**Intestinal parasites in children hospitalized at the Central Hospital in Maputo, Mozambique**

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Abstract

Introduction: Intestinal parasites are important contributors to the global disease burden, especially in children of low-income countries. The present study determined the frequency of intestinal parasites in children hospitalized at the diarrhea section of the Infectious-Contagious Diseases ward and at the Malnutrition ward of the Department of Pediatrics of the Maputo Central Hospital in Mozambique.

Methodology: This pilot study conducted between February and March 2009 enrolled a total of 93 children between 1.5 and 48.2 months of age; 87.1% were younger than 24 months. Parasite detection in stool samples was achieved using direct microscopic observation and Ritchie’s concentration technique.

Results: Infection with pathogenic intestinal parasites was detected in 16.1% (15/93) of the children. *Giardia duodenalis* and *Trichuris trichiura* were the most common parasites (6.5%, 6/93 each), followed by *Ascaris lumbricoides* (2.2%, 2/93). One case of mixed infection with *A. lumbricoides* plus *T. trichiura* was also detected.

Conclusion: This study reinforces the importance of routinely examining stool samples for the diagnosis of intestinal parasites (including protozoa) in children hospitalized in endemic areas.

Key words: intestinal parasites; children; Mozambique


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Introduction

According to World Health Organization every year there are approximately 1.7 billion cases of diarrheal diseases. Diarrheal disease is the second leading cause of death in children under five years of age, killing around 760,000 children each year [1]. In Mozambique, childhood diarrhea and malnutrition constitute an important health problem, and access to adequate water and sanitation is still limited [2,3].

Diarrhea can be related to a wide range of bacteria, viruses, and intestinal parasites [4]. Infection with intestinal parasites, both protozoa and helminths, is often associated with diarrhea, but also with growth impairment (both physical and intellectual development) and worsening of nutritional status, especially during infancy [4-6].

Studies performed in Mozambique concerning the prevalence of intestinal parasites are scarce. A hospital-based study in a rural area of Mozambique, focusing on children under five years of age with diarrhea, detected a prevalence of 14.4% for intestinal parasites [7], while other surveys of intestinal parasites in school-aged children (non-hospitalized) revealed a much higher prevalence [8-10]. These data from Mozambique are in accordance with the results obtained in a study performed in Kenya (where hospitalized children under five years of age showed a 20.1% prevalence for intestinal parasites) [11], in Senegal (where 14% of children between one month and five years of age from a primary health care institution in an urban area had intestinal parasites) [12], and in Ethiopia (where 37.4% of students between 6 and 19 years of age had intestinal parasites) [13].

The aim of the present work was to investigate the frequency of intestinal parasites in children hospitalized in the diarrhea section of the Infectious-Contagious Diseases ward (ICD) and in the Malnutrition (MN) ward of the Department of Pediatrics of the Maputo Central Hospital in Mozambique.
Methodology

A pilot study was conducted between February and March 2009, using a convenience sample of 93 children interned in the two wards (40 from ICD and 53 from MN).

Stool samples were collected by the parents or guardians of the child according to given instructions and placed into a sterile stool container. One stool sample was collected per child, without any pharmacologic induction. Parasite detection was performed through direct microscopic observation of stool samples in saline solution and using Ritchie’s concentration technique [14]. The detection and identification of parasites was conducted at the parasitology laboratory at the Faculty of Medicine of the Eduardo Mondlane University of Mozambique.

The study was approved by the Mozambican National Bioethics Committee for Health in December 2008. Oral informed consent was obtained from all the legal parents or guardians of the enrolled children. Only those children whose legal parents or guardians agreed to participate in the study were included.

Results

The age of the 93 children included in this study ranged from 1.5 to 48.2 months; 87.1% (81/93) were less than 24 months, and 51.6% (48/93) less than 12 months of age. Boys accounted for 64.5% (60/93) of the children. The overall prevalence of intestinal parasites was 16.1% (15/93). Altogether, *Giardia duodenalis* was detected in 6.5% (6/93), *Trichuris trichiura* in 6.5% (6/93), and *Ascaris lumbricoides* in 2.2% (2/93) of the children. One case of mixed infection with *A. lumbricoides* and *T. trichiura* was also detected.

