



# Epidemiology of Intestinal Parasites in the Rural and Urban Areas of Hamadan Province in west –Central Iran

Mohammad Mahdi Majzoubi<sup>1</sup>, Amir Hossein Maghsood<sup>2</sup>, Mohammad Matini<sup>2</sup>, Khosrow Sardarian<sup>2</sup>, Sayed Ali Alavi<sup>3</sup>, Mohammad Fallah<sup>2</sup>

<sup>1</sup>Department of Infectious Diseases, School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran

<sup>2</sup>Department of Parasitology & Mycology, School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran

<sup>3</sup>Diseases Control Unit, Province Health Center, Hamadan University of Medical Sciences and Health Services, Hamadan, Iran

## Abstract

**Background and aims:** Previous studies have shown that the intestinal parasites have the high prevalence in Hamadan province. However, this problem has not been addressed properly yet and, therefore, there is not up-to-date information about it. This study aimed to determine the prevalence of intestinal parasites in different residential areas of Hamadan Province (urban and rural areas) and compare the obtained findings with the results from previous studies on these parasites in this region and other parts of Iran.

**Methods:** In this cross-sectional study, a total of 2948 fecal samples were collected from all rural and urban inhabitants of the province (including 12 cities) by cluster random sampling method. Fecal samples were examined using the direct smear and formalin ether concentration techniques. A questionnaire was used to collect relevant epidemiologic information about the study population.

**Results:** Overall, 52.2% of the samples were from rural areas, and the rest were from urban areas. As for the gender of study population, 50.6% were male and 49.4% were female (Mean age 29±12.3). The infection rate was 4.9% for both pathogenic and non-pathogenic parasites. Only 4 specimens were positive for ova (*Ascaris lumbricoides*, *Hymenolepis nana*, and pinworm). A total of 69 specimens (2.3%) were positive for pathogenic parasites, and 73 specimens (2.5%) were positive for non-pathogenic (*E. coli*). The most important intestinal parasite in this region was found to be *Giardia lamblia*. It was also discovered that totally 2.3% of the studied population was infected with this parasite.

**Conclusion:** According to the results from this study, this area was not faced with a problem caused by the intestinal parasites at the time. In addition, only *G. lamblia* was found to have been a moderate parasitic problem in the province.

**Keywords:** Intestinal parasites, Epidemiology, Urban, Rural, Iran

\*Corresponding Author:

Mohammad Fallah,  
Email: fallah@umsha.ac.ir

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## Introduction

Intestinal parasites are among the problems of silent health subjects since they do not often have an acute and immediate effect on the infected population, but exert a slow and gradual influence on the nutrition and physical/mental developments of the people, especially on children's.<sup>1,2</sup> Changes in social, economic and cultural situations, as well as the widespread climatic changes in many countries located in the endemic regions can alter the epidemiological pattern of these parasites.<sup>3-6</sup>

Because of the silent character and intangible consequences of these parasites, little attention has been given to them so far and, therefore, insufficient attention has been paid to introduce and implement necessary measures for controlling them in recent years despite their high prevalence in most communities, especially in rural areas.<sup>7</sup> Although intestinal parasites are prevalent in

most parts of the world, there is not accurate and correct information about their prevalence in many regions of the world as well as in Iran due to the lack of enough attention to epidemiological studies in recent years.

According to previous studies, some intestinal parasites such as *Giardia lamblia* and *Ascaris lumbricoides* have been proved to have significant prevalence in Hamadan city, as well as in Hamadan Province<sup>8-10</sup>; due to the complexity and difficulty of controlling these parasites, however, no considerable measure has been taken in the urban areas of the province to control them. In addition, there is no accurate and up-to-date information on their current prevalence. According to some epidemiologic evidence and research reports, Hamadan drinking water has been likely contaminated by the parasites, which necessitates conducting a new epidemiologic study in a provincial scale for providing the regional decision makers with

accurate information on these malign organisms.<sup>10-12</sup>

Since the intestinal parasitic infection rate is “a mirror of the health status of any society,” awareness of the epidemiological situation can help the relevant authorities and regional health planners in the country. Furthermore, it is necessary to provide “up-to-date” information on the status of intestinal parasites in the province in order for educating students and institutions involved in different medical sciences in the country. This study further aimed to clarify the epidemiological pattern and burden of disease to help executive officials involved in health planning and preparation of resource for dealing with infective disease control.

