

## Factors Associated with High Prevalence of *Entamoeba histolytica/dispar* Infection among Children in Jeddah, KSA

Jamila, S. Al-Malki

Department of Biology,  
Science Collage, Taif University, KSA

**Abstract:** The prevalence and species distribution of *Entamoeba histolytica* and *E. dispar* in the Jadda region were studied. Data were collected by personal interview with all respondents over 5 years of age using a pre-designed questionnaire eliciting sociodemographic data such as age, sex, feeding health situation, education and environmental factors such as water supply. The overall prevalence of this infection was 48%, while the infection in females 48.7% more than male 47.8%. The highest prevalence of parasitic infection in the studied individuals occurred in the age-group are (1 month- 6 years). While the infection in non-breast-feeding compare with breast feeding are 52.6% and 9.1% respectively. The prevalence of parasitic infection in patients used water rainage network 84.8% or non-water rainage network 37.2%. Concerning the relation between *E. histolytica/dispar* and level of education for parent, It was found that the rate of infection in both mother and father was 70% and 92% respectively in Academic education. Concerning the relation between *E. histolytica/dispar* and health situation was 48% and 75% in normal and non normal (physical disability-mental retardation) respectively.

**Key words:** *Entamoeba histolytica /Dispar* amoebiasis • Jeddah • KSA

### INTRODUCTION

Amebiasis is an important parasitic disease in humans [1]. *Entamoeba histolytica* and *Entamoeba dispar* parasitize approximately 10% of the world population of which 90% are asymptomatic infections. The disease was widely distributed in tropical and subtropical areas, especially in poor populations [2]. While the infectious agent was discovered in 1875 by Fedor A. Lösch and the distinction between *E. dispar* and *E. histolytica* was first suspected in 1925, the evidence for the dichotomy in two different species, pathogenic (*E. histolytica*) and nonpathogenic (*E. dispar*), is relatively recent. However, *E. dispar* and *E. histolytica* are morphologically indistinguishable from each other [3].

Amoebiasis is still one of the major public health problems in tropical and sub-tropical areas and it is associated with low socioeconomic status and poor hygiene which favours the indirect faecal-oral transmission of causative parasite [4].

In Saudi Arabia, a high prevalence rates of infection with intestinal parasitic diseases among specific populations including food handlers (14%), Riyadh school children (14.2%), expatriates (55.7%), the Abha community (13.2%) and patients attending hospitals (31.3%) was found as recorded by Al-Shammari *et al.* [5]. In a study in rural southern India, the overall period prevalence of intestinal parasites was 97.4%/month. Another study in Sierra Leone showed a prevalence rate of 73.5%. The higher rates in these communities may be attributed to improper hygiene and agricultural backgrounds [6].

The objective of this work was to investigate the prevalence of *E. histolytica/dispar* infections in children in Jeddah city and to identify associated sociodemographic and environmental factors.

### MATERIALS AND METHODS

A total number of 300 sample of stool collected from patient auditors children to health centers and neighborhoods who suffer from diarrhea was used in this study.

Data were collected by personal interview with all respondents over 5 years of age using a pre-designed questionnaire eliciting sociodemographic data such as age, sex, residence and environmental factors such as water supply and sewage disposal. Each participant gave one stool specimen in a tight-lid plastic container, which was sent immediately to the lab. A wet smear from each specimen in normal saline was examined microscopically for the presence of trophozoites and cysts [7].

Data were checked for completeness and consistency manually, double entered and matched. Program SPSS for data tabulation and analysis was used.

## RESULTS

The prevalence and distribution of *E. histolytica*, *E. dispar* are shown in Table 1. The overall prevalence of this infection was 144(48%), as the infection in females 36(48.7%) more than male 108(47.8%). The highest prevalence of parasitic infection in the studied individuals occurred in the (1month- 6 years) age-group while the least was in the (More than 6 years) age group (Table 2). Relation between *E. histolytica/dispar* and type of feeding, it was found that, the non- breast-feeding compare with breast feeding are 52.6 and 9.1%, respectively (Table 3). Table 4 shows the prevalence of parasitic infection in patients used water rainage network 56(84.8%) or non- water rainage network 87(37.2%). Relation between *E. histolytica/dispar* and level of education for paient, (Table 5). It was found that the rate of infection in both mother and father was 70 and 92%, respectively in Academic education. Concerning the relation between *E. histolytica/dispar* and health situation, it was 48 and 75% in normal and non normal (Physical disability-mental retardation), respectively (Table 6).

