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# PREVALENCE OF PARASITIC PROTOZOA AMONG KIRKUK PROVINCE POPULATION (IRAQ) DURING A YEAR 2014

**Abdul Kadar Raoof Ahmed Barzinji***

* Department of Biology, College of Education- Al Hawija, Kirkuk University, Kirkuk-Iraq.

Corresponding: gaylan_phd2@yahoo.com

**ABSTRACT**

Protozoan parasitic infectious diseases are major public health problems in developing countries. These infections have common characteristics, they are highly endemic in some populations with low socio-economic status and poor sanitation, favoring oral/fecal or insects skin bite transmission. The present study was conducted in Kirkuk city to estimate the prevalence of intestinal parasitic and blood/tissue infections among Kirkuk province outpatients, who were attending state main " Al-jumuri, Children and Azadi teaching" hospitals of Kirkuk city and health centers in its respective districts administratively "Dibis, Al-Hawija and Daquq" during a year 2014. The study showed that the overall prevalence of different four parasitic infectious diseases was 46.06%. The intestinal parasitic infection was more prevalence than blood/tissue infections (i.e. leishmaniasis and toxoplasmosis). Regarding to intestinal parasitic infection, *Entamoeba histolytica* was significantly most prevalence than *Giardia lamblia* with a rate of 82.18 % and 15.45 %, respectively. The highest infection with entamoebiasis was among children aged 5-14 yrs (26.31%). The highest monthly distribution peak for overall intestinal and blood/tissue protozoan parasitic infection during a year 2014 was for entamoebiasis in June and August (11.42%, 11.4%), respectively. The fecal samples were examined using the standard protocol (WHO, 1991).

**KEY WORDS:** Entamoebiasis, Giardiasis, Infection, Kirkuk, Leishmaniasis, Parasitic protozoa, Prevalence, Toxoplasmosis,

## INTRODUCTION

Pathogenic intestinal protozoan infections "*Entamoeba histolytica* and *Giardia lamblia*" continuously remain among the most serious public health problems worldwide, particularly in developing countries (Speich *et al.*, 2013; Walana *et al*., 2014). *E. histolytica* is a pathogenic amoeba that infects man. It lives in the large intestine and causes amoebic dysentery (Akisu *et al.*, 2004; Sarker *et al.*, 2008). The infection may lead to the extra intestinal amoebiasis such as amoebic liver abscess (Bansal *et al.*, 2004), or brain abscess (Azam and Agarwal, 2007). Fifty million symptomatic cases of amoebiasis are reported each year (Bansal *et al.*, 2004; Azam and Agarwal, 2007), and about 100,000 deaths around the world are reported annually (Gatti *et al.*, 2002; Delialioglu *et al.*, 2004).

*G. lamblia* is the most common causative agent of diarrhea, worldwide (Savioli *et al.*, 2006; Yang *et al.*, 2006), and affects around 200 million people worldwide (Hussein, 2011). The disease is widespread among developing countries, and is implicated as an important cause of childhood growth retardation in the tropics (Shinohara *et al.*, 2006; Reiner, 2008). *G. lamblia* is known as the most frequent intestinal protozoan parasite infection in Kirkuk Province (Iraq) (Salman and Mustafa, 2013). Leishmaniasis is one of the most serious vector-borne diseases of mankind, and it can be caused by *Leishmania* sp. The disease is worldwide spread throughout the Mediterranean basin and the Middle East (CFSPH, 2009; Khalaf *et al.*, 2016), and transmitted by the bite of female phelobotomine sandflies (de Veer *et al.*, 2003; Spotin *et al.*, 2015). According to recent reports, more than 350 million people live in the endemic areas, there are an estimated 12 million cases worldwide. Furthermore, annual frequency is estimated at 1.3 million cases of leishmaniasis, with an estimated 20,000 to 59,000 deaths annually (Mukhopadhyay and Mandal, 2006; Hide *et al*., 2007; Salam *et al*., 2014). The disease could recognize as visceral leishmaniasis 'VL' known as kala-azar and cutaneous leishmaniasis 'CL'(WHO, 2008), both types are endemic to Iraq (Postigo, 2010; Rahi *et al*., 2013; Alsamarai *et al.*, 2016).

