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Intestinal Parasitosis in Children among Internally Displaced Persons in the Hauts-Bassins Region of Burkina Faso

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Abstract

Introduction: The setting up of camps for internally displaced persons in Burkina Faso as a result of terrorism creates favorable conditions for the emergence of digestive parasitosis in these displaced populations. The objective of this study was to evaluate the prevalence of digestive parasitosis in children of this population in the Hauts-Bassins region. **Material and methods**: This was a prospective cross-sectional study from November to December 2020, in which stool samples were collected from internally displaced children from the Sinfra reception site in Banzon and from Poya in Karangasso Vigué. The stool samples were stored at room temperature, protected from dust and insects, in a cooler and then sent to the laboratory of the CHUSS in Bobo-Dioulasso where the parasitological analyses were performed. **Results**: The mean age was 5.8 ± 2.4 years. The most represented age group was 5 to 10 years (75.31%). The sex ratio is 1.61. The overall prevalence of intestinal parasite infection was 53.09%. The prevalence was statistically higher among those who consumed well water than those consuming tap water (p = 0.01). Monoparasitism by protozoa and helminths represented 74.42% and 6.68% respectively. The polyparasitism rate was 9.31%. The species identified in monoparasite patients were protozoa with *Entamoeba coli* (37.21%), *Giardia lamblia* (25.58%), *Endolimax nanus* (6.98%) and *Entamoeba histolytica/dispar* (4.65%). Biparasitism was identified with combinations, such as *E. coli* + *E. histolytica*/*dispar* (11.63%). **Conclusion**: There is a high prevalence of digestive parasitosis among IDPs in the Sinfra and Poya reception site. Educational sessions

on hand washing before meals, use of drinking water, etc. should emphasize preventive measures in these IDP camps.

Keywords

Digestive Parasitosis, Internally Displaced Children, Hauts-Bassins, Burkina Faso

1. Introduction

Intestinal parasitoses are neglected tropical diseases that represent a significant cause of morbidity and mortality on a global scale. The prevalence of IPIs is high in resource-limited regions, largely due to a combination of factors, including high population density, limited access to improved water sources, low latrine availability, poor sanitation, low health awareness, and limited economic resources [1]-[3]. In 2018, the World Health Organization (WHO) estimated that 2 billion people worldwide are affected by gastrointestinal parasites, resulting in approximately 155,000 deaths annually. The impact of these parasitic infections on children's education is detrimental, resulting in cognitive delays, inattention, and absenteeism [4] [5]. Burkina Faso, like other countries with limited resources, is an endemic country with all the associated risk factors. Indeed, a study conducted in Bobo-Dioulasso, Burkina Faso (BF), on requests for parasitological examinations from 1999 to 2008 in search of the etiology of gastroenteritis, revealed an overall prevalence of intestinal parasitosis of 23.8% in 2013 [6]. The advent of the security crisis in the country in 2015, which precipitated a deterioration in the socio-economic crisis and the displacement and establishment of camps for internally displaced persons (IDPs) within the country, has exacerbated the health situation in the country. As of August 31, 2021, the number of internally displaced individuals in the country had reached 142,378, representing over 17% of the total population of more than 800,000 individuals. As of August 2021, the Hauts-Bassins region had a population of nearly 231,910 internally displaced persons (IDPs) [7]. This microenvironment provides optimal conditions for the proliferation of intestinal parasites within these populations. This study aimed to assess the prevalence of intestinal parasitosis in IDP camps in Burkina Faso, with a particular focus on the Hauts-Bassins region.

2. Material and Methods

2.1. Setting of the Study

This study took place in the Hauts-Bassins region, located in the west of Burkina Faso, covering an area of 25,479 km^2 with 1,776,803 inhabitants. It includes three provinces, including Houet, Kénédougou and Tuy, whose capitals are Bobo-Dioulasso, Orodara and Houndé. It has 03 urban communes, 33 departments, 30 rural communes and 472 villages.

