

PREVALENCE OF GIARDIA LAMBLIA AND OTHER INTESTINAL PARASITES IN PRESCHOOL CHILDREN AND ITS RELATION TO RESIDENCE PLACE, SEX AND BLOOD GROUP IN ILAM COUNTY OF IRAN

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Abstract — The object of this study was to determine the prevalence of asymptomatic infestation with *Giardia lamblia* and other intestinal parasites in children of urban and rural communities of Ilam county and its relation with dwelling place, sex and blood groups. The study designed as a five-month parasitological survey of fecal and blood specimens from humans and performed in 10 urban health-treatment clinics of Ilam city, two urban health-treatment clinics of Eyvan city, two rural health-treatment clinics of Chavar and Sartaf villages, Ilam province west of Iran. The examined population was preschool 6 to 7 year-old children without any gastrointestinal complaints. Prevalence of infestation in subject group was 32.54% (n=3100). Among intestinal parasites *G. lamblia* with 85.43% (27.8% of all, n=1009) prevalence rate was the most common. Infestation with *H. nana* with 6.93% and *E. coli* with 3.07% were in the second and third ranks, respectively. Infestation shows a distinct relationship with gender ($P < 0.05$) and dwelling place, but it lacks a significant relation with blood groups. This study shows that the prevalence of intestinal infestation in 6 to 7 year old child of Ilam county is equivalent to the top of the line of the statistical percentage all over the world. The relation between the severity of infestation and residence place may arouse the suspicion of severe contamination of imbibing water. *Acta Medica Iranica* 34 (1 & 2): 33 - 40; 1996
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water is a major source of the transmission of the disease, (3,4,5,6,7,8) but feco-oral route is still remaining the main route of transmission (9). Day-care centers, nurseries and primary schools are areas with increased risk of transmission (10).

Using several high-tech methods such as PCR, Pulsed-field gel electrophoresis and restriction fragment length polymorphism many biotypes of giardia lamblia have been identified and now is believed that it is host specific (11,12,13,14,44). Antibodies against giardia lamblia can pass from mother to fetus and infant through umbilical cord blood or breast milk (15). Our objective in this epidemiological research was to review the prevalence of infestation by trophozoites and cysts of giardia lamblia and other intestinal parasites detectable by microscopic stool exam including eggs of *hymenolepis nana*, trophozoites and cysts of *entamoeba coli*, adult worms of *enterobius vermicularis* and eggs of *ascaris lumbricoides* and *taenia saginata* in children of rural and urban communities of Ilam county. The probable relationship between subjects' sex and the species of parasit, subjects' dwelling place and the prevalence of parasites, blood group and the species of the parasites were also the objectives of this survey.

INTRODUCTION

Infectious diseases due to protozoa and helminths are a major cause of morbidity and mortality in infants and children in many parts of the world. Protozoa infections of the intestine cause a wide variety of clinical syndromes, ranging from asymptomatic carrier states to severe disease associated with pathologic lesions in the gastrointestinal tract or other organs. *Giardia lamblia*, a ubiquitous, flagellated protozoan, is a common worldwide cause of infectious diarrhea. The infection is more prevalent in children than in adults and is an important cause of morbidity in the developing world. Estimated worldwide prevalence of giardiasis is 250000000 with 500000 morbidities and 10000 mortalities annually and is just fourth in rank after malaria, toxoplasmosis and amebiasis (1,2). Several waterborne and food-borne outbreaks of giardiasis have been reported and it seems that contaminated drinking

MATERIALS AND METHODS

A five-month survey of personal sheet completion, physical examination, microscopic stool examination and blood typing between Mars 1995 and July 1995. The location of the study was the Ilam county of the Ilam state, a small state in the west of Iran and near Iraqi border with an overall poor socioeconomic figure. With coordination of "Office of education of primary schools of Ilam county", approximately all 6 to 7 year-old children eligible to enter the first year of primary school were examined and sampled in their nearest rural or urban health-treatment clinics. Ten urban health-treatment clinics in Ilam city, two urban health-treatment clinics in Eyvan city and two rural

health-treatment clinics in Chavar and Sartaf villages of Ilam county participated in our study. 3100 preschool asymptomatic boys and girls between six to seven years old without any gastrointestinal complaint who were examined by physicians of rural and urban health-treatment centers to confirm they apparent health.

The sequences of our study were as follows:

1- Every child eligible to enter the first year of primary school was sent to his (her) nearest rural or urban health-treatment clinic by his (her) school.