## Materials and Methods

In this cross-sectional study, a total of 2958 stool specimens were collected by cluster random sampling from all rural and urban areas of Hamadan province located in the west-central part of Iran. The criteria for sampling in the cities were district numbers and, in the rural areas, they were numbers of villages; and the number of districts and villages were randomly selected. To carry out the study, two laboratory experts working in the parasitology unit of the health center laboratory of each city were invited to the medical school after making a prior arrangement with the Chancellor for Health of Hamadan University of Medical Sciences and Health Services and, then, they were trained in a one-day workshop on the principles of intestinal parasites diagnosis. Through the network of health centers, stool samples were collected and all specimens were fixed with 10% formalin in the county health center laboratories. Fecal specimens were examined in these labs using the direct wet mount and formalin-ether concentration techniques. The data were analyzed by SPSS software version 16, and the results were analyzed using descriptive statistics.

## Results

### Demographic Characteristics

From among the examined samples, 1543 samples (52.2%) were from urban, and 1415 ones (47.8%) were from rural areas of the province. A total of 1497 samples (50.6%) from males, and 1461 samples (49.4%) from females were collected. The mean age of participants was  $30.42 \pm 18.61$  years, and the age range was from 1 to 98 years. As for the participants' occupations, the majority of them were housewives (28.4%) and students (20.4%), and a small number of them were drivers (1%). As for the education level of the participants, the majority of them (27%) had elementary certificates of completion (Table 1). Only 11.5% of the participants mentioned the history of anti-parasite treatment. As for the type of drinking water, 34.6% of the water samples was taken from the dam, 62% from deep water well, 2.5% from the river, 0.5% from house water wells, and 0.4% from the aqueduct. About 98% of the stool specimens were normal formed, and 2% of them were diarrheal.

### Parasites Prevalence

The infection rate of intestinal parasites (pathogenic and non-pathogenic) was 4.9% (95% CI, 3.8% to 5.3%). Only 4 samples out of these were infected with parasitic worms (3 samples from rural areas, and 1 sample – *Enterobius vermicularis*, from urban areas), and the rest (4.8%) contained protozoa. Overall, 69 samples (2.3%, 95% CI 2.1 to 2.8%) had pathogenic parasites, 73 samples (2.5%, 95% CI 2.1 to 2.9%) had non-pathogenic parasites, and 4 samples (1%) had a mixture of both pathogenic and non-pathogenic parasites (Table 2). Three species of helminths (*A. lumbricoides*, *Hymenolepis nana*, and *E. vermicularis*) were detected in this study (Table 3). As for the protozoa, the most common parasitic protozoa and even the most common intestinal parasite in the region was found to have been *G. lamblia* with which a total of 67 individuals were infected (i.e. 2.3% of the population tested regarding this parasite). Only one case of *E. histolytica*-like amoeba was detected in this study (Table 3). Because of the importance of *Giardia lamblia* in this province, additional analysis was performed on this parasite, which indicated the significant

**Table 1.** Demographic Characterizations of Studied Population for epidemiology of Intestinal Parasites in the Urban and Rural Areas of Hamadan Province, West of Iran

Variable	No.	Percent	
Gender	Female	1461	50.6
	Male	1497	49.4
Age(yr)	≤6	249	8.4
	7-11	272	9.2
	12-19	321	10.9
	20-39	1050	35.5
	40-59	598	20.2
	≥60	223	7.5
	No mentioned	245	8.3
Job	Student	602	20.4
	Child	249	8.4
	Employee	110	3.7
	Un-employee	81	2.7
	No mentioned	245	8.3
	Farmer/worker	263	8.9
	Housewife	841	28.4
	Self-employed	567	19.1
Educational level	Illiterate	353	11.9
	Elementary school	798	27
	Junior high school	584	19.7
	Diploma	540	18.3
	Graduate	186	6.3
	No mentioned	245	8.3
Result	Negative	2812	95.1
	Positive	146	4.9

relationship between infection rate and different age groups (Table 4).

