Short Communication

The Incidence and Predictive Factors Associated with Severity of Amebiasis among Children at Kut City, Middle Iraq

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Abstract

Background: Amebiasis is a parasitic disease. Its causative agent is *Entamoeba histolytica*. Yearly, about 50 million people are affected by amebiasis, which produces 100,000 deaths yearly, especially in developing countries. **Objective:** This study aimed to identify the incidence of amebiasis in Kut City and the predictive factors of the severity of amebiasis among children. **Materials and Methods:** A descriptive-analytical study was conducted at three hospitals in Kut city/Wasit governorate, middle Iraq, for 12 months from 1st June 2022 until 31st May 2023. A total of 421 stools were taken from participants suffering from diarrhea and examined by microscopy by wet smear and iodine to find cysts, trophozoites, or both to detect the presence of the parasitic infection. Afterward, *E. histolytica* Rapid Test Cassette was used for the qualitative detection of *E. histolytica* antigens in human feces. **Results:** The age group <5 years old had the highest recorded percentage of amebiasis (41.1%). Males made up more than half (52.7%) compared to females (47.3%). Infected children came from rural areas (58.7%) and urban areas (41.3%). The study results demonstrate that the incidence rate was 9 per 1000 children aged <5 years, 8 per 1000 for children aged 5 to <10 years old, and 6 per 1000 children aged between 10 and 14 years old. Children's age, residence, mother's education, type of water, and sewage disposal are predictive factors of the severity of amebiasis. **Conclusion:** The high incidence rate of amebiasis in Kut City is the main conclusion of the current study. A comprehensive community-based health education program is recommended to reduce the disease's incidence.

Keywords: Amebiasis, incidence, prediction, rapid test, risk factors

Introduction

Amebiasis is a parasitic disease. Its causative agent *Entamoeba histolytica* is considered a protozoan pathogen for humans. Every year, about 50 million people are affected by this invasive disease, and it produces 100,000 deaths yearly, especially in developing countries.[1,2] The majority of amebiasis cases are asymptomatic, but the infection can lead to two severe infections: amebic colitis and amebic liver abscess.[3] Several weeks of cramping, abdominal pain, watery or bloody diarrhea, and weight loss may be the symptoms of an invasive intestinal disease. Liver abscess, pneumonia, purulent pericarditis, and cerebral amebiasis have been defined as a complication of extra-intestinal infection.[4] The usage of undercooked, raw vegetables, drinking polluted water, unsanitary conditions, and inadequate sanitation were the main means by which this parasite was spread.[5]

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Cysts from contaminated food or water are typically the cause of infection. The cysts grow in the small intestine after consumption and discharge the trophozoites into the colon. These organisms can survive in the colon and consume colonizing bacteria and mucosal cells.[6]

The study aimed to identify the incidence of amebiasis in Kut City and to determine the predictive factors of the severity of amebiasis among children.

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Materials and Methods

Before running the study, ethical approval was obtained from the University of Sousse Faculty of Medicine Ibn Al-Jazzar, Tunisia, and the Ministry of Health, Wasit health office. In addition, written consent was obtained from the parents of the studied participants. A descriptive-analytical study design was selected to achieve the current study aims. It was conducted at three hospitals (Al-Zahraa Teaching Hospital, Al-Karama Hospital, and Al-Batool Hospital) in Kut City/Wasit Governorate, middle Iraq. The study period was for 12 months from 1st June 2022 to 31st May 2023 devoted to actual incidence data collection. The cases of the study were defined as children from both sexes having diarrheal disease at age group (hours-14) years attended these hospitals. The exclusion criteria were children with immunological diseases, underweight children, and participants who did not complete the investigation or data. The present sample included 421 children selected by a simple random sample. The patient sheet that is used to collect children's data consists of two domains. The first one was about personal Information (age, gender, feeding history, sewage disposal, animal contact, sources of drinking water, and family members infected). The second domain includes laboratory examination (microscopic stool examination and antigenic examination).