2.2. Study Site

Several sites and host families have been identified in the Hauts-Bassins region, namely Larama, Banzon, Bobo-Dioulasso, Founsan, and Karangasso Vigué. However, for our study, only the host sites of Sinfra in Banzon and Poya in Karangasso Vigué were involved in the collection of samples. The laboratory analyses were performed in the parasitology-mycology department of the laboratory of the Sourô Sanou University Hospital of Bobo-Dioulasso (CHUSS), the second largest university hospital in the country.

2.3. Study Population and Participation Criteria

Our study population was internally displaced children living in the Hauts-Bassins region, regardless of gender. Children whose parents gave oral consent were included. Participants who reported having recently taken a digestive antiparasitic drug (less than two weeks) were excluded from the study.

2.4. Type and Period of Study

This was a prospective cross-sectional study that took place from November to December 2020.

2.5. Sampling and Data Collection

The sampling technique consisted of systematic recruitment of IDPs meeting the eligibility criteria during the study period. A total of 81 displaced children were included in the study. A questionnaire was used to collect socio-demographic, clinical and parasitological data.

2.6. Parasitological Diagnosis

Participants' stools were collected in sterile jars. The labeled samples were placed in a cooler at room temperature and transported by a service vehicle to the CHUSS laboratory for analysis. Each stool sample was examined macroscopically to assess the consistency and color of the stool. And to look for the presence of parasitic elements in the stool. Microscopic examination including direct fresh examination and examination after concentration using the Ritchie technique was also performed.

- Direct examination in the fresh state

A small amount of faeces was collected and diluted in a drop of physiological water previously placed on a slide to obtain a fine spread. The spread was then covered with a coverslip and examined under a light microscope immediately for cysts and eggs. This examination was performed with a microscope with a 10× and then 40× objective.

- Examination after concentration by the Ritchie technique

A small amount of stool was taken in a glass stem and 10% formalin was added to about 10 times the volume of the sample. The stool was triturated until a

homogeneous solution was obtained. This solution was filtered into a conical tube using a pad. Ether was then added to 1/3 of the total desired volume. The whole was shaken well and centrifuged at 1500 rpm for 5 min. After removal of the tube, four phases were formed (an upper layer represented by ether, an intermediate layer made of bacterial residues and food debris, an aqueous layer made of formalin and the pellet which contained the parasitic elements). The supernatant was discarded by inverting the tube with a quick movement

2.7. Statistical Analysis

The data were entered and processed with EPI-INFO software version 7.2.0.1. and version 4.3.3 of R software. The statistical test used was the Chi-square test at the 5% significance level. Logistic regression was used to reconsider factors associated with the possibility of parasitic infection

2.8. Ethical Considerations

Authorization was obtained from the Ministry of Gender, National Solidarity, Family, and Humanitarian Action to conduct this study. Authorization was obtained from the Ministry of Gender, National Solidarity, Family, and Humanitarian Action to conduct this study. In addition, participants were informed of the results of the biological analysis and those detected with parasites were treated according to the parasitosis.

3. Results

3.1. General Characteristics of the Population

The mean age was 5.8 ± 2.4 years. The most represented age group was 5 to 10 years (75.31%). The sex ratio is 1.61 (Table 1).

Table 1. General characteristics of the population.

Variables		Number (n)	Proportion (%)
Socio-demographic characteristics			
Age group	[0 - 5 years]	20	24.69
	[5 - 10 years]	61	75.31
Sex	Male	50	61.73
	Female	31	38.27
Current occupation	Unemployed	80	98.77
	Other	1	1.23
Level of education	Primary	4	4.94
	None	77	95.06
Host site	Poya	56	60.14
	Sinfra	25	30.86

Continued

Other characteristics			
Water supply source	Well	56	69.14
	Tap	25	30.86
Attitudes after using the toilet	Soap-free washing	1	1.23
	Lack of hand washing	80	98.77
Consistency of stool	Hard	13	16.05
	Liquid	4	4.94
	Soft	42	51.85
	Pasty	22	27.16
Color	Whitish	1	1.23
	Greyish	1	1.23
	Yellowish	8	9.88
	Blackish	3	3.70
	Greenish	68	83.95

3.2. Prevalence of Digestive Parasitosis

The overall prevalence of digestive parasitosis was 53.09% (54/100). Prevalence stratified by host site showed a statistically higher prevalence at the Poya host site (p = 0.01). Prevalence within each age group ranged from 41% to 57%. Regarding the source of water supply, the prevalence was statistically higher among those who consumed well water than those consuming tap water (p = 0.01) (Table 2).

