



The prevalence of *Giardia lamblia* and *Entamoeba histolytica/dispar* among Iraqi provinces

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Abstract

Giardia lamblia and *Entamoeba histolytica* are intestinal protozoan parasites, widely prevalent, causing serious public health issues in developing countries. The aim of this study was to determine the prevalence of *G. lamblia* and *E. histolytica/dispar*, and also to quantify age, gender, and region related prevalence among a population from the eighteen provinces of Iraq, using the available surveillance database taken from the Ministry of Health, from January 2013 to December 2013. Prevalence of *E. histolytica/dispar* was significantly higher than *G. lamblia*. Both were found in varying prevalence in relation to sex (higher in males), age groups (higher in age group 15–44) and regions (higher in Middle Euphrates region). In this study, lower prevalence rates were observed in comparison with the similar studies conducted in Iraq, which may be as a result of the sample size, seasonal diversity, improved personal hygiene and public health services.

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1. Introduction

Diarrheal diseases are common in developed and developing countries and are considered as major causes of morbidity and mortality [1]. The etiologies of diarrhea include viruses, bacteria and parasites [2] of which both *Giardia lamblia* and *Entamoeba histolytica* are the main intestinal parasitic agents [3]. These species are important and widely prevalent pathogens, causing important

public health and medical problems in developing countries [4]. *E. histolytica* causes amoebic colitis, amoebic dysentery, and amoebic liver abscess, resulting in 100,000 deaths annually [5], while 5–10% of population is at risk of giardiasis [6]. Both *G. lamblia* and *E. histolytica* are frequently transmitted by contaminated food and/or drinking water, as well as potentially spread from person to person through fecal–oral contact [7].

Many papers presented different prevalence level of *G. lamblia* and *E. histolytica/dispar* in Iraq. Prevalence of *G. lamblia* and *E. histolytica/dispar* ranged from 3.8% to 48% and 3.7%–33.8%, respectively [8,9]. Some researchers focused on gender related and

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occupation related prevalence [8,9], others have focused on the relation between anemia and infection with gastrointestinal parasites [10]. The regional burden and geographical distribution of these pathogens remain to be determined and from annual and seasonal reports. The aim of the present study was to assess the prevalence of *G. lamblia* and *E. histolytica/dispar* infections among Iraqi people over all provinces based on the database of the Iraqi Communicable Diseases Control Center (CDCC) at the Ministry of Health.

2. Subjects and methods

This retrospective survey included spatial and temporal analysis of the reported cases of *G. lamblia* and *E. histolytica/dispar* infections using the available surveillance database taken from the Iraqi CDCC at the Ministry of Health, from the beginning of January 2013 to the end of December 2013. Diagnoses of *Giardia* and *Entamoeba* species were confirmed by microscopic examination. Data were included from all provinces of Iraq. The total number of examined patients in this survey was 2,761,990. Data on infection for each parasite were structured according to the geographical distribution of Iraqi provinces from north to south. Eighteen provinces were then combined into four groups according to CDCC's database:

South region group: Thiqr, Miasan, Basra and Wasit.
 Middle Euphrates region group: Babil, Karbala, Najaf, Diwaniya and Muthanna.
 Middle region Group: Baghdad, Anbar, Diyala and Salahuddin.
 North Group: Nineva, Suleimaniyah, Ta'mim, Erbil and Dohuk.

Infection data for each parasite were classified according to the gender of patients, the seasonal variation from January to December. Data were assessed according to the age distribution within groups as follow: Group 1: cases less than one year in age, Group 2: cases from one to 4 years in age, Group 3: cases from five to 14 years in age, Group 4: cases from 15 to 44 years in age and Group 5: cases $45 \leq$ years in age. Differences in prevalence were examined among genders, age classes and regions using Chi square test by the Statistical Package for the Social Sciences (SPSS, 2001).

3. Results

The overall infectivity rates of *G. lamblia* and *E. histolytica/dispar* were 1.77% and 3.78%, respectively.