2- A personal sheet for each child was completed, including his (her) first and last names, address, age, past medical history, etc.

3- Each child was subjected to a complete physical examination by confidential physicians of each rural urban health-treatment clinic with special attention to gastrointestinal system to rule out any significant complain. Thereafter the physician completed the medical category of the personal sheet.

4- A stool and blood specimen was taken from every child entering the study.

5- The fresh stool without preservative and blood specimens were sent quickly and without any delay to the central laboratory at urban health-treatment clinic of Ilam city in a paraffin sealed plastic stool containers.

6- A wet preparation and Lugol's iodine strong solution added preparation of stool specimens were microscopically examined for trophozoites and cysts of giardia lamblia, entamoeba coli, the eggs of hymenolepis nana, ascaris lumbricoides, taenia saginata and adult worm of enterobius vermicularis. Low power objective

(x16) was used for screening and high power dry objective (x40) for identification.

7- All positive slides were confirmed by at least two of the medical technologists.

8- Blood specimens were typed for major blood groups and Rh factor.

RESULTS

From 3100 cases that were tested, 1593 (51.38%) cases were male and 1507 (48.62%) were female. Overall 1009 (32.54%) cases were infested with at least one kind of intestinal parasites. The ranking of infestation was as follows: giardia lamblia 862 cases (n=1009 85.43%, n=3100 27.80%), hymenolepis nana 70 cases (n=1009; 6.93%, n=3100; 2.25%), entamoeba coli 31 cases (n=1099; 3.07%, n=3100; 1.00%), enterobius vermicularis in 11 cases (n=1099; 1.09%, n=3100; 0.35%), ascaris lumbricoides 3 cases (n=1009; 0.29%; n=3100; 0.09%), taenia saginata 4 cases (n=1009; 0.39%, n=3100; 0.12%), co-infestation with G. lamblia and H. nana 21 cases (n=1009; 2.08%, n=3100; 0.67%), co-infestation with E. coli and H. nana in 7 cases (n=1009; 0.69%, n=3100; 0.22%), co-infestation with G. lamblia and E. coli in 4 cases (n=1009; 0.39%, n=3100; 0.12%), and co-infestation with G. lamblia and E. vermicularis in 2 cases (n=1009; 0.19%, n=3100; 0.06%). This result and other significant results are summerized in Table 1, Table 2 and figure 1.

Table 1. Total number of positive stool examinations

Health-treatment	Boys	Girls	Giardia	H. nana	E. coli	Ascaris	Enterobius	Giardia+	E. coli+	Giardia+	Giardia+	Taenia	Giardia+
	n	n	n	n	n	n	n	H. nana	H. nana	E. coli	Enterobius	Taenia	Taenia
Ilam city, No 1	252	221	103	5	1	1	0	0	0	0	0	0	0
Ilam city, No 2	132	131	115	5	0	0	1	4	1	0	0	0	0
Ilam city, No 3	176	83	57	20	15	0	2	4	1	1	1	0	0
Ilam city, No 4	98	132	63	2	0	0	0	0	0	0	1	0	0
Ilam city, No 5	91	54	39	2	0	0	0	0	0	0	0	0	0
Ilam city, No 6	33	33	56	1	1	0	2	0	0	0	0	4	2
Ilam city, No 7	74	74	21	4	2	0	0	0	0	0	0	0	0
Ilam city, No 8	143	123	82	13	4	1	1	5	0	0	0	0	0
Ilam city, No 9	103	98	64	5	0	0	0	0	0	0	0	0	0
Ilam city, No 10	105	124	50	4	5	1	1	2	0	0	0	0	0
Eyvan, No 1	190	219	116	4	0	0	3	0	0	0	0	0	0
Eyvan, No 2	113	122	32	4	1	0	0	0	0	0	0	0	0
Chavar	66	81	46	0	1	0	0	0	0	0	0	0	0
Sartaf	17	12	19	2	1	0	0	0	0	0	0	0	0
Total	1593	1507	863	69	31	3	11	21	3	1	2	4	2

Table 2. Prevalence of giardia lamblia

Health-treatment center	G. lamblia, %
Ilam city, No.1	21.77
Ilam city, No.2	43.72
Ilam city, No.3	22
Ilam city, No.4	27.39
Ilam city, No.5	26.89
Ilam city, No.6	84.84
Ilam city, No.7	14.18
Ilam city, No.8	30.82
Ilam city, No.9	31.84
Ilam city, No.10	21.83
Ilam city, total	28.5
Eyvan, No.1	28.36
Eyvan, No.2	13.61
Eytan, total	22.98
Chavar	31.29
Sartaf	65.51
Total	27.05