Table 1: Relation between *E. histolytica/dispar* and sex.

Sex	Total No.	<i>E. histolytica/dispar</i> infection	
		+ ve	%
Male	226	108	47.8
Female	74	36	48.7
Total	300	144	48

Table 2: Relation between *E. histolytica/dispar* and age.

Age	Total No.	<i>E. histolytica/dispar</i> infection	
		+ ve	%
1month-6 years	171	104	60.8
More than 6 years	129	41	31.8

Table 3: Relation between *E. histolytica/dispar* and type of feeding

Type of feeding	Total No.	<i>E. histolytica/dispar</i> infection	
		+ ve	%
Non- Breast-feeding	289	152	52.6
Breast-feeding	11	1	9.1

Table 4: Relation between *E. histolytica/dispar* and water sources.

	Total No.	<i>E. histolytica/dispar</i> infection	
		+ ve	%
Non- water drainage network	66	56	84.8
water drainage network	234	87	37.2

Table 5: Relation between *E. histolytica/dispar* and level of education for mother and fether

Level of education		Mother	
		+ ve	%
From Primary to Secondary	174	56	32
Academic	126	88	70
Total	300	144	48
		Father	
		+ ve	%
From Primary to Secondary	166	20	12
Academic	134	124	92
Total	300	144	48

Table 6: Relation between *E. histolytica/dispar* and health situation

	Total No.	<i>E. histolytica/dispar</i> infection	
		+ ve	%
Normal	295	141	48
Non-normal (physical disability-mental retardation)	4	3	75

## DISCUSSION

In this study, diarrhea was very common and 144 out of 300 were infected with *E. histolytica/dispar* (Total prevalence 48%) these results were agreed with results reported in different locality in Saudi Arabia. It varies between 55.7 and 41.4% in Riyadh [8, 9] and 40.3% in Jeddah [10] and 46.5% in Abha [11].

The increased prevalence of *E. histolytica/dispar* infections in children in Jeddah city in this study was higher than the previously recorded (8.3%) in the same locality as reported by Al-Shammari *et al.* [5] in Saudi Arabia and that found in other Gulf regions (23% in Al-Ain, UAE) [12]. Also, this is lower than the other studies done in Riyadh [8, 9] and that done in Jeddah [10] Abha [11] and in Al-Khobar [13].

Women were more affected (48.7%) than men (47.8%) with *E.histolytica/dispar* infection in Jeddah city. The infection patterns between men and women were not significantly different.

These rates are still high compared with countries from other parts of the African countries such as Mali (1.9%), but are comparable with the rates in other countries in the Southern African sub-region such as Malawi (14.2%) and Zambia. Females formed the majority of the study population. The high rate of female with *E.histolytica/dispar* infection in Jeddah is due to the fact that most Saudi families favor female housemaids over males for cultural, religious and traditional reasons [14, 15]. Also studies done on the expatriates working in Saudi Arabia reported different prevalence rates. It varies between 55.7 and 41.4% in Riyadh [8, 9] and 40.3% in Jeddah [10] and 46.5% in Abha [11].

Moustafa Abdelaal Hegazi et al. [17] disagreed our results who they recorded that the percentage of male cases of *E.histolytica* male gender was associated with relatively higher risk to have *E.histolytica* infection. This was also observed in other studies where asymptomatic *E.histolytica* infection was equally distributed between the genders with higher proportion of men with invasive amebiasis that was related to male susceptibility to invasive disease in one study [17]. The infection of *E.histolytica* was more prevalent in male hosts (22.36%) compared to female hosts (20.9%) in another study [18].

Concerning relation between *E.histolytica/dispar* and age, it was found that, in this study, there were 60.8 and 31.8% suffering from diarrhea and infected with *E.histolytica/dispar* infection at age from 1 month to 6 years and more than 6 years, respectively. Our observation agreement with results obtained by Tasawar et al. [19] who stated that, the prevalence and species distribution of *Entamoeba histolytica* and *E. dispar* in the Venda region were determined in stool samples collected from public hospitals and primary schools. Also *E.histolytica* was detected in 18.8 and 2.1% samples, whereas 25.3 and 8.5% had *E. dispar* in the hospitals and schools, respectively. The age groups most infected were 02 (33%) years followed by 20–29 years (27%).

Worldwide, diarrheal diseases are a leading cause of pediatric morbidity and mortality, with 1.5 billion episodes and 1.5–2.5 million deaths estimated to occur annually among children < 5 years of age. [20]. Most important is the effect this diarrhea could have on the physical and cognitive development of these children later in their lives [21].

