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Full Length Research Paper

Serum lipid profiles and eosinophilia among *Giardia* cyst passers

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***Giardia* trophozoites attach to upper portion of small intestine and may present with severe damage affecting nutrient absorption. One of the main complications of giardiasis is lipid malabsorption. Consequently, infected people may lack the important caloric source and lipid soluble vitamins. This study aimed to assay serum lipid profiles and eosinophilia in *Giardia* cyst passers and compare with non- infected individuals. Three hundred and fifteen peripheral blood samples of *Giardia* cyst passers were studied by cell blood cunt and colorimetric methods and compare with control. All infected stool samples were confirmed by at least one method of saline-Lugol, formaline- ether concentration and trichrome staining or Ziehl–Neelsen. The results of these findings showed that Eosinophilia was greater than 5 in 18% of infected people, but was not in control. With the exception of high density lipoprotein (HDL), cholesterol, triglyceride and low density lipoprotein (LDL) levels were statistically lower than those observed in the control groups (P < 0.05). This study revealed that there is a significant influence of *Giardia lamblia* on lipid levels and eosinophilia in infected individuals.**

Key words: *Giardia* cyst passer, lipid profiles and eosinophilia.

INTRODUCTION

Giardiasis is a protozoan disease caused by *Giardia* genus. This disorder is the most parasitic infection in the world especially in the developing countries (Giraldo-Gómez et al., 2005; Hesham et al., 2004; Savioli et al., 1992, 2006). Iran is an endemic area for the infection and the prevalence is 10.9% (Sayyari et al., 2005). *Giardia* protozoan is seen in two cyst and trophozoite forms. Trophozoites attache to upper portion of small intestine by it' s sucker plate and may present with severe damage affecting nutrient absorption (Oberhuber et al., 1997). *Giardia lamblia* is unable to synthesize lipids *de novo* and must obtain them from the dietary products of the host small intestine (Jarroll et al., 1981).

Detailed pathogenesis mechanisms of *Giardia* in host are not clear, however, colonization of the microorganism appears cause microvillus shortening, villous flattening or atrophy (Scott et al., 2000). Infected children revealed malnutrition and growth retardation compare to health group (Hjelt et al., 1993). One of the main complications of giardiasis is lipid malabsorption so that steatorrhoea (foul smelling, greasy stool) is a clinical sign of giardiasis (Huang and White, 2006). Therefore the infected people especially children, may lack the important caloric source and lipid soluble vitamins (K, A, D, E) (Bansal et al., 2005; Takahashi et al., 2001; Girard et al., 2006). Lower level of hemoglobin concentration and, iron-deficiency anemia associated with giardiasis were observed (Jiménez et al., 1999; Kasirga et al., 2009). Giardiasis is one of the protozoan infections associated with peripheral blood eosinophilia (Ferrante et al., 1991). Information on the effect of *G. lamblia* on lipid parameters and eosinophilia is scarce. Therefore this study aimed to assay total cholesterol, triglyceride, high density

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Table 1. Demographic information of the study population.

Category Age(year)	SG(Giardia cyst$^+$%)	CG(Giardia cyst$^-$%)	Significant
1-5	69/315(21.9)	62/315(19.6)	p>0.05
6-10	58/315(18.4)	65/315(20.6)	p>0.05
11-15	63/315(20)	68/315(21.5)	p>0.05
16-25	40/315(12.7)	35/315(11.1)	p>0.05
26-35	44/315(14)	40/315(12.7)	p>0.05
36-45	27/315(8.6)	31/315(9.8)	p>0.05
46-65	9/315(2.8)	11/315(3.5)	p>0.05
>65	5/315(1.6)	3/315(0.9)	p>0.05
Total	315(100)	315(100)	
Gender			
Male	154/315(46)	141/315(44.8)	p>0.05
Female	170/315(54)	174/315(55.2)	p>0.05
Total	315(100)	315(100)	

No significant differences were seen between gender and age means of two study and control groups (P>0.05) Key: SG (Study group), CG (Control group).

lipoprotein (HDL), low density lipoprotein (LDL), and eosinophilia in peripheral blood in *Giardia* cyst passers.

MATERIALS AND METHODS

Fecal samples of 315 people aged between 2 and 65 years old, who were admitted to Imam Khomeini Hospital of Ahvaz Jundishapur University of Medical Sciences with giardiasis indications were examined. Patients who were found to be positive for *G. lamblia* cysts and or trophozoites by at least one method of saline-Lugol, formaline- ether concentration and trichrome staining or Ziehl–Neelsen, were considered as the study group. In the control group, 315 healthy, age-matched people without any disorders were enrolled. All the persons in the study group underwent thorough physical and laboratory examinations to rule out infections or diseases, except giardiasis. The ones in the control group underwent similar routes and their three successive fecal samples were examined by saline-Lugol, formaline-ether concentration, trichrome and Ziehl–Neelsen staining methods to exclude *Giardia* infection.

