

## Rapid Reinfection by *Giardia lamblia* After Treatment in a Hyperendemic Community, During One Year Follow up

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### Abstract

**Background:** *Giardia lamblia* is the most common intestinal parasite in the most parts of Iran, including Hamadan. Treatment of healthy cyst passers is a controversial challenge in view of public health features. The aim of this study was to determine the reinfection rate of *G. lamblia* after treatment during one year follow up.

**Methods:** In the endemic area for giardiasis, Hamadan, the west of Iran, 87 individuals out of 120 school children cyst passers, aged between 7-14 years were effectively treated for *G. lamblia* with metronidazole. Stools were examined monthly in a period of 12 months after treatment, to determine the rate of reinfection. Eighty seven children were eligible to analysis after one year follow up.

**Results:** Totally 83% of children were reinfected within 12 months, and reinfection rate was significantly higher than the second six months during first half of study, i.e. October through March ( $P<0.05$ ). The cumulative rate of reinfection with this parasite was almost linear. No significant association observed between the age and sex of the children and duration of parasite elimination after treatment, but reinfection rate in some parts of the city was significantly higher and occurred sooner than the other parts ( $P<0.001$ ).

**Conclusion:** We concluded that, reinfection rate for *G. lamblia* was rapid and high in this area. Treatment of all symptomless *G. lamblia* infections in a hyper endemic region of a developing country is of questionable value because of rapid reinfection.

**Keywords:** *Giardia lamblia*, reinfection, treatment.

### Introduction

Giardiasis is one of the common causes of acute and persisting diarrhea in developing countries and a major health problem there (1, 2). In these countries, the incidence of the disease is often over four times higher than developed countries, and also it varies considerably between regions in the same countries (3). Children are more often affected, and this is of particular concern because of the ensuing repeated exposure to potentially toxic drugs in some regions (4). The higher prevalence of giardiasis in children is likely to be a consequence of a greater risk of infection, as protective immunity is acquired with age and increasing multiple exposure (3, 4).

Infection varies inversely with socio-economic status and is high in regions where water supplies are poor or not existent, and sanitation as well as hygiene standards are not sufficient. A greater incidence of giardiasis is seen in rural communities than in urban ones and important risk factors include high environmental fecal contamination; lack of potable water, education and good housing; overcrowding and high population density (5, 6). Giardiasis has high prevalence in different parts of Iran, including Hamadan (7). Infection rate in rural and urban areas is 21% and 15% respectively; with a high prevalence among school children (33%). Investigation on major sources and causes of infection at community level is of high concern in relation to control measures (5, 6).

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## Materials and Methods

### Identification of cyst passers

In order to detect the *Giardia* cyst passers, a cross sectional descriptive study carried out in the city of Hamadan. The target population was school children in elementary and junior high schools. A total of 480 stool specimens were collected by cluster random sampling method from 16 schools in five different parts of the city, of different socio-economic status. The stool samples were examined by formalin-ether concentration technique for ova and parasites. A total of 120 cases out of 360 eligible specimens were positive for *G. lamblia* (32.8%).

### Treatment of infected subjects

One hundred and twenty children (44 males and 76 females) were enrolled based on age (less than 14 years) and the presence of *G. lamblia* in their stools. All had been treated with metronidazole (15 mg/kg, 3 times a day for 7 days) until three weekly stool samples were negative for the parasite. All negative subjects remained in the study for monthly follow up.

### Follow up

Stool examination was conducted for enrolled children every month for one year. At 12th month, children who either had not become reinfected or who had infection but then had negative stools for 4 consecutive weeks were dropped from the study. From 6th month onwards, only *G. lamblia* negative children continued to be followed up until the study finished after 12 months. Children were dropped from analysis either if they did not provide any stools in any two months period or if they were unable to remain in the study for the first 6 months.

## Results

Of 120 enrolled school children, 87 were eligible for analysis after one year follow up. Thirty three children, who were excluded from the analysis, were positive cyst passers after

treatment or, some of them did not provide stool samples at

least for two consecutive months. These 87 participants (50 females, 37 males) aged 7 - 14 years (mean 10.7). These children did not differ regarding age from those who were excluded of the study. Eighty three percent (76 out of 87) of the participants were reinfected within 12 months after treatment. The infection and reinfection rates in different types of the schools are shown in table 1. The cumulative rate of reinfection with this parasite was almost linear. There was no significant association between age and sex of the children and the duration of parasite elimination after treatment. Reinfection rate in the first 6 months (October through March) was significantly higher than second half of the study period ( $P < 0.01$ ). Moreover, reinfection in the schools situated in east part of the city was higher than other parts as well.

**Table 1:** Infection and re-infection rate of *G. lamblia* during one year follow up in the different schools of Hamadan, Iran.

School name	Kind of School	Infection Rate (%) (n=360)	Re-infection Rate (%) (n=120)
Kashani	E; Bs	27.2	83.3
Hafez	E; Bs	37.5	44.4
Maasoumi	E; Bs	26.5	77.7
Resalat	E; Gs	27.2	50
Shahid			
gomnam	E; Gs	50	72.2
Shokoofa	E; Gs	27	100
Maasoumi	E; Gs	48	83 *
Beheshti 1	E; Gs	16.6	57.1
Hedayat	G; Bs	31	77.1
Maqsoudi	G; Bs	41.6	80
Dastgheib	G; Bs	30	75
Babataher	G; Bs	30	100
Fazilat	G; Gs	50	83.3
Vahdat	G; Gs	31.8	57.1
Azadeh	G; Gs	31.5	66.6
Shaahed	G; Gs	37.5	-
Total		32.8	83

Notes: E= elementary school, G= guidance school,

Bs = boys' school, Gs= girls' school

## Discussion

The majority of *Giardia* cyst passers were reinfected during one year. Reinfection rate was higher in the first half of educational year. This can be due to frequent and commonly contact together in the school, because the active education year is between October to March. *G. lamblia* is one of the most common intestinal parasites in the west of Iran (7). Valid reinfection rates of *G. lamblia* are difficult to determine. When stool examination is used alone to detect the parasite and the result is negative, one does not know whether the organism has been truly eradicated or is sequestered in the duodenum. To determine true reinfection rates we used metronidazole to eliminate the protozoa from the duodenum; however, this drug has shown 5-20% failure in treatment of the parasite (8). We observed about 25% ineffectiveness in this target group. It is not clear that the subjects who didn't respond to treatment whether or not had completed the course of treatment. Although resistance *per se* has not been described, treatment failures occur with the most common anti-giardial therapeutics, and patients are often treated with repeated courses of alternative drugs (9). It seems that, in the areas hyper endemic for *G. lamblia*, treatment of asymptomatic cyst passers is not an effective public health measure, since high percent of children become rapidly reinfected and the protozoa can be excreted in the stools for a long period after reinfection (10). The high rate of reinfection after therapy, lack of age differential, and, long duration of parasite excretion after reinfection all suggest that the children in developing countries do not acquire immunity to recolonization with the parasite (11, 12). On the basis of our data we suggest that in resource-limited communities in developing countries where *G.lamblia* is hyper endemic, children infected with this parasite should be treated

only when clinically indicated and not routinely on the basis of being cyst passer. Although chemotherapy has become very effective as a tool for controlling giardiasis and other parasitic infections in underdeveloped countries with the ability to treat individual infections promptly (13,14) but, if reinfection is rapid and extensive, this measure will be questionable as an effective preventive one.

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