Toxoplasmosis is a zoonotic disease caused by an obligate intracellular opportunistic protozoan parasite *Toxoplasma gondii*, that can infect varied vertebrates including humans (Lim and Othman, 2014; Sarkari *et al*., 2014). Approximately 30-50 % of the world's population is infected by *T. gondii* (Flegr *et al*., 2014; Liu *et al*., 2015). Recently, studies show that around 90% of infections may occur in immunocompetent humans and are asymptomatic (Aqeely *et al*., 2014). Toxoplasmosis is a common protozoan infection among Iraqi population.

## MATERIALS AND METHODS

- **Study area**

The present study was conducted at the laboratories of Kirkuk city hospitals and health centers in their respective districts administratively; these are Dibis, Al-Hawija and Daquq districts. Kirkuk Province is located between latitudes N 35° 28' 80'' and longitudes E 44° 23' 28", with an altitude of 300-350 m above sea level. According to the Kirkuk Central Authority of Statistics (2012), the city is densely populated with an estimated population of 1,500,000 living in some 9679 $km^2$ area. Average annual rain fall is 250-500 mm with winter rainy season.


**Figure 1. The regional setting of Kirkuk province and location of the Kirkuk city.**

- **Data collection**

Data of the present study were obtained from the records of laboratory results restricted in a designed computer database with the permission of the Chairman of the Laboratories Department- Kirkuk General Directory of the Health (KGDH). The data included the period of 1st January to 31st December 2014. The General Stool Examination carried out with the protocol as described by WHO (1991).

- **Statistical Analysis**

The obtained data were validated for double entry errors in MS-Office (2007), then Chi-squaretest ($\chi^2$) was applied to determine frequency distribution between studied groups (sex and age) using IBM SPSS 22.0 version statistical package .

**RESULTS**

Frequencies of parasitic protozoan infections among Kirkuk province patients whom attended hospitals and medical centers during a year 2014 are summarized in Table 1and 2. Of 5534 positive for intestinal and blood and tissue infections out of 12015 specimens subjected to the examination in based on the data analysis of KGDH (Figure 2).

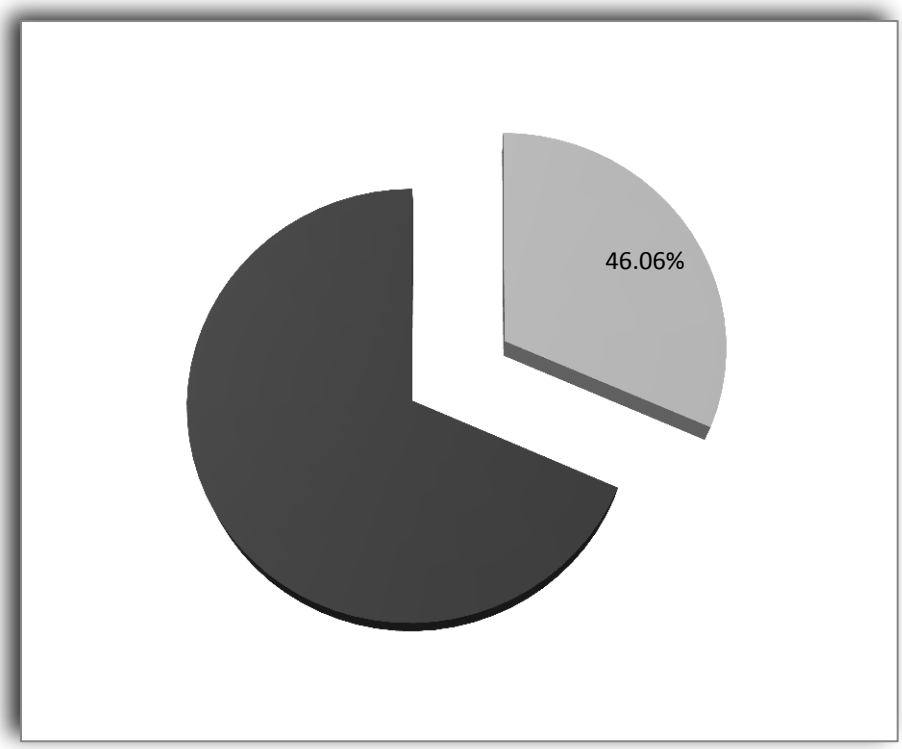



**Figure 2. Prevalence percentage of protozoan parasitosis among hospital attended patients in Kirkuk province during a year 2014.**