No significant differences were seen between gender and age means of two study and control groups (P > 0.05) (Table 1).
Three hundred fifteen blood samples from study group and 315 of blood samples from control group were prepared.

These blood samples were allowed to clot and the serum was separated and stored at -20°C until use. Initially blood samples divided in two volumes, one for Eosinophilia blood count and other to colorimetric study of cholesterol, triglyceride, HDL and LDL. Kits containing ready to use liquid reagents were purchased from PTH Hydrex (Warsaw, Poland). The amounts were measured as mg per 100 ml of serum. All participated people were explained about the study and filled consent questionnaires. SPSS software and student t- test were used for statistical analysis.

The study was approved by the University Hospital and Ahwaz Jundishapur University of Medical Sciences Ethics Committees,and all subjects granted informed consent to participate.

Results: Eosinophilia > 5% was observed in 57 of 315 (18%) infected people but didn't in health group. As shown in Figure 1, except to HDL the cholesterol, triglyceride and LDL levels in infected people were statistically lower than those observed in the control groups. ($p < 0.05$) (Figure 1).

DISCUSSION

In this study, the correlation of *Giardia* infection and serum lipid profile and eosinophilia were assessed. Previous *in vitro* studies reported the inducing of encystations of *G. lamblia* by using of lipoprotein cholesterol (LPC) solution in culture medium ((Adam, 1991; Lujan et al., 1997).

The effect of *Giardia* on nutrient absorption is controversial. Some studies have indicated that severe giardiasis may cause malabsorption of nutrients in the host while few studies have revealed the probable effects of moderate or asymptomatic giardiasis on nutrient absorption, and thus the effects on the nutritional status of the host (de Morais et al., 1996; Tolboom et al., 1987; Gendrel et al., 1992; Hazrati Tappeh et al., 2006).

In the present study, with an exception of HDL, a significantly lower lipid profile was apparent in *G. lamblia* cyst passers when compared to the control group. Similar results were found by Bansal and others, who reported that *Entamoeba histolytica*, *Entamoeba dispar* and *G. lamblia* cyst passers had significantly lower levels of total serum cholesterol (73.42 ± 2.24 mg/dl) as compared to levels in controls (166.26 ± 2.02 mg/dl), suggesting that cholesterol was utilized by the parasites for their growth (Bansal et al., 2005). The effect of giardiasis on fat-soluble vitamins, depends on lipids for intestinal absorption (Jalal et al., 1998), was studied by researchers. Subcutaneous bleeding was stopped after treatment of

