

Relationship between the rate of giardiasis and knowledge and practice of prevention in primary school children in south of Tehran

Azam Hedayati · Javid Sadraei ·
Fazlollah Ghofranipour

Received: 26 April 2008 / Accepted: 18 August 2008 / Published online: 5 September 2008
© Springer-Verlag 2008

Abstract In this study, 420 children (aged 9–12 years) were selected from two female primary schools in south Tehran and examined for parasite infection. The infection rate for *Giardia* was 18.1% (76 children) in both schools. The case group included 30 children that were selected from the school no. 1 with *Giardia* infection. The same number of children from the school no. 2 with *Giardia* infection was selected as the control group. After being treated by a pediatrician and cured of *Giardia*, all children in both groups were checked for parasitic infection. The case group and their mothers were separately covered by the health education programs for 3 months, whereas the control group was not covered. The, both groups were checked three times for *Giardia* infection. The rate increased to 23.3% in the case group and 86.7% in the control group, showing a significant difference between two groups ($p < 0.05$).

Introduction

Giardia lamblia has a global distribution, causing an estimated of 2.8×10^8 cases per annum (Lane and Lloyd 2002), and is the most common intestinal parasite of humans in the developed countries. About 200 million people in Asia, Africa, and Latin America have symptomatic

giardiasis, with some 500,000 new cases reported each year (WHO 1996).

Human-to-human transmission of *G. lamblia* can occur indirectly through the accidental ingestion of the cysts in contaminated water or food or, directly, in the environments where hygiene levels may be compromised. Environments such as disadvantaged community settings and daycare centers are conducive to direct person-to-person transfer and thus favor the high frequency of transmission of *Giardia* (Hoque et al. 2002; Hopkins et al. 2002).

Giardiasis is also one of the most important parasitic infections in Iran, but no health education studies on the effectiveness of hygienic health practices of the population is yet available.

Materials and methods

In this study, 420 children (aged 9 and 12 years) were randomly selected from two female primary schools in the same area in south Tehran. The children and their families were living under similar cultural and social conditions. All the children were examined for parasite infection with the formalin–ether concentration method. The infection rate of *G. lamblia* was 18.1% (76 children) in both schools. The case group selected included 30 children from the school no.1 with *Giardia* infection. The same number of children with *Giardia* infection was selected from school no. 2 with as the control group. All 60 children were treated and cured of *Giardia*. The case group and their mothers were separately covered by the health education programs that included washing hands with soap, cutting nails, washing vegetables, and making the families knowledgeable about giardiasis and its effects on their children. All the programs were performed by health education methods, e.g., poster,

A. Hedayati · F. Ghofranipour
Health education Department, Faculty of Medical Sciences,
Tarbiat Modares University,
Tehran, Iran

J. Sadraei (✉)
Head of Parasitology Department, Faculty of Medical Sciences,
Tarbiat Modares University,
Tehran, Iran
e-mail: sadraej@yahoo.com

video film, face-to-face meetings, and pamphlets. The control group had not undergone any health education program. Three months later, a triple stool examination was done in both groups to check reinfection.

Results

In this study, 93.1% of fathers and 96.3% of mothers in both groups had only high school education. Of the mothers in the case and control groups, 86.2% and 83.8%, respectively, were not aware of their children's infection. Furthermore, more than 82% of mothers in both groups had no information about giardiasis and its control methods.

After implementation of the health education programs, the mean of the mother's awareness about controlling of giardiasis increased from 6.54% to 27.16% ($p=0.00001$). The control group had no variation in this item because they had not undergone any health education. The increase in the awareness of the mothers in the case group demonstrates the effectiveness of health education programs. The mean of children's information about giardiasis and its methods of control in the case and control groups before implementation of the health education programs was 4.76% and 4.86%, respectively, but after the implementation of the programs, it increased to 16.3% in the case group but remained at 4.86% in the control group ($p=0.00001$).

In this study, the children chosen in both groups had a 100% infection rate by *Giardia*. After being treated by a pediatrician, both groups were cured of the *Giardia* infection. After implementation of health education programs, the rate was 23.3% in the case group but 86.7% in the control group, indicating a significant difference between the two groups ($p<0.05$; Table 1).

Discussion

G. lamblia has a global distribution, causing an estimated of 2.8×10^8 cases per annum (Lane and Lloyd 2002). Its simple life cycle involving an environmentally resistant cyst provides ample opportunities for the parasite to be transmitted directly from one individual to another or

indirectly through contamination of the environment or food (Hoque et al. 2002). Esrey et al. (1991) have documented that children infected with parasites progressed slowly in school and lagged behind in all the anthropometric values, such as body height, weight, and thorax circumference (Anderson and May 1991; Egger et al. 1990; Mohamed et al. 2004; Raj et al. 1996). Children with parasite infections are prone to immunodeficiency, increased acute respiratory diseases, increased risk of urinary infections, allergy, bronchial asthma, appendicitis, infertility, and vulvovaginitis in girls (Moore et al. 2001; Van den Biggelaar et al. 2004).

