



Detection of Intestinal Parasitic Infections Among Children Under Six Years of Age in Benghazi City, Libya

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Abstract—Parasitic infections remain a significant issue in the history of public health for certain communities or globally. In developing country, parasitic diseases still represent a major public health challenge, particularly for children. This research was performed to detect intestinal parasites in children under six years in Benghazi City, Libya; where 114 fecal samples were collected and examined. The gross examinations of the stools were made for the presence of worms and segments, while the microscopic examination of the stool was performed using direct wet smears in normal saline and Lugol's iodine. The results showed that infection rate was relatively high; around 56.14% were infected with intestinal parasite. The most common parasites were *Entamoeba histolytica* and *Entamoeba dispar* (22.80%), followed by *Giardia lamblia* (12.28%), *Enterobius vermicularis* (11.40%), *Hymenolepis nana* (9.64%). The study indicates high rate of parasitic infections among children, which necessitates health education for families and children regarding regular hand washing with soap and water, the use of toilet paper, washing fruits and vegetables, and drinks from unsafe sources.

Keywords—Intestinal parasites; Children under six years; Benghazi; Abdominal discomfort

المخلص— لا تزال العدوى الطفيلية تمثل تحديًا بالغ الأهمية في مجال الصحة العامة، سواء على مستوى بعض المجتمعات أو على الصعيد العالمي. ففي البلدان النامية، ما تزال الأمراض الطفيلية تشكل تحديًا رئيسيًا للصحة العامة، خاصةً بين الأطفال. أجريت هذه الدراسة للكشف عن الطفيليات المعوية لدى الأطفال دون سن السادسة في مدينة بنغازي، ليبيا، حيث تم جمع وفحص 114 عينة براز. وقد أجري الفحص الظاهري للبراز للتحقق من وجود الديدان أو أجزائها، كما تم الفحص المجهرى باستخدام مسحات مبللة مباشرة في محلول ملحي عادي ومحلول يودي. أظهرت النتائج أن معدل الإصابة كان مرتفعًا نسبيًا؛ حيث بلغ حوالي 56.14% من الأطفال مصابين بطفيليات معوية. وكانت الطفيليات الأكثر شيوعًا هي انتاموبيا هستولويتكا وانتاموبيا ديسبار (22.80%)، تلتها جيارديا لامبليا (12.28%)، ثم الدودة الدبوسية (11.40%)، والشريطية القزمية (9.64%). وتشير الدراسة إلى ارتفاع نسبي للإصابة بالطفيليات بين الأطفال، مما يستدعي التوعية الصحية للأسر والأطفال بأهمية غسل اليدين بانتظام باستخدام الماء والصابون، واستخدام مناديل الحمام، وغسل الفواكه والخضروات، وتجنب شرب المياه من مصادر غير آمنة.

الكلمات المفتاحية— الطفيليات المعوية؛ الأطفال تحت عمر ست سنوات؛ بنغازي؛ الأم البطن

1. Introduction

Parasitic infections are a common cause which frequently result in illness and death for children in different regions [1]. The prevalence of parasites that cause enteropathy in children differs by location around the world [2,3]. In many low-income and developing countries where drinking water is polluted, sanitation is inadequate, and the workforce is of low quality, the prevalence of parasites is especially high [2].

Many cases of intestinal parasitic infections (IPIs) are asymptomatic, yet they can lead to long-term health effects. Common symptoms associated with these infections include constipation, headaches, intestinal discomfort, indigestion, nausea, cramps, diarrhea, reduced appetite, and inflammation. The signs and symptoms of IPIs often overlap with those of noncommunicable diseases as well as bacterial and viral infections, making diagnosis more challenging [4].

As stated by the World Health Organization (WHO), over 95% of all parasitic infections documented worldwide stem from poverty, inadequate personal hygiene, open defecation practices, drinking contaminated water, and mishandling of food. The incidence of parasitic infections is especially elevated in the pediatric population [5]. The most prevalent protozoan parasites responsible for acute diarrheal diseases in children are *Giardia duodenalis*, *Cryptosporidium parvum*, and *Entamoeba histolytica* [6].

