Epidemiology of *Entamoeba histolytica* among children in Erbil Province, Kurdistan Region-Iraq

**ABSTRACT:**

The current epidemiological study investigated the prevalence of *Entamoeba histolytica* and its relation with residency, sexes, age, economical status, maternal education and studied months, among 200 children, including 117 boys and 83 girls, aging less than 1-12 years, attending the pediatric hospital in Erbil/Kurdistan region-Iraq, between the beginning of November 2010 to the end of March 2011. The rate of infection was 30% (34.69% in urban and 25.49% in rural regions). The higher rates of infection were among girls (33.73%), aged 4-6 years (52.38%), with moderate economical status (34.54%), illiterate mothers (39.24%) and in February-2011 (54.54%).

**Keywords:** *Entamoeba histolytica*, Children, Erbil-Iraq.

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INTRODUCTION

Entamoeba histolytica, a protozoan parasite, occurs worldwide (Kreidl et al., 1999) D. F. Loesch, in Petersburg, Russia, first described this ameba in 1875 (Roberts et al., 1996) Amebiasis is a parasitic infection caused by the protozoon Entamoeba histolytica (Pritt et al., 2008) and it is one etiology of diarrheal disease. Diarrhea is a major contributor to childhood mortality and morbidity in the developing world and it is accounted for a median of 21% of all deaths of children aged under 5 years in these areas and countries (Kosek et al., 2003) Amebiasis is the third most common parasitic cause of death worldwide, surpassed only by malaria and schistosomiasis. On a global basis, amebiasis affects approximately 50 million persons each year, resulting in nearly 100,000 deaths. The prevalence of infection varies between 1% in industrialized countries to between 50% and 80% in tropical countries, where transmission of E. histolytica cysts by untreated drinking water is common. Ingestion of food and drink contaminated with E. histolytica cysts from human faeces and direct faecal oral contact are the commonest means of infection (Bruckner, 1992).

This parasite has two forms: a motile form, called the trophozoite which inhabits the large intestine of human, and a cyst form, responsible for the person-to-person transmission of infection. The cysts may remain viable for three months but may be destroyed by iodination or hyperchlorination. The incubation period is usually two to four weeks but may be as long as months or years. About 10% of those infected have clinical symptoms. Most (80% to 98%) present with amoebic colitis, with bloody diarrhoea and abdominal pain, the remaining 2% to 20% present with extra-intestinal disease, most commonly as liver abscess (Marshall et al., 1997) The case fatality rates of E. histolytica liver abscess are estimated to be between 0.2% to 2% in adults and up to 26% in children. Metronidazole is the drug of choice for treatment of liver abscess and intestinal disease (Kreidl et al., 1999).

There were many studies carried out in Erbil-Iraqi Kurdistan to investigate the intestinal parasites in children, among them: a study performed by (Molan et al., 1989) and 18.6% for infection by E. histolytica was recorded among fecal samples of school children aged 6-13 years old of both sexes. While (Salih, 1991) reported the infection rate 3.6% for E. histolytica. (Abdullah et al., 1999) collected 249 stool samples from children below 3 years of age and 39.7% were recorded for E. histolytica. Out of 115 collected stool samples from kindergartens children, the infection rate was 1.7% for the studied parasite (Farag, 2000) In a survey, (Ahmed, 2006) revealed that 9.47% was the infection rate for E. histolytica among rural primary schoolchildren from different regions in Erbil city, while (Hama, 2007) reported rate of infection 2.33% among children aged 6-12 years old from rural and urban primary schools.

Aims of the present study are to:
1. Investigate the prevalence of E. histolytica among children in Erbil governorate.
2. Study the relationship between the infection with E. histolytica and residency, sexes, age, economical status and maternal educational level of the children and the seasons of the studied years.
3. Our study, although a small one, in the field of observation of parasitic infestations, whether it be rural or urban, may help others in the prevention and control of intestinal parasitic disease in children worldwide.

MATERIALS AND METHODS

Time and location

The present study was achieved on 200 children, including 117 boys and 83 girls, aging <1-12 years, and they were attended to the rapareen pediatric hospital in Erbil/Kurdistan region-Iraq, between the beginning of November 2010 to the end of march 2011, for detection of the trophozoites and cysts of Entamoeba histolytica infection. The children and their parents were interviewed, then informative questionnaire form was organized for each patient including data such as age, sex, residence (urban, rural), education level of the household and the economical status of the families.

Collection of stool samples

The stool samples were collected in sterile containers labeled with names of the patients and brought to the laboratory for macroscopic and microscopic examinations.

