

Gastrointestinal parasitic infections in children aged less than 5 years in Ouagadougou, Burkina Faso

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Abstract

Background: Parasitic gastroenteritis is a public health problem in Burkina Faso. However, there is lack of epidemiological data for better management of the disease. This study aimed at identifying the intestinal parasites responsible for diarrhoea and assessing their prevalence among children aged 0 - 5 years in Ouagadougou, Burkina Faso.

Methods: This hospital-based cross-sectional study consisted of 317 children aged from 0 - 5 years, with gastrointestinal disorders, were recruited at Saint Camille Hospital of Ouagadougou (HOSCO) and Notre Dame de Fatima Reception Centre (CANDAF). Stool samples were collected and processed by direct microscopic examination for the presence of intestinal parasites.

Results: An overall prevalence of 20.8% (66/317) of parasitosis was observed. *Giardia intestinalis*, *Entamoeba histolytica/dispar*, *Entamoeba coli*, *Trichomonas intestinalis* and *Hymenolopis nana* species were found with respective frequencies of 12.0% (38/317), 4.4% (14/317), 4.4% (14/317) and 3.5% (11/317). Children aged 25 to 60 months were the most affected by parasitosis with 57.6% (38/66) of cases. Approximately 19.0% (60/317) of the patients presented with diarrhoea. Children aged 12 to 24 months were the most affected and represented 65% (39/60) of diarrheal cases. The most etiologic agents of diarrhoea were *Giardia intestinalis* and *Entamoeba histolytica/dispar* found in 15% of cases.

Conclusions: Parasites were weakly associated with childhood gastroenteritis which mainly affects children under 2 years.

Background

Intestinal parasitosis caused by protozoa and helminths is one of the leading causes of childhood morbidity and mortality worldwide [1,2] and they can lead to malnutrition, anemia, decreased resistance to infection, diarrhoea and stunting [3-5]. Burkina Faso faces these endemic parasitic infections. However, there is scarcity of data on the epidemiology of parasitic diseases. This study aimed to identify intestinal parasites responsible for diarrhea and evaluate their prevalence among children from 0-5 years in the city of Ouagadougou for the development of integrated and effective control strategies.

Methodology

Patients and study setting

A cross-sectional study to diagnose parasitic infections in children under 5 years old was performed at Biomolecular Research Center Pietro Annigoni/Laboratory of Molecular Biology and Genetics (CERBA/LABIOGENE). The study was conducted from June to October 2015 and included 317 stool samples of children under 5 years old from the city of Ouagadougou and attending HOSCO and CANDAF. Stool samples were collected from patients with gastrointestinal disorders. A parasitological examination of stool specimens by a clinician was requested during the study period.

Stool collection and processing

The stools of the patients, freshly emitted, were collected in a sterile container and sent directly to the medical parasitology laboratories of HOSCO and CANDAF to be examined within one hour of their emission. The stool was first examined macroscopically and analyzed for consistency, presence of blood or mucus, and the possible presence of Taenia rings, Ascaris adults, or pinworms. The fresh fecal samples were then processed by direct wet smear followed by iodine staining and examined via microscopy for the presence of the vegetative, living and mobile forms of protozoa and their cysts, but also the eggs or adult helminths. The Motic BA300 optical microscope (Motic Instruments, Canada) was used for the analysis.

Statistical analysis

The data was entered on Microsoft Excel 2016 and analyzed using the Standard Statistical Package for Social Sciences (SPSS) version 20.0.

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For analysis purposes, patients were divided into 3 classes by age: 2 to 11 months, 12 to 24 months, 25 to 60 months. The qualitative variables were described in terms of size and percentage of data. The chi-square test at 5% significance level was used to compare the different proportions.

Ethical considerations

The institutional ethics committees of Saint Camille Hospital of Ouagadougou and the Pietro Annigoni Biomolecular Research Center approved this study. The objectives of the study were orally explained to the parents or legal guardians of the children in their language of comprehension. All patients provided a voluntary, signed and dated informed consent, or fingerprint if illiterate, prior to enrollment in the cohort. Parasitological examination results were immediately transmitted to the clinician for patients management.