A stool sample was taken from children for laboratory examination to detect the parasite. 3 g of stool were placed on a glass slide. A stool is mixed with one drop of normal saline and one drop of iodine on a slide, and it is then covered with a cover slide (24–24 mm). After the magnification of 40× of slides, the results were expressed as the presence of cysts, trophozoites, or both per gram of feces. Erythrophagocytosis is an essential diagnostic feature for *E. histolytica* trophozoites, and the cyst appears under the microscope in a circular shape, containing four nuclei that are central and distributed in the cytoplasm. Then *E. histolytica* Rapid Test Cassette (Catalogue Number: RAPG-ENT-001) was used for the qualitative detection of *E. histolytica* antigens in human feces.

Statistical Package for Social Sciences (SPSS) version 26 was used to analyze data. Descriptive and inferential statistic was used.

Results

Table 1 showed that the age group <5 years old had the highest recorded percentage (41.1%). In terms of sex, males made up more than half (52.7%) compared to females (47.3%). In terms of residence, the major number of survey participants came from rural areas (58.7%) rather than from urban areas (41.3%), and 47.3% and 36.3% of children belong to low and moderate socioeconomic status, respectively. Regarding the mothers' education, primary school graduates predominated (29.0%). The majority of the participants had animal contact (50.8%), water sources (62.7%), consumed Ro water, had common drainage (63.2%), and had no prior amebiasis history (61.5%).

The study result reveals that about half (50.8%) of samples had both (cyst and trophozoite) at microscopic stool examination. According to color and consistency, the highest percentage was mucoid greenish (30.2%). 33.7% of total samples were with more than 4 Pus/high power field (HPF) while regarding the presence of red blood cells (RBCs). 40.1% had 1–2 RBCs/ HPF [Table 2]. In Table 3, the current study results demonstrate that the incidence rate was 9 per 1000 children aged <5 years, 8 per 1000 for children aged 5 to <10 years old, and 6 per 1000 children aged between 10 and 14 years old. In terms of gender, the incidence rate among males was 0.008, while among females was 0.009. Finally, the incidence rate of amebiasis in rural areas was 0.011 compared with urban areas (0.006).

The present study results shown in Table 4 reveal a statistical association between age, residence, and incidence rate of amebiasis at P value = 0.000 and 0.024, respectively.

Simple linear regression test indicated that the children's age (β= −0.128; P = 0.004), residence (β = 0.287; P = 0.000), mothers education (β= −0.255; P = 0.000), type of water (β= -0.085; P = 0.048), and absence of sewage disposal (β= −0.201; P = 0.000) are predictive factors of amebiasis's severity [Table 5].

Table 1: Demographic characteristics for the children with amebiasis

Variables	Classification	No.	%
Age/years	<5 years	173	41.1
	5 to <10 years old	143	34.0
	10–14 years old	105	24.9
Gender	Male	222	52.7
	Female	199	47.3
Residents	Urban	174	41.3
	Rural	247	58.7
SES*	Good	69	16.4
	Moderate	153	36.3
	Bad	199	47.3
Mothers' education	Illiterate	110	26.1
	Primary school	122	29.0
	Middle school	97	23.0
	Secondary school	92	21.9
Animals contact	Yes	214	50.8
	No	207	49.2
Type of water	Tap water	89	21.1
	RO*	264	62.7
	Bottle	68	16.2
Sewage disposal	Common drainage	266	63.2
	Others	155	36.8
Family history of infection	Yes	162	38.5
	No	259	61.5

No = number; % = percentage; SES= socioeconomic status; RO = reverse osmosis

Table 2: Microscopic characteristics of stool samples from *E. histolytica*-infected children

Characteristics	Classification	No.	%
Stage	Cyst	41	9.7
	Trophozoite	166	39.4
	Both	214	50.8
Color and consistency	Soft brown	93	22.1
	Mucoid greenish	127	30.2
	Mucoid brown	43	10.2
	Liquid brown	56	13.3
	Mucoid bloody	8	1.9
	Liquid yellow	4	1.0
	Liquid greenish	14	3.3
	Mucoid brown	76	18.1
Pus/HPF	1–2	80	19.0
	2–3	87	20.7
	3–4	112	26.6
	More	142	33.7
RBCs/ HPF	0–1	169	40.1
	1–2	79	18.8
	2–3	70	16.6
	more	103	24.5

HPF= high power field; RBCs = red blood cell

Table 3: Incidence rate of amebiasis for 12 months according to demographic features of children

Variables		Incidence rate
Age	<5 years	0.009
	5 to <10 years old	0.008
	10–14 years old	0.006
Gender	Male	0.008
	Female	0.009
Residence	Urban	0.006
	Rural	0.011