Laboratory methods

The stool samples were examined with the naked eye for appearance, color, and the presence of blood. They were then examined microscopically by direct method for presence of Entamoeba histolytica trophozoite and cystic stages.

Direct stool examination

The fresh stool samples were examined under the microscope using the saline solution by
adding a small quantity of the selected fresh stool to
one or two drops of normal saline (0.9% NaCl) on
the slide with an applicator stick and covered with a
cover slip Faust et al., (1978).

RESULTS AND DISCUSSION

Epidemiological study

Out of 200 examined stool samples of the
children, 98 cases were from urban and 102 from
rural areas, only 60 cases were positive for
Entamoeba histolytica (34 in urban and 26 in rural
habitants), the total rate of infection was 30%
(34.69% in urban and 25.49% in rural regions) as
shown in (Table 1).

Table 1: Prevalence of Entamoeba histolytica
according to the residency of the patients

<table>
<thead>
<tr>
<th>Residency</th>
<th>No. Examined</th>
<th>No. +ve</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>98</td>
<td>34</td>
<td>34.69</td>
</tr>
<tr>
<td>Rural</td>
<td>102</td>
<td>26</td>
<td>25.49</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>60</td>
<td>30</td>
</tr>
</tbody>
</table>

The infection rate, in the present study, is
much higher than those reported by some other
studies in Iraq and Erbil. In Kirkuk, the infection
rate of E. histolytica among primary schoolchildren
was 8.45% Al-Shirifi HMH, (2000) in Mosul, Al-
Abbadie, (2001) recorded 11.07% among primary
school and kindergartens children, in Sulaimani
district Raza HH et al., (2009) reported 4% among
pre-school children. While in Erbil, 2.33% and
6.4% were recorded by Hama, (2007) and Faraj AM
et al., (2007) respectively. The present result (30%)
was lower than that of (Kasssem et al., 2007) in
Libya (36.57%).

The findings of this study, including the higher
infection rate of E. histolytica among children in the urban areas in comparison with that
of rural regions 34.69% and 25.49%, are in
agreement with the study of (Al-Shammari et al.,
2001) who detected higher rates of infection in
urban than rural areas, but disagreed with the
situation recorded by (Rayan et al., 2010) who
reported that significant differences were noted
between rural and urban children for E. histolytica
(4.2% vs. 0%), while (Raza HH et al., 2009)
documented that for E. histolytica, the rates were
close to each other in both sexes. The present result
is possibly caused by the greater number of
villagers (majority resides in urban area) in our
study population.

In general, this variations may be due to
many interacted factors like sanitary service, low
education of mothers, improper water supply
because E. histolytica can be transmitted orally by
drinking water and it is one of the environmental
contaminants of the water supply (Omar et al.,
1995) also absence of regular hygiene toilets, and
malnutrition which significantly increases
susceptibility to Entamoeba histolytica in children
(Duggal et al., 2011) In addition to environmental,
social and economic factors are also playing a role
in this matter (Al-Shammari et al., 2001).

Sexes

Table (2) shows that higher infection rates
were recorded among girls than boys (33.73% and
27.35%). The present results are similar to a study
performed in Saudi Arabia (Al-Shammari et al.,
2001) These results may be because this group of
children is more involved in out and indoor
activities which might lead to Entamoeba
transmission.

Table 2: Prevalence of Entamoeba histolytica
according to the sexes of the patients

<table>
<thead>
<tr>
<th>Sex</th>
<th>No. Examined</th>
<th>No. +ve</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>117</td>
<td>32</td>
<td>27.35</td>
</tr>
<tr>
<td>Female</td>
<td>83</td>
<td>28</td>
<td>33.73</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>60</td>
<td>30</td>
</tr>
</tbody>
</table>

Age groups

Regarding the results of E. histolytica
infection among different age groups, Table (3)
shows that the children less than 1 year old group
had a lower rate of infection (19%), and it is
consistent with the study conducted in Saudi Arabia
(Al-Shammari et al., 2001) This finding perhaps
because parents are responsible for their hygiene
(Al-Saeed et al., 2006) although not statistically
significant, the incidence rates of E. histolytica
infection were higher in children who were breast-
fed less than 12 months (Haque et al., 2003) The
infection rate was highest in the illiterate age group
(4-6 years) and in the group with educational level
of primary school (10-12 years) (52.38% and 50%
respectively), which may be attributed to defecation practices because these groups of children are fully independent in toilet use and are more involved in both outdoor activities and feeding. In addition to their poor level of education, the prevalence of *E. histolytica* was found to increase with age (Omar et al., 1991) Table 3: Prevalence of *Entamoeba histolytica* according to the age groups of the patients

**Economical status**

The patients were evaluated according to their socio-economic criteria (Table 4); most of the cases (34.54%) were from moderately developed regions where there is no proper sewage system present. A study (Nematian et al., 2004) showed that a higher family income was related to a lower prevalence of parasitic infection in the children. Both studies (Jarabo et al., 1995) and (Gunduzi et al., 2005) demonstrated that intestinal parasites are more prevalent in school-age children, probably due to the moderate to low socio-economic level and these infections deteriorate the psychological and physical development of the children.