Significant differences ($p < 0.05$) were noted between the prevalence of *G. lamblia* and *E. histolytica/dispar*. Najaf, Miasan, Diwaniya and Basra provinces had the highest prevalence of *G. lamblia* which were 7.9%, 7%, 6.3% and 6.1%, respectively, while the lowest prevalence was reported in Anbar, Nineva, Erbil and Suleimaniyah where the prevalence rates were 0.13%, 0.4%, 0.6% and 1.0%, respectively. Similar results were observed for the prevalence of *E. histolytica/dispar*. Najaf, Wasit, Basra, Diwaniya and Miasan provinces showed the highest prevalence rates (18.6%, 10.4%, 10.2%, 10.3% and 9.8% respectively), while the lowest prevalence was reported in Anbar, Diyala, Thiqr, Erbil and Nineva (0.5%, 1.9%, 1.9% 1.2% and 2.1%, respectively) (Table 1).

There were significant differences ($p < 0.05$) among regions in the prevalence of *G. lamblia* and *E. histolytica/dispar*. The Middle Euphrates region showed the highest prevalence rates for *G. lamblia* and *E. histolytica/dispar* (2.2% and 4.9%, respectively) while the North region showed lower prevalence rates for *G. lamblia* and *E. histolytica/dispar* (1.2% and 3.1% respectively) (Table 2). The study also revealed significant ($p < 0.05$) seasonal differences with the highest prevalence in winter (1.9%) and spring (4.3%), while it was lowest in the fall (1.5%) and summer (3.5%) for *G. lamblia* and *E. histolytica/dispar*, respectively. The seasonal variation is given in Table 3. Results revealed significant ($p < 0.05$) differences among age groups in the surveyed population. The

Table 1

The distribution of *E. histolytica/dispar* and *G. lamblia* infections among 18 surveyed provinces.

Province	Number of positive cases (%) among provinces	
	<i>E. histolytica/dispar</i>	<i>G. lamblia</i>
Anbar	1013 (0.5%)	241 (0.13%)
Babil	22,563 (3.4%)	9903 (1.5%)
Baghdad	15,884 (5.1%)	8315 (2.7%)
Basra	1843 (10.2%)	1091 (6.1%)
Diwaniya	4586 (10.3%)	2895 (6.3%)
Diyala	1756 (1.9%)	961 (1.07%)
Dohuk	8966 (3.3%)	4497 (1.7%)
Erbil	2195 (1.2%)	1063 (0.6)
Karbala	7080 (9.8%)	3493 (4.8%)
Miasan	2513 (9.8%)	1795 (7%)
Muthanna	5157 (5.9%)	2004 (2.3%)
Najaf	3746 (18.6%)	1588 (7.9%)
Nineva	5785 (2.1%)	1191 (0.4%)
Salahuddin	1155 (2.3%)	1353 (2.8%)
Suleimaniyah	4996 (4.5%)	1111 (1%)
Ta'mim	6592 (7.2%)	3543 (3.9%)
Thiqr	4530 (1.9%)	1582 (0.6%)
Wasit	7468 (10.4%)	2963 (4.1%)

Table 2
The distribution of *E. histolytica/dispar* and *G. lamblia* infections among the four surveyed ranges.

Regions	Number of positive cases (%)	
	<i>E. histolytica/dispar</i>	<i>G. lamblia</i>
South region	16,345 (4.6%)	7431 (2.1%)
Middle Euphrates region	43,132 (4.9%)	19,883 (2.2%)
Middle region	19,808 (3.1%)	10,870 (1.7%)
North region	28,534 (3.1%)	11,405 (1.2%)

Table 3
The seasonal distribution of *E. histolytica/dispar* and *G. lamblia* infections among the surveyed population.