It is noteworthy that 5403 (97.63 %; 95% CI, 95.33.61-99.96) were positive for intestinal protozoa and 131 (2.37 %; 95% CI, 1.38 – 3.36) for blood and tissue protozoa. Generally, the entamoebiasis was the most prevalence among intestinal parasites infections significantly, where *E. histolytica* (82.18 %; 95% CI, 80.3- 84.06; n=4548) and *G. lamblia* (15.45 %; 95% CI, 13.55-16.35; n= 855). The above mentioned two parasites were the only intestinal protozoan observed in the current study. However, table 1shows that the significant highest infection prevalence among the blood/tissue cases was CL (1.265 %,95% CI, 1.085- 1.445; n=70) followed by the toxoplasmosis (1.03 %; 95% CI, 0.95-1.11; n=57) ($p<0.05$). It was noticed that the higher monthly distribution peak for overall intestinal and blood/tissue protozoan parasitic infection was for entamoebiasis in June and August (11.42%, 11.4%), respectively (Figure 3 a and b).

It can be noticed from Table 1 also that the prevalence ratio of intestinal protozoan was significantly higher in females than males. Entamoebiasis was the most prevalence (41.23 %) among the intestinal infections in males (95% CI, 40.13-42.33; n=2282) than females (40.95 %; 95% CI, 39.15-42.75; n=2266) ($p<0.02$).

**Table 1. Prevalence (%) of protozoan parasitic infections stratified by genders, during a year 2014.**

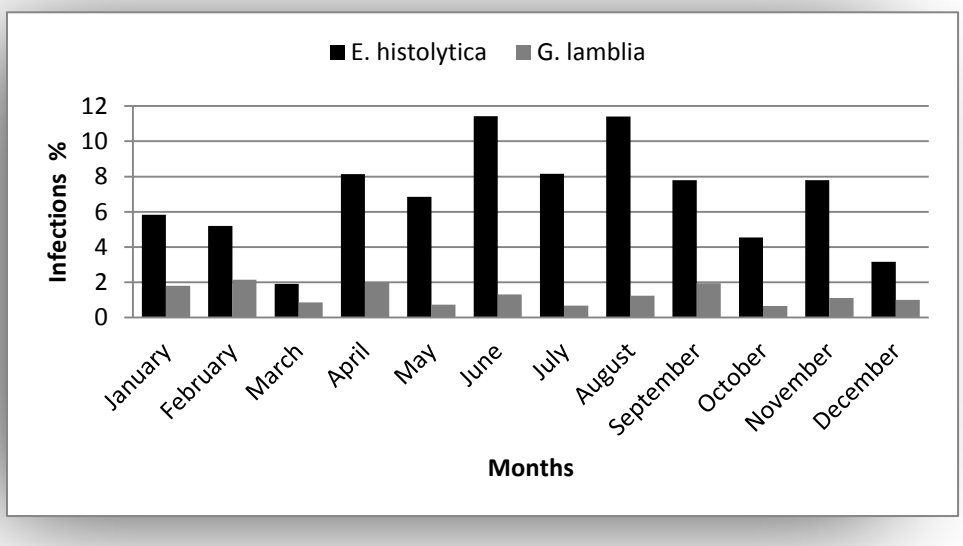
| Parasites | | Patients genders | | Whole prevalence |
|---|---|---|---|---|
| | | Male | Female | |
| ***Intestinal infections*** | *E. histolytica* | 2282 (41.23) | 2266 (40.95) | 4548 (82.18) |
| | *G. lamblia* | 421 (7.61) | 434 (7.84) | 855 (15.45) |
| ***Blood & tissue infections*** | *L. tropica* (CL) | 35 (0.63) | 35 (0.63) | 70 (1.265) |
| | *L. donovani* (VL) | 2 (0.036) | 2 (0.036) | 4 (0.072) |
| | *T. gondii* | 0.0 (0.0) | 57 (1.03) | 57 (1.03) |
| **Total** | | 2740 | 2794 | 5534 |

Age wise, Table 2 shows the prevalence rate of the intestinal and blood/tissue protozoa parasitosis. Entamoebiasis was found to be highest intestinal infections followed by giardiasis, both intestinal protozoan parasites were showed high prevalence among children aged 5-14 yrs (26.31%, 4.46%) respectively. Regarding to the leishmaniasis infections, data in table 2 also illustrate that CL was the highest infection among children aged 5-14 yrs (4.46 %), then VL among early children aged 1-4 yrs (0.29%). Otherwise, toxoplasmosis seems to be the most prevalence among pregnant adults aged 15-45 yrs (1.012 %).

