

Frequency of *Giardia lamblia* Infection in Children with Recurrent Abdominal Pain

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Abstract

Introduction: To assess the frequency and causative role of *Giardia lamblia* infection in children with recurrent abdominal pain in our setup.

Methods: Prospective observational study of 239 children with recurrent abdominal pain was conducted at Department of Paediatrics, Postgraduate Medical institute, Hayatabad Medical Complex, Peshawar, from November 2004 to July 2006. Inclusion criteria was children from 4 to 14 years having recurrent abdominal pain defined as greater than three episodes of abdominal pain, in the last 3 months severe enough to affect the daily activities of the child. Fresh stool specimen was collected from each child for laboratory examination. Those with negative results had two other samples taken at different times. Positive cases were treated with metronidazole or tinidazole. Stool examination was repeated 1 week after the end of the treatment, followed by evaluation of complaints for the next 6 months.

Results: Seventy-four (30.96%) children were positive for giardiasis. Thirty-eight were positive in their first sample, while 27 and 9 were in their second and third samples respectively. *Giardia* cysts were positive in 93% and trophozoite in 7%. Mean age of positive cases was 86 ± 47 months. The mean duration of pain was 158 ± 64 days, with 42% having pain for more than 6 months. Abdominal cramps, nausea and vomiting, abdominal distension, flatulence/bloating, anorexia and weight loss were the main clinical symptoms observed. Poor health hygiene, poor toilet training, overcrowding, and low socioeconomic status were observed risk factors. Stools were negative for giardiasis one week after the end of treatment. Only 76% children returned for follow-up and all were free of any complaints.

Conclusion: A significant proportion of children with recurrent abdominal pain were infected with *Giardia lamblia* and this study supports its potential role in recurrent abdominal pain in children (JPMA 58:171;2008).

Introduction

Recurrent abdominal pain (RAP) is defined as at least three episodes of pain in a three month period interfering with normal activity. This definition was derived from the seminal description by Apley and Nash in the late 1950's.¹ The frequency of recurrent abdominal pain in children ranges between 10-20%.² Apley observed that males and females are affected equally in early childhood up to the age of 9, at which point the incidence decreases in males.¹ The incidence in females continues to increase till 11 to 12 years of age. Between 9 and 12 years of age the female-to-male ratio approaches 1.5 to 1. Onset of chronic pain in a child younger than 4 years old requires a more in-depth organic evaluation, particularly for structural abnormalities.³

Both organic and inorganic causes are responsible for recurrent abdominal pain but their incidences are variable in different studies.¹⁻³ Emotional components like stressful events, sibling rivalry, school phobia, unpleasant parent relationship etc. have been attributed as underlying component in non-organic recurrent abdominal pain.^{3,4} Causes of organic pain like *H. Pylori* infection, parasitic

infestations and cholelithiasis have also been reported.⁵

Parasitic infections constitute a considerable public health problem especially in developing countries.⁶ *Giardia lamblia*, a protozoan parasite, is a common intestinal protozoon all over the world.⁷ It is considered the most commonly detected intestinal parasite in humans in developed countries.⁸ However, the prevalence of *Giardia* has been reported 20-30% of the population developing countries.⁶ About 200 million people have symptomatic giardiasis and about 500,000 new cases are reported annually.⁶ *Giardia lamblia* can produce a wide spectrum of clinical manifestations, from asymptomatic to acute or chronic diarrhoea with malabsorption syndrome and weight loss.⁹ *Giardia lamblia* is considered to be an important cause of recurrent abdominal pain in children.¹⁰

Stool examination for trophozoites or cysts is the traditional method for diagnosing giardiasis. Cysts are oval, measure 8-12 X 7-10 μ m, and characteristically contain 4 nuclei. Trophozoites are pear-shaped, dorsally convex, flattened parasites with 2 nuclei and 4 pairs of flagella. Fresh and persevered stool samples should be examined. Motile trophozoites are best identified in a saline wet mount

of fresh liquid stool obtained during the acute stages of illness. Trophozoites are usually not found in semiformal stool. Cysts are best detected in fresh stools after iodine staining or preservation in 10% buffered formalin or polyvinyl alcohol, with subsequent trichrome or iron haematoxylin staining. Concentration techniques using formalin ether or zinc sulfate flotation may increase the yield. *Giardia lamblia* is identified in 50-70% of patients after a single stool examination and in more than 90% after 3 stool examinations.¹¹

The aims of the study were to assess the frequency of *Giardia lamblia* infection in children with recurrent abdominal pain and to determine if *Giardia lamblia* has a causative role in some of the patients with recurrent abdominal pain.