### Discussion

As the present study showed, the intestinal parasites were not highly prevalent in Hamadan province at the time of study. This finding could be generalized to both urban and rural areas. It is worth mentioning that the studies in 1980s discovered some intestinal parasites such as *A. lumbricoides* in Hamadan province rural areas with the highest prevalence rate in the country.<sup>8,9,13,14</sup> Moreover, two studies examining elementary and secondary school students in 1991 and 2001 in Hamadan city found that the infection rate with *G. lamblia* was around 33%.<sup>10</sup> This implies that there was no change in the prevalence rate of this directly-transmitted and water-borne protozoa within 10 years in this area.

In an epidemiological study in 1991 examining 2,400 inhabitants of Hamadan urban areas, about 38% of the city population was reported to have been infected with *A. lumbricoides*.<sup>8</sup> Two years later, a country-wide study in rural areas revealed that *A. lumbricoides* infection in Hamadan Province was higher than that in all other provinces of the country.<sup>13,14</sup> In some other studies, the irrigation of vegetables with raw sewage – especially in the margin of cities such as Hamadan, as well as the contamination

**Table 2.** Frequency Distribution of Different Types of Parasites in the Studied Population

Type of Parasite	Result		P Value
	No.	Percent	
Pathogenic	69	2.3	0.003*
Non-pathogenic	73	2.5	
Mixed (pathogen & non-pathogen)	4	0.1	
No parasite	2812	95.1	
Total	2958	100	

\*P-value <0.05 is considered a significant result.

**Table 3.** Infection Rate of Different Parasite (Pathogenic and Non-Pathogenic) Diagnosed in the Study Area

Type of Parasite	Result		P Value
	No.	Percent	
<i>Ascaris lumbricoides</i>	2	0.06	0.001*
<i>Hymenolepis nana</i>	1	0.03	
<i>Enterobius vermicularis</i>	1	0.03	
<i>Giardia lamblia</i>	67	2.3	
<i>Entamoeba coli</i>	54	1.82	
<i>E. histolytica/dispar</i>	1	0.03	
<i>Blastocystis hominis</i>	2	0.06	
<i>Endolimax nana</i>	8	0.3	
<i>Iodamoeba butschlii</i>	9	0.3	
<i>Chilomastix mesnili</i>	1	0.03	
Total eastern area	72	0	

\*P value<0.05 is considered a significant result.

**Table 4.** Relationship Between *Giardia Lamblia* Infection With Different Age Groups

Age groups (Yr)	<i>Giardia lamblia</i>			Total
	Result	Positive	Negative	
No mentioned	Number	8	237	245
	% in age group	3.3	96.7	100
	% in Giardia	11.9	8.2	8.3
	% in total	0.23	8	8.3
6 <	Number	6	243	249
	% in age group	2.4	97.6	100
	% in Giardia	9	8.4	18.4
	% in total	0.2	8.2	8.4
7 - 11	Number	7	265	272
	% in age group	2.6	97.4	100
	% in Giardia	10.4	9.2	9.2
	% in total	0.2	0.9	9.2
12 - 19	Number	10	311	321
	% in age group	3.1	96.9	100
	% in Giardia	14.9	10.8	10.9
	% in total	0.3	10.5	10.9
20 - 39	Number	17	1033	1050
	% in age group	1.6	98.4	100
	% in Giardia	25.4	35.7	35.5
	% in total	0.6	34.9	35.5
40 - 59	Number	15	583	598
	% in age group	2.5	97.5	100
	% in Giardia	22.4	20.2	20.2
	% in total	0.5	19.7	20.2
60 >	Number	4	219	223
	% in age group	1.8	98.2	100
	% in Giardia	6	7.6	7.5
	% in total	0.1	7.4	7.5
Total	Number	67	2891	2958
	% in age group	2.3	97.7	100
	% in Giardia	100	100	100
	% in total	2.3.	97	100