Table 3. Relation of sex with stool examination results using Chi square test

Stool examinations result		+	-	Total
Female	Number	264	229	493
Female	Percent	53.5	46.5	47.7
Female	Number	251	290	541
Female	Percent	46.4	53.6	52.3
Total number		515	519	1034
Total percent		49.8	50.2	100

Prevalence of G. lamblia in Ilam county

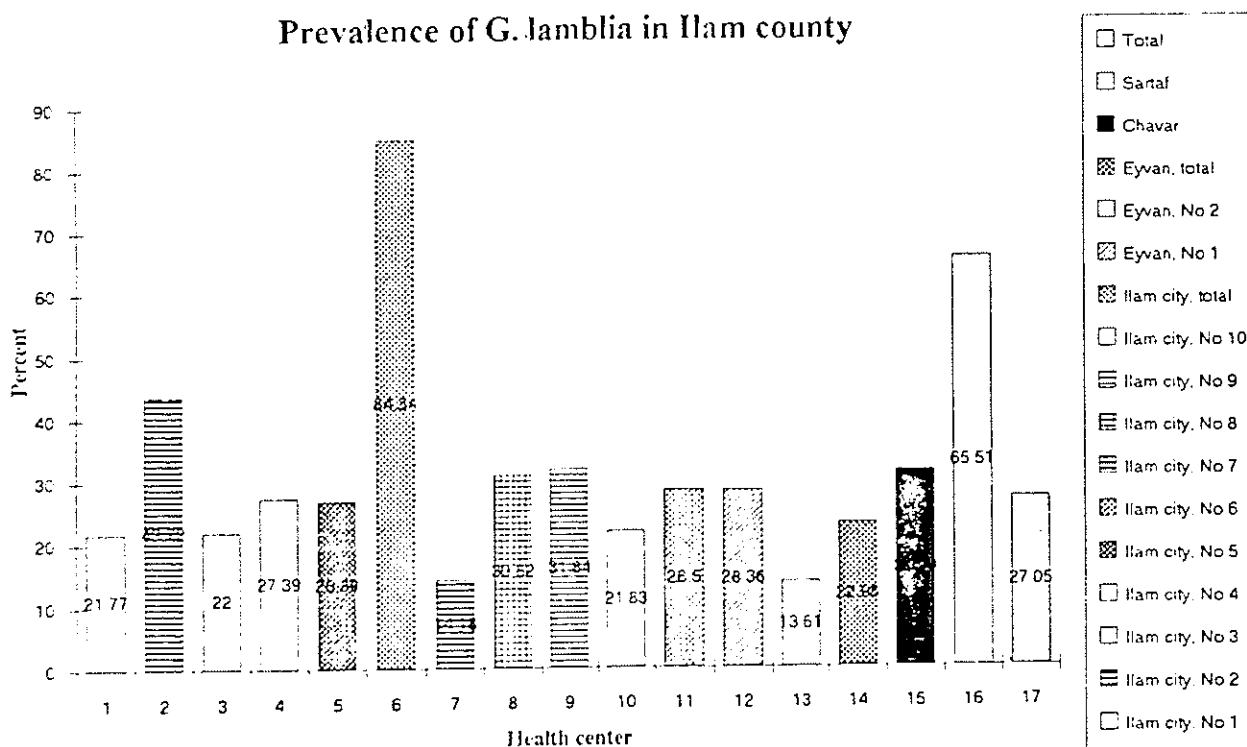


Fig. 1. Prevalence of G. lamblia in Ilam county

Relation of gender with positive stool examination results was studied using 1034 reliable data. Using this data and null hypothesis (H_0) of "the relation between the gender of the cases and positive stool examination is due to chance" and with $\alpha=5\%$ level, hypothesis H_0 was ruled out, i.e. according to Table 3, 46.5% of female subjects and 53.6% of male subjects have positive stool examination, so the alternative hypothesis (H_A) in the $\alpha=5\%$ level was accepted. Having male gender is related with more intestinal infestation. But this relationship is not strong because $p < 0.01$ and H_0 hypothesis is not rejected in $\alpha=1\%$ but in $\alpha=5\%$ level. (Table 3).

To determine the presence of relation between residence place and intestinal infestation we have used two different methods: first, according to the different special territories of each nine health-treatment centers determined by Ilam county health center and three other special territories of Eyvan, Chavar and Sartaf second, according to the three different imbibing water supply zones of the Ilam city and two other imbibing water supply zones of Eyvan, Chavar and Sartaf villages determined by the "Bureau of the imbibing water supply of the Ilam county".