Results

Sociodemographic characteristics of the study population

The present study consisted of 317 children aged 2 to 60 months from Ouagadougou and surrounding areas. Children aged 12 to 24 months accounted for 46.4% (147/317) of the study population (Table 1).

Clinical characteristics of the study population

The clinical signs that prompted the demand for parasitological examination in patients were mainly abdominal pain, vomiting, fever, constipation, anorexia, nausea and diarrhea. Diarrhea, defined as the emission of at least 3 liquid or soft stools per day, was present in 18.9% (60/317) of patients. Children aged 12 to 24 months were the most affected age group for diarrhea which represents 65% (39/60) of cases (Table 1). An abnormal bacterial flora was found in 89.6% (284/317) of children with predominance in those aged 12 to 24 months (Table 2). In cases of diarrhea, we found an abnormal bacterial flora in 91.7% (55/60) and children aged 12 to 24 months presented the majority of cases that was 65.5% (36/60).

The study also found a strong association ($p < 0.0001$) between the presence of parasitosis and abnormal bacterial flora in cases of diarrhea. In fact, 100% (21/21) cases of parasitic infections among cases of diarrhea, have also presented an abnormally constituted bacterial flora.

Prevalence of intestinal parasitosis

The overall prevalence of parasitosis was 20.8% (66/317). The parasites encountered during the study period were: *E. histolytica/dispar*, *E. coli*, *G. intestinalis*, *T. intestinalis* and *H. nana*. The prevalence of protozoa *E. histolytica/dispar*, *E. coli*, *G. intestinalis* and *T. intestinalis* was 4.4% (14/317), 4.4% (14/317), 12.0% (38/317) respectively. *H. nana* representing helminths had a prevalence of 0.3% (1/317) in our study population. Children aged 25 to 60 months were the most affected by parasitosis with 57.6% (38/66) of cases (Table 3). The overall prevalence of parasitosis in diarrhea cases was 35% (21/60). The etiology of diarrhea was in favor of *E. histolytica/dispar*, *E. coli*, *G. intestinalis*, *T. intestinalis* with respective prevalence of 6.7% (4/60), 15% (9/60), 8.3% (5/60) and 5% (3/60) (Table 3). Parasitic co-infections were recorded at a rate of 15.1% (10/66) (Table 4).

Discussion

This hospital-based cross-sectional study involved 317 stool specimens from children under 5 years old with gastrointestinal disorders. The results showed an overall prevalence of 20.8% of parasites

with a predominance of *G. intestinalis* accounting for 57.6% (38/66) of parasitosis with a global prevalence of 12.0% in the study population. *E. histolytica/dispar* accounted for 21.2% (14/66) of parasitosis with a prevalence of 4.4%. These results are higher than those found by Simporé *et al.* with 17.0% of parasitosis in 2009 including 7.6% and 1.1% of *G. intestinalis* and *E. histolytica/dispar* infections respectively in a study population of 648 children under 5 years of age in Ouagadougou [6]. In the same year, Koueta *et al.* recorded a prevalence of 9.7% of parasites with 2.9% and 1% of *G. intestinalis* and *E. histolytica/dispar* infections respectively in a sample of 196 children under 5 years at the Pediatric Teaching Hospital Charles de Gaulle of Ouagadougou [7].

The results of the present study confirm previous observations that *G. intestinalis* is the first cause of parasitic gastroenteritis in Burkina Faso, followed by *E. histolytica/dispar* [8-11]. The overall prevalence of parasitosis (20.8%) in our study is low compared to those found by Karou *et al.* (25.9%) and by Ouermi *et al.* (44.3%) [9,12]. This allows us to conclude that there has been a significant decrease in the occurrence

Table 1. Sociodemographic characteristics of the study population

Characteristics	Male		Female		Diarrheal cases	
	N	%	N	%	N	%
Age (months)						
0 - 11	45	14.2	35	11.0	13	21.7
12 - 24	78	24.6	69	21.8	39	65.0
25 - 60	48	15.1	42	13.3	8	13.3
Total	171	53.9	146	46.1	60	100.0