P<0.05

of some of the daily consumed materials such as raw vegetables to ova of parasites – especially *Ascaris*, were identified as major public health problems. Due to the specific location of Hamadan city which lies on a slope of the mountain, the collected wastewater flows naturally to the plain (i.e. to the vegetable farms) and joins to the rivers flowing from the valleys of Alvand. The vegetation of the region is also considerable due to the relatively favorable rainfall, which creates favorable conditions for the survival of worm eggs in the soil.

This situation resulted in developing a comprehensive mass chemotherapy program against intestinal helminths in the rural areas of Hamadan Province through a collaboration between Ministry of Health and Medical Education, which yielded very beneficial results. Two years after operating the program, an evaluation was conducted indicating a sharp decline of *Ascaris* prevalence from a mean of 55% at provincial level to 6%.<sup>15</sup> The majority of recent epidemiologic studies have also shown a decline in the intestinal parasites infection in most parts of Iran. Some other recent studies conducted in different regions

of the country from the north (Fooman, Takestan) to the south (Ahwaz, Bandar Abbas, Kerman), to the center (Kashan) have revealed a significant reduction in intestinal parasites, especially helminthic infections in Iran.<sup>16-27</sup>

These studies have also determined that the most common intestinal parasites in Iran presently are *Blastocystis hominis*<sup>23,25,26</sup> and *G. lamblia*,<sup>22,25</sup> and the mean infection rate for *G. lamblia* is about 2.5%; however, *A. lumbricoides* is extremely rare, even in the rural areas located in other provinces of the country.<sup>24,25</sup>

Significant changes in society and at depths of it are likely taking place. The expansion of higher education, attendance of more than 4 million students in universities, attendance of millions of university graduates, expansion of public communication and social media in various ways including satellite and Internet, etc. have significantly increased the level of public awareness and, in line with expectations, promoted the level of public health awareness. On the other hand, the socioeconomic development gradually taking place in the communities is influencing the public health. The majority of peoples have access to safe and healthy drinking water, sanitation of villages modified in a "Hadi plan" which also includes the construction of sanitary toilets, as well as to the general pavement of public passageways. Moreover, the use of human excreta as fertilizer in agriculture is avoided. The use of chemical fertilizers to increase the productivity of agricultural grounds, which has replaced the use of human fertilizers, has provided all the means to gradually reducing the intestinal parasites.

On the other hand, due to the changes in cultural situation of the community and the changes in the direction of the population movement from villages to cities, many villages have been vacant; and in villages with a decrease in the size of household, the number of young people living in these rural areas has been virtually decreased. When children are less infected with a parasitic disease, this leads to less contamination of the soil by them. There has been also a reduction of infection among children from soil or directly from each other, since in undeveloped societies where children under primary school age often play with soil are more exposed to infection with *Ascaris* and other Soil-transmitted helminths (STHs). In these communities, accordingly, the infection with *Giardia* and other parasites transmitted through direct contact or by water and raw vegetable/food has been reduced.

### Conclusion

According to the findings from the present study – in line with the results from other studies conducted in other provinces of Iran, it was concluded that the intestinal parasites in Hamadan province had relatively low prevalence. From among these parasites, only *Giardia* was found to have been the most important intestinal parasite in this province, since the epidemiology and control of this protozoa was very complex. It was also determined that the parasite had an impact on children's nutritional status,

arousing a serious concern over the public health.

### Ethical Approval

The study was approved by the Research Ethics Committee of Hamadan University of Medical Sciences.

### Conflict of interests

The authors declare that they have no conflict of interests.

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