparable to Escobedo's data (16.4%). Cryptosporidium spp., in particular, is a common cause of chronic diarrhea in HIV-positive patients, with a prevalence ranging from 8 to 23% in the United States, and reaching up to 37% in Europe [32]. Isospora belli, on the other hand, is associated with chronic diarrhea in developing countries, with a prevalence ranging from 5 to 26% in HIV-infected patients [33]. This cosmopolitan parasite is mainly found in tropical and subtropical regions, where it can represent up to 20% of cases of intestinal parasitosis, compared to less than 2% in temperate zones. In our series, one case of Isospora belli (3.57%) was isolated from a military patient who had traveled to tropical areas.

Regarding amoebae, only Entamoeba coli and Endolimax nana have been identified, with respective prevalences of 15.38% and 7.69%. Although historically considered non-pathogenic, these protozoa can cause intermittent or chronic digestive disorders according to certain studies [34].

Finally, Giardia intestinal is the only flagellate detected in this study, found in a single patient (7.69%). This prevalence remains moderate, although it is slightly higher than that reported by Si Luciana Ventura Cardoso (3.5%) [32-35].

E. CONCLUSION

Human intestinal parasitoses represent a significant public health issue. The constant increase in these infections among patients living with HIV motivated the present study, aimed at assessing the prevalence of these parasitic diseases in this vulnerable population. The results obtained aim to guide preventive actions, in particular by implementing appropriate hygiene measures and raising awareness among the population about the transmission of these parasites. The diagnostic techniques used made it possible to identify the different parasitic forms present, thus contributing to better confirmation of the diagnosis. Furthermore, the conduct of larger longitudinal studies, integrating all the associated risk factors, as well as continuous epidemiological surveillance, are essential to limit the spread of intestinal parasites in HIV-positive patients.

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