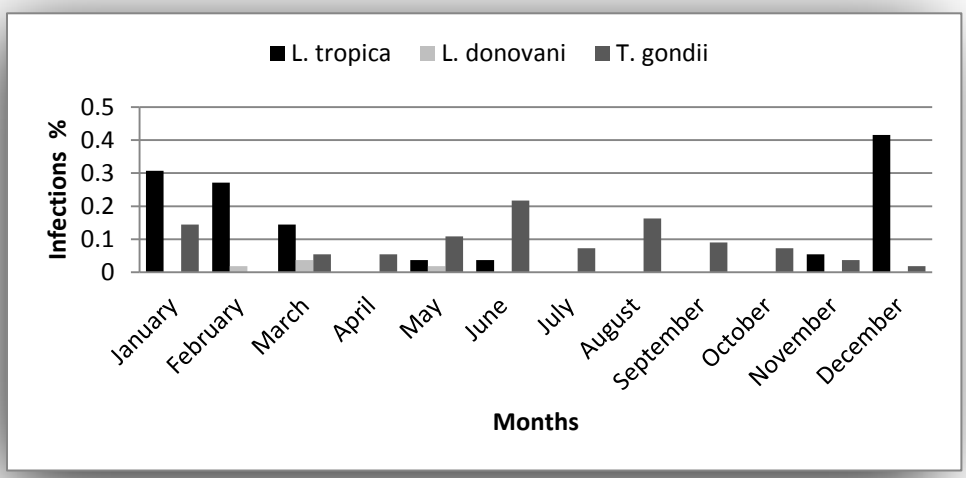
**Table 2. Prevalence (%) of protozoan parasitic infections stratified by age (years), during a year 2014.**

| Parasites | | Age by years (%) | | | | | Whole prevalence |
|---|---|---|---|---|---|---|---|
| | | **< 1** | **1-4** | **5-14** | **15-45** | **>45** | |
| ***Intestinal infections*** | *E. histolytica* | 578 (10.4) | 1128 (20.38) | 1456 (26.31) | 834 (15.07) | 552 (9.97) | 4548 (82.18) |
| | *G. lamblia* | 52 (0.94) | 169 (3.05) | 247 (4.46) | 198 (3.58) | 189 (3.41) | 855 (15.45) |
| ***Blood & tissue infections*** | *L. tropica* | 2 (0.036) | 16 (0.29) | 31 (0.56) | 20 (0.36) | 1 (0.018) | 70 (1.265) |
| | *L. donovani* | 1 (0.018) | 3 (0. 054) | 0 (0) | 0 (0) | 0 (0) | 4 (0.072) |
| | *T. gondii* | 0 (0) | 0 (0) | 0 (0) | 56 (1.012) | 1 (0.018) | 57 (1.03) |
| **Total** | | 633 | 1316 | 1734 | 1108 | 743 | 5534 |




a




b

**Figure. 3 Monthly distribution of (a) intestinal protozoa parasitosis and (b) blood/tissue infections in Kirkuk province during 2014.**

**DISCUSSION**

The present study aimed at estimating the prevalence of parasitic protozoan infections among Kirkuk city (Iraq) and their respective districts administratively( Dibis, Al-Hawija and Daquq districts) population during one year "2014". Primary objectives of epidemiological studies on the prevalence of infection of intestinal parasites in different regions/localities are to identify high-risk communities and formulate appropriate intervention. Thus, the present study attempted to assess the prevalence of different protozoan parasitic infections in Kirkuk province attributed to dwellers in Kirkuk province then recommend appropriate intervention.