The null hypothesis of H_0 regarding relation between dwelling place according to the health-treatment centers' territories and intestinal infestation is due to chance" with $p < 0.01$ is ruled out strongly using chi square test. On the other hand, the null hypothesis of "relation between dwelling place regarding five different imbibing water supply zones of Bureau of the imbibing water supply of Ilam county and intestinal infestation is due to chance" was also rejected in the favor of H_A hypothesis with $p < 0.01$ ($\chi^2=71.70$ and $\alpha=1\%$) according to Table 4.

The possible relationship of blood group and positive stool examination result is studied using chi square test

and is reflected in Table 5. The volume of the simple consisted of total number of three urban health-treatment centers of Ilam city and systematic and random sampling of the other 1500 samples. Because of the very high volume of samples, the results will have less than 1% error ($\alpha=1\%$). The null hypothesis of "relation between positive stool examination and blood group and Rh factor is due to chance" was accepted with $p < 0.05$ ($\chi^2=2.5 < \chi^2=5$ and 0.05). So there is no relationship between blood group of subject children and positive stool examination or intestinal infestation. About relation between dwelling place and intestinal infestation, Table 6 and its related statistical calculations show that subjects reside in the fields of activity of the first, second and third urban health treatment centers of Ilam city were significantly more infested. On the other hand, Table 4 and its related statistical calculations show that subjects who reside in the second imbibing water supply zone are significantly more infested.

The study of possible relation between subjects' sex and the type of the intestinal parasites using chi square test (χ^2) shows that the null hypothesis of "relation of gender with the type of intestinal parasite is due to chance" was accepted with great significance since $\chi^2 = (4+0.05)^2 = 9.48 < \chi^2 = 0.95$. So the genders of the studied cases has not any relation with the type of intestinal infestation. The chi square table is reflected in Table 7.

Table 8 and figure 2 reflect total number of different blood groups and Rh factor among the subject group of children. Table 9 and figure 2 reflect different percentages of blood groups and Rh.

Table 5 and 9 and figure 5 and their statistical calculations show that after our study there were no relation between blood group of subject children and positive stool examination or intestinal infestation.

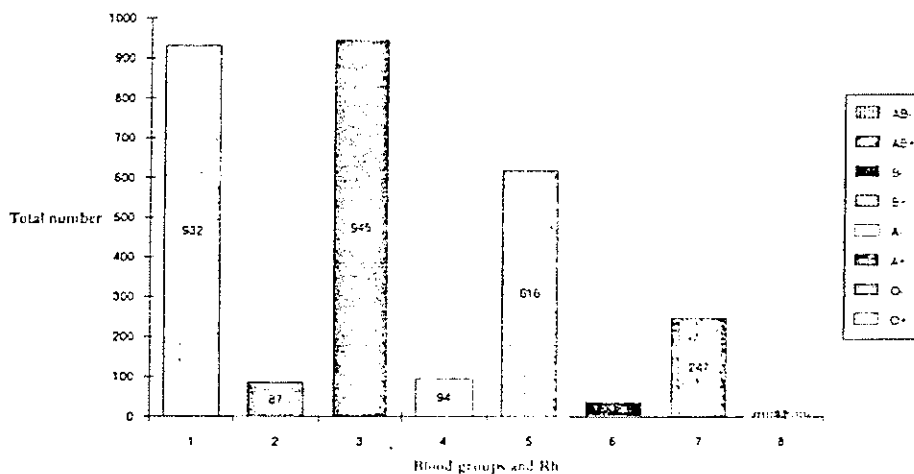


Fig. 2. Total count of different blood groups and Rh

Table 4. Relation of stool examination results with inhabiting water zone

	Ilam city, first zone	Ilam city, second zone	Ilam city, third zone	Eyvan	Chavar	Total, row
Negative stool examination, count	3	161	27	96	15	302
Negative stool examination, percent	1	53.3	8.9	31.8	5	48.1
Positive stool examination, count	Out	177	98	35	16	326
Positive stool examination, percent	Out	54.3	30.1	10.7	4.9	51.9
Total, count	3	338	125	131	31	628
Total, percent	0.5	53.8	19.9	20.9	4.9	100