Our finding was agree with the results obtained by Moustafa Abdelaal Hegazi et al. [17] who recorded that, *Entamoeba histolytica* had high prevalence and unusual presentation by affecting high proportion of infants under 1 year; severe clinical manifestations and laboratory findings that were known to be usually encountered in invasive amebiasis as significant neutrophilic leukocytosis for age and positive C-reactive protein were found among more than 50% of admitted Saudi infants and children with *E.histolytica* infection in Jeddah. *E.histolytica* can be a re-emerging serious infection when it finds favorable environmental conditions and host factors which are mainly attributed to inadequate breastfeeding in this study. This may occur in any other area of the world with the same risk factors, so we must be ready to tackle it with effective and more powerful preventive measures [22].

Boss et al. [23] stated that, Considerable number of infants under one year had *E.histolytica* (36.7%) and this was considered as unusual presentation because transmission of *E.histolytica* is frequently associated with contaminated food and water, so *E.histolytica* was found both in the hospital and in the schools. However, *E.histolytica* was less common among primary school children between 5 and 15 years of age. These findings underscore the potential role of *E.histolytica* in morbidity in the study area because the association between *E.histolytica* infections and diarrhea was statistically significant. Similar results have been found in other countries around the world such as Thailand [24].

Concerning relation between *E.histolytica/dispar* and type of feeding, there was highly significant difference between the two type of feeding. Out 152 of 289 (52.6%) of nonbreast-feeding were infected with *E.histolytica/dispar* infection, while in case of breast-feeding the percentage of infection was lowered (9.1%). Our results was coincided with results recorded by Nada [15].

The most important risk factor to acquire *E.histolytica* infection was found to be related to breastfeeding practice with significantly higher percentage of inadequate breast feeding among *E.histolytica* cases, especially infants under one year. This can be explained by the fact that colostrum and mature human milk have significant lethal effect on *E.histolytica* and protect against its infection in breast-fed children [25]. This lethal effect is accomplished by bile salt-stimulated lipase in human milk, which kills *G.lamblia* and *E.histolytica* [26]. Moreover, an important observation of inadequate exclusive breastfeeding and the common practice of bottle

feeding among cases of *E. histolytica* still persisted as documented in several studies conducted in different regions of Saudi Arabia, including Jeddah and in the western region of the kingdom. These studies were alarming for an extremely low prevalence of exclusive breastfeeding in Saudi population which was very far from compliance with even the most conservative *World Health Organization* recommendations of exclusive breastfeeding for 4–6 months. Partial breastfeeding was the trend for feeding in the first 6 months of life, which was accompanied by a rapid decline in lactation duration [27].

The single most common reason cited for the early introduction of bottle feeding was that breast milk was insufficient. Because of this tendency, many mothers practice mixed feeding [28, 29]. Therefore, the high prevalence of *E. histolytica* in infants less than one year in this study was mostly related to the absence of a main protective factor which is breastfeeding [30].

The results of this study were similar to those results obtained by Moustafa Abdelaal Hegazia *et al.* [17].

The increased prevalence of *E. histolytica* among patient who using Non- water drainage network was (84.80%), which higher than the previously recorded prevalence of 37.2% in the people using water drainage network, these might be related to the type of domestic water supply as 100% of *E. histolytica* cases used water from wells for drinking and tap water from home tanks for other purposes and this was associated with a higher risk to have *E. histolytica*. This risk factor was proved to be the sole factor significantly associated with high prevalence rates of *E. histolytica* infection of 9.2% in southwest region of Saudi Arabia compared to other endemic areas. Those who used desalinated water for drinking had the lowest degree of exposure to the risk of infection. Moustafa Abdelaal Hegazi [17] also agreed with result of this study.

Concerning: Relation between *E. histolytica*/dispar and level of education for parent, 144 out of 300 (48.00%) was infected with *E. histolytica*/dispar. It was found that the rate of infection in both mother and father was 70 and 92%, respectively in Academic education. There was significant differences were found between the studied groups in the risk factors of the *E. histolytica*/dispar infection including mother's or father's level of education.

The Kingdom of Saudi Arabia has experienced a rapid socio-economic development in recent years. The improved standards of living have led to a large influx of

expatriate workers from developing countries and hence, one should expect parasitic infections among them Al-Saud [9].

High levels of education on woman in Kingdom of Saudi Arabia lead to work outside the home and adopted by the expatriate labor in the home and raising children.