Preventing intestinal parasites involves improving environmental sanitation, providing handwashing facilities for children, encouraging early education for children both at school and at home; educating children on personal hygiene and providing access to clean drinking water [7]. Children under the age of five require special care and regular monitoring, as their lower immunity makes them more vulnerable to intestinal parasites and other infectious pathogens [8]. Therefore, this age of children requires a special attention, and the objective of this study was to detect intestinal parasites in children under six years in Benghazi City, Libya.

2. Materials and Methods

2.1 Collection of Sample

A total of 114 patients were studied for three months starting from March 13, to May 20, 2023. Fresh stool specimens from 114 patients who attended al-Akeed lab were collected in sterile containers and sent to the Department of Microbiology without delay.

The samples were delivered to the laboratory in sterile plastic containers, tightly closed to prevent contamination, and a sticker was placed on the container showing the data of the sample's owner: triple name, age, and gender. It was ensured that the sample did not mix with urine or water, and that the sample was collected in the morning to be examined directly in the laboratory. Well experienced laboratory technologists who worked in al-Akeed lab did the stool specimen diagnosis.

2.2 Laboratory Examination

The color, consistency and the nature of the feces were recorded by visual Examination. The stool specimens were examined for the presence of worms like *Ascaris*, *Enterobius*, proglottids of *Taenia*, adult Hookworm and *Trichuris*, either with the naked eye or with the aid of a hand lens. The samples were then prepared with saline and iodine prepared under high power for routine microscopy to observe cyst, eggs or larva in the stool.

2.3 Microscopic Examination

Each stool samples was examined by the following techniques:

2.3.1 Direct Microscopic Examination

This examination was performed using saline and iodine preparations. On a 1 mm thick microscopic slide, a small amount of stool sample was emulsified in 1-2 drops of saline or iodine solution. A cover slip was placed on it by taking care that the preparation was free of air bubbles and macroscopic debris.

2.3.2 Direct Wet Smear

The standard method of stool examination was used to examine each sample. A drop of normal saline was placed on a clean glass slide, and about 20 mg of stool was placed on a wooden rod and emulsified in a drop of normal saline. The smear was then counterstained with Lugol iodine, covered with a clean lid, and examined microscopically by swabbing the entire lid area under low power (X target for larvae and egg identification, X40 target for protozoa). The resulting solid waste (slides and wooden tools) was lysed in disinfectant solution overnight before discarding [9].

3. Results

3.1. Age, Gender, and Distribution of Children Infected with Parasites

A total of 114 samples under six years were included in the analysis with 57 samples from each gender. The study sample was mainly represented by children aged 1 to 5 years: children under 2 years old represented 23.68%, while children 2 to 3 years old represented 54.38%, and 3 to 5 years old represented 21.93%, as shown in Table 1.

Table 1. Age distribution of children under six years (n = 114)

Age in year	Number	Percent
< 2	27	23.68%
2–3	62	54.38%
3–5	25	21.93%

3.2. Intestinal Parasitic Infection Among Children Aged 1 to 5 Years

The examination of stool samples indicated that around 64 (56.14%) were infected with at least one intestinal parasite. Four intestinal parasites were detected, with *E. histolytica*/*E. Dispar* in 26 samples (22.80%), followed by *Giardia lamblia* in 14 samples (12.28%). The next was *Enterobius vermicularis* in 13 samples (11.40%), and lastly *Hymenolepis nana* at 11 (9.64%) as indicated in Table 2.

Table 2. Identified intestinal parasites among children under six years

Name of parasite	No. of infected parasite
<i>Entamoeba histolytica</i>	26 (22.80%)
<i>Giardia lamblia</i>	14 (12.28%)
<i>Enterobius vermicularis</i>	13 (11.40%)
<i>Hymenolepis nana</i>	11 (9.64%)

3.3. Number of Infected Males and Females by the Four Types of Parasites

Both gender (male and female) were affected by the four types of parasites. The results showed that *Entamoeba histolytica* was highly distributed in both genders. It has also observed that *Enterobius vermicularis* was more distributed in males, while *Giardia lamblia* was more detected in females. Eventually, *Hymenolepis nana* parasites showed low difference between males and females as shown in Table 3.