Table 2. Prevalence of digestive parasitosis in internally displaced children.

Variable		Prevalence n (%)	p
Host site	Sinfra	18 (41.86)	0.01
	Poya	25 (58.14)	
Age group (Year)	0 - 5	16 (37.2)	0.05
	5 - 10	27 (63.8)	
Water supply source	Tap	22 (49.23)	0.01
	Well	32 (68.75)	

3.3. Clinical Manifestations of Digestive Parasitosis

Clinically, 90% of patients were asymptomatic. Abdominal pain was the main clinical sign observed with 63.64% of cases. Other clinical signs observed were pruritus (9.09%), rash (9.09%) and constipation (9.09%).

3.4. Parasitic Species Isolated in Stools

Different species have been identified according to the type of parasitism and the phylum. Monoparasitism by protozoa and helminths represented 74.42% and 6.68% respectively. The species identified in monoparasite patients were protozoa with *Entamoeba coli* (37.21%), *Giardia lamblia* (25.58%), *Endolimax nanus* (6.98%)

and *Entamoeba histolytica/dispar* (4.65%). Polyparasitism constituted 9.31% of positive results (Table 3).

Table 3. The different species identified according to the type of parasitism and the phylum.

Type of parasitism/Phylum		Species	Frequency n (%)
Monoparasitis	Protozoa	*E. coli*	16 (37.21)
		E. histolytica/ dispar	2 (4.65)
		Giardia lamblia	11 (25.58)
		E. nanus	3 (6.98%)
	Helminthes	*E. vermicularis*	1 (2.33)
		T. Trichiura	2 (4.65)
Polyparasitism	Biparasitism	*E. coli* + *E. histolytica/ dispar*	5 (11.63)
		E. coli + *E. nanus*	1 (2.33)
	Triparasitism	*E. coli* + *E. histolytica/ dispar* + *E. nanus*	2 (4.65)
Total			43 (100%)

E. coli was the most common parasite regardless of the age of the child: 51.7% in children under 5 years, and 37.5% in children over 5 years of age. Helminths were more isolated at the Poya host site (34.39%) than at the Sinfra site (Table 4).

Table 4. Distribution of parasites according to age and host site.

		E. nana (%)	*E. coli* (%)	*E. histolytica /dispar* (%)	*E. vermicularis* (%)	*G. intestinalis* (%)	*T. trichuira* (%)
Age (year)	0 - 5	12.5	37.5	22.73	4.17	16.69	8.33
	5 - 10	10.3	51.72	13.79	0	24.14	0
Host site	Sinfra	14.29	52.38	19.05	0	9.52	4.76
	Poya	9.38	40.63	15.63	3.13	28.13	3.13

The host site (p = 0.03037) and the water supply (p = 0.03037) were associated with the possibility of parasitic infection (Table 5).

Table 5. Factors associated with the possibility of parasitic infection.

Variables	Frequency (%)	OR	95% CI	P-value
Age group				
[0 - 5 years]	24.69	1		
[5 - 10 years]	75.31	2.001543	[0.6441841 - 6.5383759]	0.2045
Sex				
Male	61.73	1		
Female	38.27	1.666102	[0.6186801 - 4.5646261]	0.3598

Continued

Host site				
Poya	60.14	1		
Sinfra	30.86	3.142747	[1.047063 - 10.401179]	**0.03037**
Water supply source				
Well	69.14	1		
Tap	30.86	3.142747	[1.047063 - 10.401179]	**0.03037**
Signs				
No	86.42	1		
Yes	13.58	2.636113	[0.5717491 - 16.6987130]	0.2038