The highest infection prevalence was found at the ICD ward (22.5%, 9/40), while the MN ward presented half of this value (11.3%, 6/53) (Table 1). Helminths were more frequent in the ICD ward, and protozoans were more frequent in the MN ward. Older children were infected with more parasites than the younger children (50% [> 24 months] vs. 12.1% [12-24 months] and 10.4% [0-12 months]) (Table 2).

Discussion

In the present study, 93 stool samples from children hospitalized in the Central Hospital of Maputo, Mozambique, were analysed through microscopy. Fifteen of the children (16.1%) were found to be carrying at least one pathogenic intestinal parasite. Our results are similar to those reported in a previous study of hospitalized children (mean age 13.1 months) performed in a rural area of Mozambique and also using microscopy for parasite detection (14.4%) [7].

Regarding the proportion of parasite distribution by the age groups, the present work showed that half of the children older than 24 months of age were infected. It is known that older children have higher infection rates of parasites because they are more exposed to parasite-prone environments, such as contaminated soil and water, and thus more likely to

| Table 1. Intestinal parasitic infections found in 93 children hospitalized at the diarrhea section of the Infectious-Contagious Disease (ICD) and Malnutrition (MN) wards |
|---------------------------------|-----------------|-----------------|-----------------|
|                                 | ICD (n = 40)    | MN (n = 53)     | Total (n = 93)  |
| Ascaris lumbricoides            | 5% (2/40)       | 0               | 2.2% (2/93)     |
| Trichuris trichiura             | 12.5% (5/40)    | 1.9% (1/53)     | 6.5% (6/93)     |
| Ascaris lumbricoides + Trichuris trichiura | 0               | 1.9% (1/53)     | 1.1% (1/93)     |
| Giardia duodenalis              | 5% (2/40)       | 7.5% (4/53)     | 6.5% (6/93)     |
| Infected                        | 22.5% (9/40)    | 11.3% (6/53)    | 16.1% (15/93)   |

| Table 2. Intestinal parasitic infections distributed by age groups of 93 hospitalized children |
|---------------------------------|-----------------|-----------------|-----------------|
|                                 | 0-12 months (n = 48) | 12-24 months (n = 33) | > 24 months (n = 12) |
| Infected                        | 10.4% (5/48)     | 12.1% (4/33)     | 50% (6/12)      |
| Ascaris lumbricoides            | 2.1% (1/48)      | 0               | 8.3% (1/12)     |
| Trichuris trichiura             | 4.2% (2/48)      | 3% (1/33)       | 25% (3/12)      |
| Ascaris lumbricoides + Trichuris trichiura | 0               | 0               | 8.3% (1/12)     |
| Giardia duodenalis              | 4.2% (2/48)      | 9% (3/33)       | 8.3% (1/12)     |
| Uninfected                      | 89.6% (43/48)    | 87.9% (29/33)   | 50% (6/12)      |
be infected than younger children who are still breastfed [15,16].

The frequency of infection obtained could be underestimated, considering one stool sample per child was collected; for instance, in the case of *G. duodenalis*, analysis of one stool sample allows for the detection of 60% to 80% of infections, two samples allow for 80% to 90% detection, and three samples allow for detection of over 90% of infections [17]. Furthermore, other potential enteric parasites, such as *Cryptosporidium*, are not detected through microscopy without a specific staining technique [18].

Children from the ICD ward were two times more infected when compared with children from the MN ward, especially with helminths.

Despite the limited number of samples tested, this is the first study that describes the frequency of intestinal parasites (including protozoa) in children hospitalized in one of the biggest hospitals of the town of Maputo in Mozambique.

The parasites detected in the present study may not be the main agents of diarrhea since other potential pathogens such as bacteria, viruses, or even other parasites are not detectable through microscopy. Nevertheless, this study suggests that in endemic regions such as Mozambique, the diagnosis of intestinal parasites in children should be performed routinely in hospitals in order to improve the health status of the children.

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**Conflict of interests:** No conflict of interests is declared