Table 5. Relation between stool examination results and blood groups and Rh

	O+	A+	A-	B+	AB+	O, B, AB	Total, row
Negative stool examination, count	174	165	15	93	36	17	500
Negative stool examination, percent	34.8	33	3	18.6	7.2	3.4	58.4
Positive stool examination, count	116	134	9	61	27	9	356
Positive stool examination, percent	32.6	37.6	2.5	17.1	7.6	2.5	41.6
Total, count	290	299	24	154	63	26	856
Total, percent	33.9	34.9	2.8	18	7.4	3	100

Table 6. Relation of stool examination results with residence place according to health treatment centers territories

Health-treatment center	Ilam, No.1	Ilam, No.2	Ilam, No.3	Ilam, No.4	Ilam, No.5	Ilam, No.6	Ilam, No.7	Ilam, No.8	Ilam, No.10	Eyvan	Chavar	Saraf	Total
Positive stool examination, count	1	128	122	37	21	Out	19	24	25	61	35	15	488
Positive stool examination, percent	0.2	26.2	25	7.6	4.3	Out	3.9	4.9	5.1	12.5	7.2	3.1	49.1
Negative stool examination, count	107	128	129	12	11	14	9	26	18	20	15	16	505
Negative stool examination, percent	21.2	25.3	25.3	2.4	2.2	2.8	1.8	5.1	3.6	4	3	3.2	50.9
Column count	108	256	251	49	32	14	28	50	43	81	50	31	993
Total, percent	10.9	25.8	25.3	4.9	3.2	1.4	2.8	5	4.3	8.2	5	3.1	100

Table 7. Relation of gender with the type of intestinal parasites

	G. lamblia	H. nana	E.coli	G. lamblia + H. nana	Others	Total, row
Female, count	196	13	8	4	8	229
Female, percent	85.6	5.7	3.5	1.7	3.5	43.3
Male, count	255	20	12	6	7	300
Male, percent	85	6.7	4	2	2.3	56.7
Total, count	451	33	20	10	15	529
Total, percent	85.3	6.2	3.8	1.9	2.8	100

Table 8. Total number of different blood groups and Rh

Blood group & Rh	Total count
O+	932
O-	87
A+	945
A-	94
B+	616
B-	38
AB+	247
AB-	12
Total	2971

Table 9. Percent of different blood groups and Rh

Blood group & Rh	Percent
O+	31.36
O-	2.92
A+	31.8
A-	3.16
B+	20.73
B-	1.27
AB+	8.31
AB-	0.4
Total	100

DISCUSSION

Giardia lamblia infects millions individuals throughout the world. In developed countries it appears primarily in waterborne epidemics of diarrhea. (16,17,18,19,20). In developing countries, it is endemic, but only a small proportion of those infected appear ill. (21,22,23,24,25,26). This flagellate parasite infects the small intestine of its host and may cause malabsorption and malnutrition, particularly among infants and young children. In one study conducted by Ich-Horowicz coworkers giardiasis was regarded as an advantage for being relatively free from other illnesses (27). Little is known about the extent of illness caused by this parasite because few epidemiologic studies have been done, (28,29) diagnosis is difficult, (29,30,44) and giardia carriers frequently are simultaneously infected with other pathogens (17). Control measures include intermittent treatment of those infected and improving water supply and sanitation. Efforts to control individual infection can only be successful on a temporary basis. The greatest progress in control should derive from efforts to develop an effective vaccine (31).

Our study shows that the prevalence of intestinal infestation especially with giardia lamblia in preschool children of Ilamm county is very high, reaching the most prevalent areas all around the world. (21,26,32,36). Many factors can contribute to these result, but the significance of relation of positive stool examination with drinking water in this results in noticeable, (16,18,20,37,38,39,40,41) and since the second zone of drinking water of Ilam county, according to the bureau of imbibing water supply of Ilam county, with significantly more intestinal infestation has the same territory with the fields of first, second and third urban health-treatment centers of Ilam city and the route of spreading of intestinal parasites and especially giardia lamblia, the great suspicion of contamination of the drinking water in Ilam county due to unknown causes arise in mind that can be the subjects of further studies (37,38,39,40,41).

Among the gender, our study shows that boys in Ilam county are slightly more infested with intestinal infestation and is similar to a previous study conducted by Hopkins and Olmsted in Colorado, USA (17) this can be because of the more attention that female gender pays to her sanity, but there is not a relationship between the sex of the subjects with the type of intestinal infestation. This study has also shown that there is not any relation between blood group and Rh factor antigens and intestinal infestation, as compared with other similar studies (21,42,43).

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Prevalance of giardia lamblia in ...

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