4. Discussion

4.1. Prevalence of Digestive Parasitosis

The overall prevalence of digestive parasitosis was 53.09% among the internally displaced person (IDP) children who were the subjects of the study. This elevated prevalence rate is indicative of the concentration of risk factors that contribute to the dissemination of digestive parasites in these locations. Indeed, promiscuity facilitates interpersonal contact and the transmission of parasites, particularly those transmitted orally. The prevalence of the condition was found to be statistically higher among IDPs in the Poya host site when the data was stratified by host site. This discrepancy may be attributed to the source of the water supply. It is notable that IDPs in the Poya site obtain their water from wells, whereas those in the Sinfra site access it from a tap. The results of our study demonstrated that the prevalence was statistically higher among individuals who consumed well water compared to those who consumed tap water ($p = 0.01$). This can be attributed to the absence of requisite coverage for the wells, in conjunction with the lack of a curb and the unsanitary condition of the collection bucket. The overall prevalence observed in our study aligns with the findings of the study conducted in Burkina Faso, which reported a prevalence of 54.7%. Nevertheless, the findings of a study conducted in Burkina Faso indicated a higher prevalence rate of 71.5% [8] [9]. This discrepancy may be attributed to the temporal aspect of the study, as our investigation was conducted subsequent to the implementation of several strategies for the control of specific parasitic infections in the country [10]-[12].

4.2. Clinical Manifestations of Digestive Parasitosis

The majority of patients (90%) with a positive parasitological stool examination were asymptomatic, which facilitates the dissemination of parasites within populations. This underscores the necessity for cross-sectional surveys to assess the prevalence of these parasitoses in at-risk populations. Additionally, anal pruritus, a highly specific symptom of pinworm disease, was observed in patients with identified E. vermicularis.

4.3. Parasitic Species Isolated in Stool

The prevalence of protozoan infestation was found to be 74.42%, which is significantly higher than the 6.68% observed for helminth infestation. This discrepancy may be attributed to the implementation of numerous helminth control initiatives within the country [10]. Amoebae constituted the predominant parasite species (66.7%). Of these, *E. coli* was the most prevalent, accounting for 37.21% of the total. This parasite, which is considered non-pathogenic, serves as an effective indicator of the fecal contamination prevalent in the Burkinabe population, a conclusion corroborated by other authors in Burkina Faso [6] [9]. *E. histolytica*/*dispar* was the second most frequently isolated amoeba, occurring in 4.65% of cases. As a result of the cystic form being diagnosed between slides, it was challenging to differentiate between *E. histolytica* and *E. dispar*. The presence of this organism serves to confirm the lack of hygiene observed in this population. The absence of the hematophagous form may explain the absence of associated clinical signs.

The only flagellate isolated in the study was *Giardia lamblia*, with a frequency of 24.07%. It is likely that this proportion is an underestimate, given that only a single examination was conducted for each participant, and the parasite in question has a latency period. Other authors have reported higher frequencies in the city of Kinshasa (27.2%) [13]. Conversely, other authors have observed lower prevalence rates, namely 18.9% and 4.7% [6] [9]. A prevalence of 2.33% was observed for pinworm. It is a pathogenic parasite most often associated with anal pruritus; thus, the prevalence would likely be underestimated in our study. Had the scotch test been applied in a systematic manner to all participants, the frequency would have been higher. The prevalence of Trichuris trichiura was 3.7%. Oyegue-Liabagui [14] reported a similar rate (4%) in Franceville, located in the southeast of Gabon. Poor hygiene is a significant risk factor for Trichuris trichiura transmission, and internally displaced children are particularly vulnerable due to their high exposure risk. This is particularly relevant in developing countries like Burkina Faso, where poor sanitary conditions are associated with a high disease burden and infections.

5. Conclusion

The objective of this study was to evaluate the prevalence of digestive parasitosis among internally displaced children in the Hauts-Bassins region for the first time. The findings indicated a markedly elevated prevalence of parasitic infection at the Sinfra and Poya reception centers. The precariousness of the level of hygiene associated with promiscuity undoubtedly represents a significant risk factor for the spread of these parasites within the IDP populations. Educational sessions on hand washing before meals, use of drinking water, etc. should emphasize preventive measures in these IDP camps.

Conflicts of Interest

The authors declare that they have no competing interests.

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