The expatriate labor, largely coming from Sri Lanka, Indonesia, Philippines, India and Bangladesh, could be expected to have been infection with various types of parasites. They are coming from endemic areas where intestinal parasites are becoming a major health problem in their countries [31, 32]. Studies done on the expatriates working in Saudi Arabia reported different prevalence rates. It varies between 55.7 and 41.4% in Riyadh [10, 11] and 40.3% in Jeddah [10] and 46.5% in Abha [13]. Studies done on the food handlers reported 14% prevalence in Al-Medinah [13] and 7.56% in Dammam and Al-Khobar [14]. The prevalence of parasitic infections among expatriates was higher than in Saudi patients [10, 11].

Studies done on the food handlers reported 14% prevalence in Al-Medinah [12] and 7.56% in Dammam and Al-Khobar [13]. Global migration patterns will continue to promote transmission of human intestinal parasites in the foreseeable future because untreated or incompletely treated infected individuals can serve as roving reservoirs of infection for long-lived parasites [33]. To maintain a low prevalence of such infestations, the government of Saudi Arabia covers the cost of the medical examination, laboratory tests, treatment and medicines. These costs are high, bearing in mind that costs of international medical health care are rising all over the world.

It was concluded that high prevalence of parasites among expatriates should be considered as a pointer to a health problem that may exert its effect on the Saudi society due to the nature of the expatriates' work.

It is recommended that health education should be increased to raise the awareness of the society about such health problems. Among the ways to control this problem is the immediate check-up upon arrival of labor.

Because transmission is frequently associated with contaminated food and water, young infants are not expected to develop amebiasis very often. More severe disease is associated with young age, malnutrition and immunosuppression [34]. It is also documented that the presence of even nonpathogenic amoebae in the stool indicates a reservoir of infection and low standard of hygiene among the population [35]. That was emphasised by another study, which showed that an infection with *E. histolytica* and *E. dispar* was significantly associated

with an *Entamoeba coli* infection [36]. That was noticed in this study where there was low prevalence of *E. coli* in nearly all nationalities, Moustafa Abdelaal Hegazi [17].

Concerning the relation between *E. histolytica*/dispar and health situation was 48 and 75% in normal and non normal (Physical disability-mental retardation), respectively. *E. histolytica* was found in 5 (16.12%) of the 31 HIV-positive individuals and in 33 (15.5%) of the 213 HIV-negative individuals. *E. histolytica* infections are common in the Venda region and are associated with diarrhea and intestinal inflammation.[37, 38].

In our study, diarrhea as resules from infection with *E. histolytica*/dispar was very common and was present in 75% of non normal specimens is in agreement with data recorded by Heird [37] and Eveland *et al.* [39]. They stated that it is well known that chronic diarrhea is one of the major AIDS-defining illnesses in World Health Organizaiton (WHO) classification and occurs in 60–90% of HIV-infected patients in Africa. In a Swiss Cohort Study, diarrhea was found to be an independent predictor of poor survival among patients with HIV and AIDS Acuna-Soto *et al.* [18] and Tasawar *et al.* [19]. 36,37 and 40. The y were concluded that, *E. histolytica* seems to be common in the Venda region of South Africa among patients with HIV and AIDS. Mixed infections were especially frequent as opposed to other areas in the world such as Japan [41].

**Recommendations:** It was concluded that high prevalence of parasites among expatriates should be considered as a pointer to a health problem that may exert its effect on the Saudi society due to the nature of the expatriates' work.

It is recommended that health education should be increased to raise the awareness of the society about such health problems. Among the ways to control this problem is the immediate check-up upon arrival of labor. This study raised the need for targeted breastfeeding education. Health care providers should be encouraged to continuously educate Saudi women on the benefits of breast feeding. There may be a need to revise the media campaign for promoting breast feeding. Improved water supplies should be used, including protection of community wells and domestic storage tanks, together with mandatory inspection measures during transportation and distribution of commercial water to reduce the rate of infection with of *Entamaeba histolytica* / *dispar* infection in Jeddah, KSA. It was concluded that high prevalence of parasites among expatriates should be considered as a pointer to a health

problem that may exert its effect on the Saudi society due to the nature of the expatriates' work. It is recommended that health education should be increased to raise the awareness of the society about such health problems. Among the ways to control this problem is the immediate check-up upon arrival of labor. The study of genetic and antigenic profiles will shed more light on the pathogenicity of this important protozoal infection and provide insight into improved control measures such as improved water and sanitation and vaccine and drug development.

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