Materials and Methods

This study was conducted from November 2004 to July 2006 at Department of Paediatrics Postgraduate Medical Institute, Hayatabad Medical Complex, Peshawar. A total of 239 consecutive children who presented to the Department with recurrent abdominal pain were investigated for *Giardia lamblia* infestation.

The inclusion criteria were, age between 4 and 14 years, with more than 3 episodes of abdominal pain in the last 3 months severe enough to affect the daily activities of the child.

Exclusion criteria were age <4 years as children at this age can not give full descriptions of recurrent abdominal pain, not fulfilling the definition of recurrent abdominal pain and children who could not provide 3 samples of stools for examination

Fresh stool specimens were collected from each child into a disposable plastic container with the assistance of the parents. The stool samples were taken immediately to the laboratory for examination. Those with negative results had two other samples taken at different times for examination.

The stool samples were examined with the naked eye for color, consistency and presence of any adult helminthes. They were then examined microscopically by direct and concentration methods for presence of *Giardia* trophozoite and cyst stages. The concentration method used in this study was the zinc sulphate floatation method. Two types of direct wet film preparation were done for each sample at the same time, 1 slide by using normal saline for detecting the motility of trophozoites and Lugol's iodine 5% slide for demonstrating structures.

When parasites were detected, patients were treated with metronidazole (20 mg/kg/day) for 10 days. If there was

intolerance or refusal to take metronidazole, these children were treated with tinidazole (two dosages of 75 mg/kg 1 week apart). At least 1 week after the end of treatment stool examination was repeated, followed by evaluation of complaints for at least 6 months.

Data on age, sex and residence were recorded for each child on a special form, together with stool examination results. The results were analyzed statistically using the Fptest.

Results

Two hundred and thirty nine children fulfilled the criteria. Of the population studied, males constituted 61% (146/239) and females were 39% (93/239), Table 1. The overall prevalence rate of microscopically positive *G. lamblia* was 30.96% (74 out of 239). Thirty-eight (38/239=15.9%) children were positive for *G. lamblia* in the first sample, while 27 (27/239=11.3%) in the second and 9 (9/239=3.8%) in the third sample. Rate of isolation of *G. lamblia* was 51.3% (38/74), 36.5% (27/74) and 3.8% (9/74)

Table 1. Frequency rate of *Giardia lamblia* according to sex.

| Sex | Total No. of children | Percentage | No. of children with giardiasis | Percentage |
|--------|-----------------------|------------|---------------------------------|------------|
| Male | 146 | 61.09% | 47 | 63.5% |
| Female | 93 | 38.91% | 27 | 36.5% |
| Total | 239 | 100% | 74 | 100% |

Table 2. Frequency rate of *Giardia lamblia* according to age.

| Age group | Total No. of children | Percentage | No. of children with giardiasis | Percentage of Positive cases |
|-------------|-----------------------|------------|---------------------------------|------------------------------|
| 4-6 years | 37 | 15.48% | 13 | 35.13% |
| 6-8 years | 76 | 31.81% | 22 | 28.95% |
| 8-10 years | 69 | 28.87% | 27 | 39.13% |
| 10-12 years | 57 | 23.85% | 12 | 21.05% |
| Total | 239 | 100% | 74 | 100% |

Table 3. Symptoms observed in study group in addition to recurrent abdominal pain.

| Symptoms | Number of children | Percentage |
|-----------------------------------|--------------------|------------|
| Diarrhea | 4 | 5.75% |
| Constipation | 7 | 9.46% |
| Diarrhea alternating constipation | 14 | 18.92% |
| Abdominal cramps | 52 | 70.27% |
| Nausea and vomiting | 42 | 56.76% |
| Abdominal distension | 27 | 36.49% |
| Flatulence/bloating | 39 | 52.70% |
| Anorexia | 43 | 58.11% |
| Weight loss | 48 | 64.86% |

in the first; second and third stool specimens respectively. Frequency of *Giardia* cysts was 93% (69/74) and *Giardia* trophozoite forms 7% (5/74).