Table 3. The number of infected male and female by the four parasite types

Name of parasite	Infected males	Infected females
<i>Entamoeba histolytica</i>	12	14
<i>Giardia lamblia</i>	5	9
<i>Enterobius vermicularis</i>	8	5
<i>Hymenolepis nana</i>	6	5

4. Discussion

Parasitic enteric infections remain a major health problem in developing countries, and risk factors associated with infections are essential for intervention strategies [10]. This study assessed the prevalence of intestinal parasite infection among children between the ages of 1 and 5 years. The stool sample examination revealed that approximately 64 (56.14%) were infected with at least one intestinal parasite. In previous studies carried out in Nyamasheke District, Rwanda, the reported rate of intestinal parasite infection was 53.2% which is consistent with this study [11]. A Similar study was also done in Boke, Guinea, showed consistent rate with our study at 59.7% of infected cases [12]. However, the rate in this study was higher than the rate reported in Hawassa, South Ethiopia (26.6%) [13]. Environmental or socioeconomic factors, including humidity levels, temperature, dust, the lack of healthcare facilities in households or daycare centers, and inadequate sewage management, may be associated with the incidence of different parasitic diseases. In this study, 13 samples (11.40%) tested positive for *Enterobius vermicularis*. This is in contrast to some reported studies where the prevalence was 15.9%, 8.15% and 33.8% in the studies conducted in Bam [14], Semnan and Damghan, respectively [15].

None of the samples analyzed in the current research showed any evidence of soil-borne parasites, such as *Ascaris*, hookworms, or *Strongyloides*. Conversely, the most frequently encountered worm in studies carried out in Venezuela and Kashmir was *Ascaris* [9,16]. The infection rates in these two studies were 28.4% and 49.3%. According to studies conducted in Illam and Bam [9,17], the infection rate for *Ascaris lumbricus* was 3.8% and 1.8%, respectively, while the rate for *Strongyloides stercoralis* was 0.8%. This supports the notion that the children in our study region are significantly healthier and less prone to infection.

In this study, the under-5 age group had the highest prevalence of *Entamoeba histolytica* infection, which was found in both males and females at a rate of 26 (22.80%). *Entamoeba histolytica* is a protozoan that causes intestinal amebiasis as well as extraintestinal manifestations. Despite the majority of *Entamoeba histolytica* infections are asymptomatic, 50 million people experience symptoms and about 100,000 people die every year [18]. Furthermore, the results of this study reported that *Giardia lamblia* was detected at a rate of 14 (12.28%). In contrast, Mesfin's

research found that *Entamoeba histolytica/dispar* was detected at a rate of 54 (14.2%), and *Giardia lamblia* at 71 (18.7%) [19]. Intestinal parasitic infections are prevalent infectious diseases in children under the age of five, who are the most susceptible to infections that cause a variety of health issues due to their underdeveloped immune systems, eating habits, and exploratory actions [20].

5. Conclusion

Intestinal infections caused by parasites, including helminths and protozoa, represent a global health burden in many developing countries. The parasites that detected during this study in Benghazi city are, *E. Histolytica* and *E. Dispar* (22.80%), *Giardia lamblia* (12.28%), *Enterobius vermicularis* (11.40%), and *Hymenolepis nana* (9.64%). Intestinal parasites are common among children aged 2-3 years in Benghazi city and might be one of the reasons for abdominal discomfort and other enteropathy in this group. Detection of one or more parasites in this study demands improved health education for families and children on regular hand washing with soap and water after using the toilet, personal hygiene, washing fruits and vegetables, avoiding consumption of food and drinks from unsafe sources.

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