**Table 4: Prevalence of *Entamoeba histolytica* according to the Economical status of 200 children patients**

<table>
<thead>
<tr>
<th>Economic Status</th>
<th>No. Examined</th>
<th>No. +ve</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad</td>
<td>25</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Medium</td>
<td>110</td>
<td>38</td>
<td>34.54</td>
</tr>
<tr>
<td>Good</td>
<td>65</td>
<td>16</td>
<td>24.61</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>60</td>
<td>30</td>
</tr>
</tbody>
</table>

**Maternal education**

Table (5) clarifies the prevalence of *E. histolytica* infection according to the maternal educational status of the children and the higher infection rates were among illiterate mothers (39.24%) and who had school education (25.22%) compare to (10%) with college education. This finding is in agreement with findings of studies in other developing nations. For example, (Curtale et al., 1998) found that the knowledge, perception, and behavior of mothers were helpful in designing and implementing an effective community based intestinal parasites control program in Egypt. (Wamani et al., 2004) found that the mother's education was the best predictor of health and nutrition inequalities among children in rural Uganda. Finally, (Nematian et al., 2004) showed that the better the educational level of the mothers, the lower the parasitic infection rate in children in Iran.

**Table 5: Prevalence of *Entamoeba histolytica* according to the maternal education status of the patients**

<table>
<thead>
<tr>
<th>Maternal Level</th>
<th>No. Examined</th>
<th>No. +ve</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>79</td>
<td>31</td>
<td>39.24</td>
</tr>
<tr>
<td>School</td>
<td>111</td>
<td>28</td>
<td>25.22</td>
</tr>
<tr>
<td>University</td>
<td>10</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>60</td>
<td>30</td>
</tr>
</tbody>
</table>

**Studied months**

The distribution of *E. histolytica* according to the months of the year is shown in Table (6). Although no samples were collected in the summer months, the rate of *E. histolytica* infection as a proportion of the number of stools examined was lowest in November-2010 (8.53%). Fewer samples were collected in the colder months but the highest infection rate of samples was in February-2011 (54.54%) followed by March (52%), January (27.58%) and December (16.66%). The cysts of *E. histolytica* are rapidly killed by temperatures below 5 ºC and above 40 ºC Roberts et al., (1996) In Erbil city the temperature in winter is 0 ºC or less than 5 ºC. Other behavioral factors could be involved, for example, the consumption of drinks with ice, ice cream and raw fruits in ice are associated with *E. histolytica* infection (De Lalla et al., 1992).

**Table 6: Prevalence of *Entamoeba histolytica* according to the studied months.**

<table>
<thead>
<tr>
<th>Months</th>
<th>No. Examined</th>
<th>No. +ve</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>November</td>
<td>82</td>
<td>7</td>
<td>8.53</td>
</tr>
<tr>
<td>December</td>
<td>6</td>
<td>1</td>
<td>16.66</td>
</tr>
<tr>
<td>January</td>
<td>29</td>
<td>8</td>
<td>27.58</td>
</tr>
<tr>
<td>February</td>
<td>33</td>
<td>18</td>
<td>54.54</td>
</tr>
<tr>
<td>March</td>
<td>50</td>
<td>26</td>
<td>52</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>60</td>
<td>30</td>
</tr>
</tbody>
</table>

According to this study, it is concluded that infection with *Entamoeba histolytica* parasites are frequent in children in Erbil-Iraq. Therefore,

a. A periodic survey and treatment of this infected age group is useful.

b. Improvements in the environmental and personal health through public education campaigns, improved sanitation facilities, proper waste and wastewater disposal, control of drinking-water and food safety are highly recommended in Erbil city.

c. Patients with intestinal parasitosis become an
infection focus for the community. If left untreated, serious complications and even death may occur due to parasitic infections. Therefore, public health care employee as well as the officers of municipality and government should cooperate to improve the survival conditions, and also people should be informed about the signs, symptoms and prevention methods of the parasitic diseases.

d. In addition, breastfeeding seems to have a strong impact on early childhood development as well as protection against disease.

REFERENCES


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