In children with giardiasis, 63.5% (47/74) were males and 36.5% (27/74) were females, Table-1. Age distribution is shown in table-2. The mean age of children with giardiasis was 86 ± 47 months with youngest at 49 months of age. The mean duration of pain were 158 ± 64 days, with 41.89% (31/74) having pain for more than 6 months. The duration of pain varied from less than 15 minutes in 28% (21/74) to persisting 'all day' in 17.5% (13/74). The majority (68%) were able to continue with the activity that they were engaged in prior to the onset of pain. School absence was common i.e., 68% missing 5 or more days and 9% missing more than 20 days. The symptoms observed in children with giardiasis in addition to recurrent abdominal pain are shown in Table-3. There was frequent comorbidity including headache (17%), dizziness (24%), and lack of energy (36%). Poor health hygiene was noted in 75.68% (56/74) children while poor toilet training and overcrowding (family members >6). Low socioeconomic status (monthly income less than Rs: 6000) was noted in 48.65% (36/74), 77% (57/74), and 85.14% (63/74) children respectively. Forty-nine (66.22%) specimens were positive in the summer season.

All 74 children were treated with metronidazole initially and only 3 children were changed to tinidazole because of intolerance or refusal to take metronidazole in proper doses. One week after the end of treatment stool examination was repeated. All samples were negative for giardiasis. Only 56 (75.68%) children returned for follow-up after 6 months of completion of treatment and all were free of any complaints.

Discussion

Recurrent abdominal pain constitutes a diagnostic and therapeutic problem in childhood. The gastrointestinal, biliary tract or renal lesions often produce recurrent abdominal pain in children. Among causative factors of the recurrent abdominal pain, infection with *Giardia lamblia* is more often taken into account. The main observation from this study is the co-existence of high prevalence of recurrent abdominal pain with infection by *Giardia lamblia* and it was found that approximately one-third (31%) of children, ages 4 to 12, with recurrent abdominal pain were infected by *Giardia lamblia*. The frequency of *Giardia* infection in recurrent abdominal pain is variable in different studies. It ranges between 7.7-67.75%.¹² However, the rate of infection in this study is similar to other studies conducted in the developing countries.^{13,14} This high rate of infection in this study could be related to a number of factors such as poor health hygiene and toilet training, overcrowding, low

socioeconomic status and climatic conditions.¹⁵ *Giardia lamblia* was isolated from stool samples of children in all primary schools but the highest rate of infection was reported from children in a primary school which is located in a low socioeconomic area. Another important factor which affects the rate of giardiasis is the presence of asymptomatic patients in the community who can be considered as the main source of infection through continuously excreting the cysts stages in their stools.¹⁶ Most of the cases in this study were infected with cysts. In the lifecycle of these parasites, carrier patients act as a source of infection by continuously excreting the cyst stage in their stool.¹⁷ Although carrier persons are asymptomatic, the infection may be converted to acute infection through excystation of cysts inside the intestine resulting in the main complaints of giardiasis such as abdominal pain, steatorrhea and loss of weight.¹⁸ Higher numbers of samples were positive during the summer months when the maximum temperature in Peshawar is about 35-40°C. Cold weather kills the infective cysts.¹⁹ Other behavioral factors could be involved, for example greater consumption of water, drinks and food in summer which may be sources of infection.²⁰

The water supply is an important risk factor for giardiasis, and several large outbreaks of giardiasis have resulted from the contamination of municipal water supplies with human waste.²¹ The ingestion of contaminated water is a common problem in Pakistan countrywide due to the poor quality of water and faulty sewage lines. The problem is greater in the rural areas that do not have a municipal water network or sewage system.²² Contamination of drinking water with *Giardia* spp. has been increasingly recognized over the past 10 years as a cause of water-borne diseases in humans.²⁰ *Giardia* cysts have been isolated from water supplies in different parts of the world.^{20,21}

The infection rate was highest in the age group 6-10 years. This is perhaps because at this age, children are fully independent in toilet use and are more involved in outdoor activities which might lead to *Giardia* transmission.²³ The present results are similar to studies of intestinal parasitosis in Saudi Arabia and Senegal.^{24,25}

Similar to previous studies^{8,11} we found that the children with giardiasis had some clinical features highly specific to this infection. These include abdominal cramps, nausea, abdominal distension, flatulence/bloating, anorexia and weight loss.

Conclusions

A significant proportion of children with recurrent abdominal pain (74 out of 239) were infected with *Giardia lamblia*. Majority of cases were between 6 to 10 years.

Spontaneous resolution of abdominal pain without eradication of parasites was not possible and eradication of parasites resulted in persistent disappearance of abdominal pain. Thus, the prevalence of *Giardia lamblia* in these children suggests a potential role for this parasite in recurrent abdominal pain.

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