In our knowledge, no new reports was found at last couple decades conducted in similar populations and studies on such lines are very rare. The obtained data in the present study revealed that overall prevalence of protozoan parasitic infections was 46.06% (Fig. 1); entamoebiasis was significantly most prevalence among patients attended hospitals and medical centers of Kirkuk province in the males (41.23%) than females (40.95%) (Table 1). Data in Table 2 show that the majority of the infections was among children aged 5-14 yrs (26.31%), followed by early children aged 1-4 yrs (20.38%), adults aged 15-45 yrs (15.07%), nursling infant aged < 1 yr (10.4 %) and elderly patients aged > 45 yrs (9.97 %), respectively. Otherwise, giardiasis was less prevalence than entamoebiasis and was significantly most prevalence among females than males (7.84% and 7.61%), respectively (Table 1), and was common among children aged 5-14 yrs (4.46%), followed by adults aged 15-45 yrs (3.58%), elderly patients aged > 45 yrs (3.41 %), early children aged 1-4 yrs (3.05%) and nursling infant aged < 1 yr (10.4 %) respectively.

Results obtained for entamoebiasis and giardiasis in the present study agree with findings of Bazzaz and Ahmed (2016) and close as to those of Salman *et al.* (2016). In fact, most of the infections was among rural locate dwellers, in such locations unhealthy habits are very common. For instance, using the human feces as a fertilizer is usual, and this may resulted in salad vegetables being contaminated with parasitic protozoan cysts. In addition, sometimes untreated sewage water is discharged into rivers and lakes directly, which leads to obvious health hazard represented in soil and water contaminations with pathogenic parasites (i.e. *E. histolytica*, *G. intestinalis*) cysts, as describe by Papazahariadou *et al*. (2004) and Salman *et al.* (2015).

Leishmaniasis was less prevalence than intestinal protozoan infections and toxoplasmosis. However, the CL was significantly more prevalence than VL, particularly of both males and females (0.63% and 0.036%) respectively (Table 1). This result agrees with those of Alvar *et al.* (2012) who found that CL is characterized with more broad prevalence than Visceral Leishmaniasis. Data in Table 2 show that the most infection with CL was among children aged 5-14 yrs (0.56 %), followed by both nursling infant aged < 1 yr and adults aged 15-45 yrs (0.36%), early children aged 1-4 yrs (0.29%) and elderly patients aged > 45 yrs (0.018 %), respectively. Very few studies on the Leishmaniasis in Kirkuk city were found in the literature. For instance, Rahi *et al*. (2013) reported that positive VL cases in Salah-Din, Ninewa and Kirkuk (Northern provinces of Iraq) was 8%. The prevalence of leishmaniasis seems to be associated with poor hygienic conditions and low socio-economic status of the population in the above mentioned districts. Moreover, children age groups are more contact with the domestic animals in such communities, and this may be increases the infection probabilities among such group (Shakoor, 2016 and Hassan, 2017). Generally, the low percentage of leishmaniasis infections may be attributed to Northern Iraq is not suitable habitat to these parasite victors. Hence, the present cases might have been infected in another cites such as Western and/or Sothern of Iraq, as describe by Bazzaz and Ahmed (2016). In Iraq, furthermore studies required concerning with this disease, particularly; WHO "Eastern Mediterranean Region Organization [EMRO]" established strategic plan to specify the problem risk and achieve an effective health care programs for CL infection control (Alsamarai *et al.*, 2016).

Toxoplasmosis infections was more prevalence than leishmaniasis relatively. Data in Table 1 show that the infection rate was 1.03 %. Table 2 shows that the highest prevalent rate was among adults aged 15-45 yrs (1.012 %). Hopefully, this finding indicates that the disease is stable at its lowest level, and this may be attributed to pregnant have subjected to the monthly health culture program in the pregnant care centers. In the last couple decades, many efforts were carried out for access efficacious vaccines against the disease. Unfortunately, it remains a challenge as

vaccine experiments have not been able to confer sterile immunity against infection (Lim *et al*., 2014). Hence, to control the universal disease, a multi-type anti-*T. gondii* immunotherapeutics conceders as an extremely valuable goal.

## CONCLUSION

The parasitic diseases are endemic in Iraq and causing a biological hazard on the public health. The data suggest carried out furthermore investigation onto the parasitic infectious diseases, because the obtained data represents only patients whom attended hospitals and medical centers in Kirkuk city. There are many patients/carriers particularly in the rural regions and do not attending hospitals. Hence, serious national campaign required to discover the reality of the parasitic infectious diseases prevalence in Kirkuk, then setting a control protocols.

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