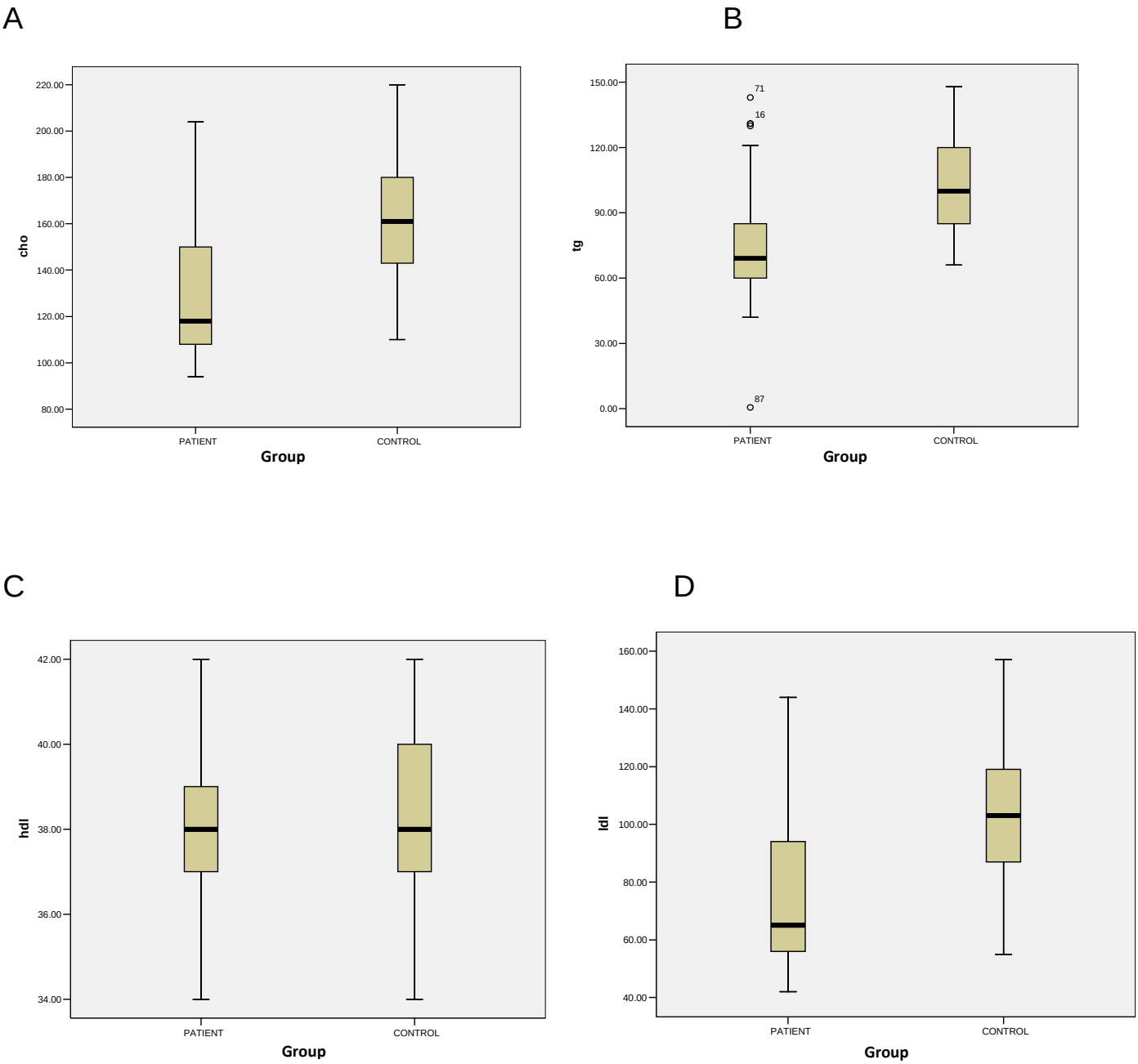

Figure 1. A, B, C, D. Mean values of total cholesterol, triglyceride, High density lipoprotein (HDL) and low density lipoprotein (LDL) in patient and control groups. A. Mean value of serum total cholesterol (127±2.7 mg/dl vs 160.7±2.3), B. Mean value of serum triglyceride (73.0528±2.1 mg/dl vs 102.3±2), C. Mean value of serum LDL (74.1±2.4mg/dl vs 102.1±2.1) and D. Mean value of serum HDL (38.2±1.7 mg/dl vs 38.1±2) in patient and control people respectively.

giardiasis in patient receiving anticoagulant medicine, indicating the role of *Giardia* in vitamin K deficiency (Takahashi et al., 2001).

The study of Girard et al. (2006) indicated follicular hyperkeratosis was removed after treatment of giardisis in child patient pointing out of vitamin A malabsorption in giardiasis. Eosinophilia has features of an immune response and often represents an allergic reaction or parasitic infection. In this study eosinophilia was observed in a peripheral blood of *Giardia* cyst passer but didn't in control group. In other studies the researches described patients with a history of giardiasis who presented with eosinophilic infiltration of the gastro-intestinal (GI) tract (Fenoglio et al., 2003; Koot et al.,

2009). In this study, 14 patients presenting with acute diarrhea stool, *Giardia* trophozoites were captured in their fresh fecal samples. The serum lipid profiles and eosinophilia status in these individuals were compared with chronic patients (*Giardia* cyst passers), no significant differences were seen for lipid profiles but differences were statistically significant for eosinophilia level. It can probably result from changing of previous chronic phase to acute phase in those infected patients. The limitation of this study was no comprehensive information about duration of giardiasis in the study group.

In conclusion, this study revealed that there is a significant influence of *G. lamblia* on lipid levels in infected individuals, and except to HDL, lipid values are lower in cyst passers than in control groups. Also *Giardia* increased noticeably the number of blood eosinophils.

These results suggest that since the groups most at risk for giardiasis are children, especially in tropics and subtropics area with poor hygiene, the serum lipid profiles and eosinophilia must be routinely checked in this vulnerable group. Also an increased prevalence of giardiasis among homosexual men has been reported by a number of studies (Pakianathan and McMillan, 1999). Therefore laboratory examination for serum lipid profiles and eosinophilia in such group seems to be needed. Further study of a greater number of cases is needed to explore the relevance of this finding.

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