Season	Number of positive cases (%)	
	<i>E. histolytica/dispar</i>	<i>G. lamblia</i>
Winter	23,252 (3.6%)	12,681 (1.9%)
Spring	34,825 (4.3%)	14,558 (1.8%)
Summer	24,212 (3.5%)	11,811 (1.7%)
Fall	24,717 (3.8%)	10,066 (1.5%)

Table 4
The distribution of *E. histolytica/dispar* and *G. lamblia* infections according age groups and sex among 18 surveyed provinces.

Age (year)	Number of positive cases (%)	
	<i>E. histolytica/dispar</i>	<i>G. lamblia</i>
1>	943 (0.8%)	298 (0.6%)
1–4	13,551 (12.6%)	397 (0.8%)
5–14	33,889 (31.6%)	18,331 (37.3%)
15–44	37,221 (34.7%)	20,266 (41%)
45≤	21,402 (20%)	9824 (20%)
Gender		
Male	62,010 (57.9%)	27,901 (56.8%)
Female	44,996 (42%)	21,215 (4.2%)

highest *G. lamblia* and *E. histolytica/dispar* infection rates were found in the 15–44 year age group, while the lowest infections were reported in the age group >1 year. Significant differences occurred between males and females, with higher *G. lamblia* and *E. histolytica/dispar* cases reported in males than in females. The results of age and gender distribution are given in Table 4.

4. Discussion

The prevalence of both *G. lamblia* and *E. histolytica/dispar* were surveyed among all Iraqi provinces for the year 2013. Infection rates for *E. histolytica/*

dispar were significantly higher than for *G. lamblia*, which may be due to the activity of cysts in environmental conditions. Our results were in agreement with the results of Al-Warid et al., 2011 [11] and Al-Khaysee & Sultan, 2008 [12] but disagreed with the results of Al-Warid, 2011 [9] who indicated that the incidence of *G. lamblia* was much higher than the incidence of *E. histolytica/dispar*. The differences in prevalence of these intestinal protozoal parasites between studies may be due to several factors, including environmental [13], nutritional, socio-economic [14], and geographical conditions, as well as demographic [15] and health-related behavior [16].

The distribution of *G. lamblia* and *E. histolytica/dispar* were varied significantly by geographic region, with the middle Euphrates and south regions having higher prevalence rates compared to the north and middle regions. Geographical patterns for some intestinal parasite species were observed possibly because of different prevailing ecological determinants of transmission and these patterns may also depend on the extent of development of the areas [17] as well as differences in the overall living standard among the provinces. Our results agreed with Bisht et al., 2011 [18] who showed that geographical location influences the prevalence of parasitic infections.

Seasonality was shown to play a significant role in the prevalence of *G. lamblia* and *E. histolytica/dispar*. The highest prevalence rates were seen in winter and spring. This result agreed with other studies, which showed that a high peak incidence of these parasites occurred in the rainy seasons [19], as well as reports that indicate that during cold seasons, *Giardia* and *Entamoeba* cysts are infective for a longer period than during dry seasons [20,21].

Age and gender were important and significant factors affecting the prevalence of both *G. lamblia* and *E. histolytica/dispar* in our surveyed population. The majority of *G. lamblia* and *E. histolytica/dispar* positive samples came from the 15–44 year age group, which may be due to the fact that this age group is more likely to be engaged in the many work activities that might expose individuals to infection through contaminated soil, water and food [22]. This result is in agreement with other reports which showed more cases in 15–44 years old individuals for some gastrointestinal parasitic infections compared to other age groups, although no significant relation was noticed between age and infections [23]. Gender is the other factor which influenced significantly the prevalence of these protozoan parasites in this survey. The majority of positive cases were reported in males. This is probably

because males are more exposed to unhygienic conditions in fields during outdoor activity while females may remain indoors [24]. This result is also in agreement with those reported by others [25].

In conclusion, our findings from this report reveal a higher prevalence of *E. histolytica/dispar* than *G. lamblia* in the surveyed population. These findings indicate the need for long term control measures to improve the sanitary and living conditions, especially in regions with high prevalence. The impact of these measures would be further enhanced via an organized health and education programs, which may support and encourage healthy behaviors and lead to decrease of these parasites.

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