Table 2. Macroscopic and microscopic characteristics of stool

Characteristics	N	%	
Consistency	Pasty	212	66.5
	Liquid	59	18.5
	Molded	0	0
	Glairy	10	3.1
Stool aspect	Mucous	35	11.0
	Bloody	1	0.3
Food debris	14	4.4	
Yeasts	87	27.3	
Abnormal bacterial flora	284	89.6	
Cysts	62	19.4	
Vegetative forms	15	4.7	

Table 3. Distribution of parasites infections according to age and diarrheal cases

Parasites	Infections by age group (N=66)				Distribution in diarrheal cases (N=60)			
	Age (Months)				Age (Months)			
	2-11	12-24	25-60	Total	2-11	12-24	25-60	Total
<i>E. histolytica/dispar</i>	3	1	10	14	1	0	3	4
<i>E. coli</i>	1	8	5	14	0	2	7	9
<i>G. intestinalis</i>	6	9	23	38	1	1	3	5
<i>T. intestinalis</i>	0	2	9	11	0	1	2	3
<i>H. nana</i>	0	0	1	1	0	0	0	0
Total	10	18	38	66	4	4	15	21

Table 4. Parasitic co-infections

Parasites	N	%
<i>E. histolytica/dispar-E. coli</i>	1	1.5
<i>E. histolytica/dispar-G. intestinalis</i>	2	3
<i>E. histolytica/dispar-T. intestinalis</i>	1	1.5
<i>E. histolytica/dispar-G. intestinalis-T. intestinalis</i>	1	1.5
<i>G. intestinalis-T. intestinalis</i>	3	4.5
<i>G. intestinalis-H. nana</i>	1	1.5
<i>G. intestinalis-T. intestinalis-E. coli</i>	1	1.5

of intestinal parasitosis. This decline in the frequency of parasitic gastroenteritis is attributable to the improvement of hygiene and access to clean drinking water in Ouagadougou, which has experienced rapid urbanization in recent decade.

In our study, children aged 12 to 24 months were the most affected by diarrhea with 65.0% of cases compared to 21.7% of infections in children aged 2 to 11 months. These results are different from those found by Koueta *et al.* who reported a frequency of 66.0% of diarrhoea in children from 0 to 12 months [7]. Orlandi *et al.* also reported the same results in Porto Velho, Brazil [13] and Ouermi *et al.* in Ouagadougou [8] observed respective frequencies of 53.3% and 47.0% of diarrhea in children from 0 to 12 months. This difference with our study is explained by the fact that children aged 12 to 24 months were the most represented in the present study population or 46.4% of children under 5 years of age.

In the present study, the diarrhea was manifested mainly in the children aged less than 2 years that was 86.7% of cases. This classic observation in pediatrics can be explained by two main reasons: immune immaturity in this age group when the antibodies transmitted by the mother are declining and poor hygiene during dietary diversification. Diarrhea, usually the symptom of a gastrointestinal infection, can be caused by bacteria, viruses or parasites. The distribution of etiologies in diarrhea showed a prevalence of bacterial flora which was abnormal in 89.6% of cases. The bacterial flora was not characterized in the present study to identify the germs responsible for diarrhea. Nevertheless, the bacterial etiology would be important in the same way as viral etiology in children's diarrhea in Burkina Faso [6,11]. *G. intestinalis* and *E. histolytica/dispar* were detected in 15% of cases of diarrhea and mostly in children 25 to 60 months.

This result is similar to that found by Georges *et al.* in the Central African Republic with a prevalence of 12.8% of *E. histolytica* from diarrhea in children 25 to 60 months of age [14]. The faeco-oral transmission of these parasites explains their strong presence in children over 2 years of age. Indeed, defective food hygiene at the dietary diversification time could lead to parasitic contamination in these children who walk on all fours, drink dirty water and eat the sand or bring all the objects found nearby in the mouth. Parasitic diarrhea usually rare, are only one aspect of the pathology induced by digestive parasites but can be frequent and serious in endemic areas in cases of malnutrition [15]. Similarly, the sudden fall of the immune defenses can cause parasitic diarrhea in a previously healthy carrier [16,17].

Conclusion

Parasitic gastroenteritis is a public health problem in Burkina Faso despite improved hygiene conditions and affects mainly children aged 2 to 5 years. This study confirmed that *G. intestinalis* and *E. histolytica/dispar* remain the most common parasites causing infant gastroenteritis in Burkina Faso.

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