Common characteristics of *Giardia* markedly influence the epidemiology of these infections: (1) The infective dose is low for the parasite; (2) the cysts are immediately infectious when excreted in feces and can be transmitted by person-to-person contact; (3) the cysts are remarkably stable and can survive for weeks to months in the environment; and (4) environmental dispersal can lead to the contamination of drinking water and food. The death triangle of poor hygiene, inadequate sanitation, and lack of access to safe drinking water claims the lives of 6,000 children each day, mostly in the developing countries (WSSCC 2004). There is a lack of evidence on how improved hygiene can help to reverse such grim figures and contribute to the well-being of children, because it is more difficult to measure the effectiveness of hygiene promotion programs than water and sanitation interventions (Almedom et al. 1997; Carneiro et al. 2002; Curtis et al. 1993; Luby et al. 2004).

In this study, two groups of case and controls were selected and there were no significant differences in terms of the mothers' age, parents' education, fathers' occupation, mothers' awareness of their children's infection, and mothers' information about giardiasis and its control methods. The obtained results also showed that 86.2% and 83.8% of the mothers' case and control groups, respectively, had no awareness of their children's infection, indicating that giardiasis is a hidden infection without any clinical symptoms. It is suggested that the Health Ministry should inform the children and the families in this regard.

By implementation of health education programs, the infection rate in the case group was 23.3% and 86.7% in the control group. This result shows that health education

Table 1 Prevalence of *Giardia* infection in the children in both groups before and after the implementation of the health education programs

Groups	Before treatment		Before implementation of the health education programs (After the treatment)		After implementation of the health education programs	
	Number	Percent	Number	Percent	Number	Percent
Case group	30	100	30	0	7	23.3*
Control group	30	100	30	0	26	86.7*

*($p<0.05$)

programs played a key role in the prevention of *Giardia* infection.

References

- Almedom AM, Blumenthal UJ, Manderson L (1997) Hygiene evaluation procedures: approaches and methods for assessing water and sanitation related hygiene practices. International Nutrition Foundation for Developing Countries, Boston
- Anderson RM, May RM (1991) Infectious diseases of humans: dynamics and control. Oxford Univ. Press
- Carneiro FF, Cifuentes E, Tellez-Rojo MM, Romieu I (2002) The risk of *Ascaris lumbricoides* infection in children as an environmental health indicator to guide preventive activities in Caparao and Alto Caparao, Brazil. Bull. World Health Organ, pp 40–46
- Curtis V, Cousens S, Mertens T, Traore E, Kanki B, Diallo I (1993) Structured observations of hygiene behaviors in Burkina Faso: validity, variability, and utility. Bull World Health Organ 71:23–32
- Egger RJ, Hofhuis EH, Bloem MW, Chusilp K, Wedel M, Intarakhao C, Saowakontha S, Schreurs WH (1990) Association between intestinal parasitoses and nutritional status in 3–8 year old children in northeast Thailand. Trop Geogr Med 42:312–323
- Esrey SA, Potash JB, Roberts L, Shiff C (1991) Effects of improved water supply and sanitation on ascariasis, diarrhea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. Bull World Health Organ 69:609–621
- Hopkins RM, Meloni BP, Groth DM, Wetherall JD, Reynoldson JA, Thompson RCA (2002) Ribosomal RNA sequencing reveals differences between the genotypes of *Giardia* isolates recovered from humans and dogs living in the same locality. J Parasitol 83:44–51
- Hoque ME, Hope VT, Kjellstrom T, Scragg R, Lay-Yee R (2002) Risk of giardiasis in Aucklanders: a case control study. Int J Infect Dis 6:191–196
- Lane S, Lloyd D (2002) Current trends in research into the waterborne parasite *Giardia*. Crit Rev Microbiol 28:123–147
- Luby SP, Agobavalla M, Painter J, Altaf A, Billhimer W, Hoekstra R (2004) Effect of intensive hand washing promotion on childhood diarrhea in high-risk communities in Pakistan. J Am Med Assoc 291:2547–2554
- Mohamed EAEB, Sammak BM, Mohamed AE, Mohamed AAK, Al Shahed M, Mohamed AAT (2004) Gastrointestinal parasite infestation. Europ Radiol Suppl 14:116–131
- Moore SR, Lima AAM, Conaway MR, Schorling JB, Soares AM, Guerrant RL (2001) Early childhood diarrhea and helminthiasis associate with longterm linear growth faltering. Int J Epidemiol 30:1457–1464
- Raj SM, Sein KT, Anuar AK, Mustaffa BE (1996) Effect of intestinal helminthiasis on intestinal permeability of early primary schoolchildren. Trans R Soc Trop Med Hyg 90:666–669
- Van den Biggelaar AHL, Rodrigues LC, Van Ree R, Van der Zee J, Hoeksma-Kruize YCM, Souverijn JHM, Missinou A, Borrmann S, Kremsner PG, Yazdanbakhsh M (2004) Long term treatment of intestinal helminths increases mite skin-test reactivity in Gabonese schoolchildren. J Infect Dis 189:892–900
- WHO, The World Health Report (1996) Fighting disease fostering development. WHO
- WSSCC (2004) WASH facts and figures. Water Supply and Sanitation Collaborative Council, Geneva