Table 4: Correlation between amoebiasis incidence and demographic characteristics

Variables	R	Significant
Age	−1.000**	0.000
Gender	−0.029	0.553
Residence	0.110*	0.024

** Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

R = correlation

Discussion

According to World Health Organization (WHO) statistics, about 450 million children and infants globally are infected with parasitic pathogens. The most common causes of these infections are Giardiasis and amebiasis. A total of 421 children suffering from watery or bloody diarrhea and abdominal pain were examined. Samples of stools were detected by direct microscopic examination and then by rapid antigenic test. The results revealed that the overall incidence rate of amebiasis among children was 0.023. This result agrees with Rahi and Majeed[7] at Wasit province, who reported that *E. histolytica* had a prevalence of 0.41.

Children under the age of five years make up 41.1% of the sample, and 58.7% of them reside in rural areas. This result came in line with Jaffar and Merdaw[8] in Wasit province in 2021 and Ahmed *et al.*[9] at Wasit province in 2023. The reason for this is that children at this age lack awareness about hygienic practices and have a low adaptive immune system. In addition to that, rural areas in Kut City lack healthy water sources and have poor lifestyles.

The present study findings showed that 52.7% were male while the female was 47.3%. This agrees with the findings of Hasan *et al*.[10] at Duhok province in 2022, who found out that males were more likely than females to be infected with *Entamoeba spp*. (67.43% vs. 32.56%). The current results indicate that 83.6% of infected children have poor or moderate socioeconomic status.[11] This finding is consistent with numerous studies, including those conducted in Mexico by Zavala *et al*. in 2020 and in Sebha, Libya, by ESalem *et al*. in 2017, and in Lebanon by Naous *et al*. in 2013.[12-14]

The current study's findings show that 29% of the mothers of affected children had a primary school education. These results concur with those of Mutalik.[15] According to a study in India, nearly 57% of women had at least a high school diploma, 10% had a college degree, and 36% were illiterate. However, this runs counter to a 2017 study by Salem *et al*. carried out in Sebha, Libya.[12,14]

At a *P* value of 0.004, the results showed a statistical relationship between age and the incidence of *E. histolytica*; these findings coincided with those of Hawash in Taif, Saudi Arabia, in 2017.[16]

The current results reveal that children's age, residents, mother's education, SES, type of water, and sewage disposal are factors that can predict the severity of amebiasis. These results come in line with many studies conducted in Iraq in different governorates such as Jameel and Eassa[17] in Duhok city, Hameed *et al*.[18] in Kirkuk province, Dhubyan Mohammed Zaki[19] in Mosul, and Hasan *et al*.[20] in Duhok city, and Al-Jawabreh *et al*.[21] in Palestine.

This may be due to the immature immune system of children; they spend more time outdoors, or they are curious and explore their environment without practicing good hygiene. The impact is more prominent when there is a lack of infrastructure in the immediate area, such as functional sewage systems, clean water, exposure to waste from dirty streets, and insufficient disposal facilities. Also, SES has a significant role as a direct result of malnutrition and lack of healthy living conditions.[22-23]

Conclusion

The high incidence rate of amebiasis in Kut City is the main conclusion of the current study, in addition to many factors that play an important role in increasing disease

Table 5: Liner regression for predictive factors of severity of amebiasis

Variables	Unstandardized Coefficients		Standardized Coefficients	t	Significant incidence rate
	B	Standard error	Beta		
Age/years	−0.059	0.020	−0.128	−2.883	0.004
Gender	0.005	0.062	0.004	0.083	0.934
Residents	0.385	0.060	0.287	6.406	0.000
SES	−0.118	0.053	−0.109	−2.254	0.025
Mothers' education	−0.154	0.028	−0.255	−5.529	0.000
Animals contact	0.081	0.060	0.061	1.342	0.180
Type of water	−0.093	0.049	−0.085	−1.900	0.048
Sewage disposal	−0.276	0.062	−0.201	−4.457	0.000
Family history of infection	0.013	0.060	0.009	0.210	0.834

Dependent variable: stages of amebiasis

severity and incidences like children's age, residents, mother's education, type of water, and sewage disposal. A comprehensive community-based health education program is recommended to reduce the disease incidence.

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Conflicts of interest

There are no conflicts of interest.

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