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PREVALENCE OF *ENTAMOEBA HISTOLYTICA* AND *GIARDIA LAMBLIA* IN CHILDREN IN DUHOK PROVINCE, KURDISTAN REGION, IRAQ

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ABSTRACT

Objective: *Entamoeba histolytica* and *Giardia lamblia* are common serious public health problems in children in developing countries. The purpose of this study was to determine the prevalence of these parasites among children in Duhok Province, Kurdistan region, Iraq. Six hundred stool samples were collected from children of both sexes and different age groups from ages 2-12 years living in Duhok city and some nearby villages, who visited an outpatient clinic (Hevi Pediatric Hospital) and some Private Laboratories (Vin Private laboratory and Sardam Private laboratory), Iraqi Kurdistan, during the period from June – November of 2021.The samples were examined microscopically by both direct and flotation methods for detection of both parasites including *Entamoeba histolytica* and *Giardia lamblia.*

Results: The prevalence of *Entamoeba histolytica* and *Giardia lamblia* among the 600 children were 47.66% -15.55%, respectively. The highest rate of both Amoebiasis and Giardiasis was found in children that the origin of the drinking water was tap water at a rate of 83.0% and the lower rate was in children that the origin of the drinking water was distilled water at 17.0%. This suggests that gastrointestinal parasites continue to be a public health concern in areas where sanitation and hygiene measures are narrow. A significant difference was shown between the females and males in both cases (Amoebiasis and Giardiasis) at a P value > 0.05. In the case of Amoebiasis the infection rate was higher in females than in males (69.9 %, 30.1%).) respectively. Also in the case of Giardiasis was higher in females than males respectively (64.5%, 35.5%) this difference was statistically significant at a P<0.05. This suggested that these two intestinal parasites remain a challenging public health concern wherever sanitation and health measures are inadequate.

In conclusion: Urgent steps, such as long-term control measures and the improvement of personal hygiene practices, as well as sanitary and living conditions, must be taken.

KEYWORDS: Prevalence, Amoebiasis, Giardiasis, Children, Drinking water

INTRODUCTION

Intestinal parasites are a major medical issue that has a significant impact on public health and causes significant morbidity and mortality in developing countries, including Iraq, where many factors, including climatic, ecological, socioeconomic, and sanitary conditions, favor their spread. Furthermore, infection with these pathogenic parasites has been linked to gastrointestinal diseases and malnutrition, especially in young children (Hajissa et al., 2008; Speich et al., 2013; Wegayehu et al., 2013).

There are several pathogenic gastrointestinal (GIT) parasites that could be the main cause of the above medical problem. There are two pathogenic gastrointestinal parasites including *Entamoeba histolytica* and *Giardia lamblia*, being the most common and significant causes of illnesses in developing countries. *Entamoeba histolytica* is the causative agent of amoebiasis and it is a major parasite of the human gastrointestinal tract (Adam et al., 2016). Amoebiasis is the third most common cause of death among parasitic diseases, following malaria and schistosomiasis (Ouattara et al., 2010). This parasite causes amoebic dysentery, amoebic colitis, and amoebic liver abscess, resulting in nearly 100,000 deaths each year (Bazzaz et al., 2017). *Giardia lamblia* is regarded as another significant cause of GIT diseases among humans worldwide, and approximately 5-10% of the world's population is at risk of giardiasis, which is considered one of the most important non-viral causes of

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diarrhoeal diseases in humans (Homan and Mank, 2001).

The prevalence of amoebiasis varies with the population of people being affected, between nations, and between financial zones (Haque and Petri, 2006). In Iraq, there are two pathogenic gastrointestinal parasites that are commonly distributed and have a significant challenging problem for health agencies due to inadequate education, poor sanitation, and inappropriate human waste. This, results in contamination of drinking water and food and economic hardship (Haque and Petri, 2006; Fekadu et al., 2013). *Entamoeba histolytica* and *Giardia lamblia* are two pathogenic parasites that are thought to be major causes of recurring abdominal pain in children. Therefore, the goal of the present study was to study the prevalence and occurrence of *Entamoeba histolytica* and *Giardia lamblia* in Pediatric hospitals in Duhok City, Iraq.

MATERIALS AND METHODS

Six hundred stool samples were collected from children of both sexes and different age groups from ages 2-12 years living in Duhok city and some nearby villages, who visited an outpatient clinic (Hevi Pediatric Hospital) and some Private Laboratories (Vin Private laboratory and Sardam Private laboratory), Iraqi Kurdistan, during the period from June – November of 2021. From each child, approximately 10g of fresh stool was taken and collected in a clean sterile screw disposable plastic stool cup and labeled clearly with the child's name, gender, age, address, and date of collection. The collected stool samples were examined directly by both direct stool smear and concentration flotation methods by using saturated sugar solution for identification of both morphological stages of Entamoeba histolytica trophozoites and cysts**.**

RESULTS

A total of six hundred fresh stool samples were examined microscopically. From the 600stool samples that were examined, 286 children were found infected with Amoebiasis, and 93 children were found infected with Giardiasis in the present study, as shown in Table.1. The highest rate of infection was found in children when the origin of the drinking water was tap water 83.0% and the lower rate was in children when the origin of the drinking water was Distilled water at 17.0% and other features are summarized in the Table 1

Table (1): Demographic features of children have participated in this study

Variable	Categories	Frequency	%
Sex	Female	324	54.0
	Male	276	46.0
Age Group	1-3	153	25.5
	4-6	298	49.7
	7-9	84	14.0
	10-12	65	10.8
Origin of Drinking Water	Tap water	498	83.0
	Distilled water	102	17.0
Amoebiasis	Positive	286	47.7
	Negative	314	52.3
Giardiasis	Positive	93	15.5
	Negative	507	*84.5*

The distribution of amoebiasis through several age groups is shown in Table 2. It was clear, that the highest rate of amoebiasis occurred in the age groups 4-6 and 7-9 years old which were 66.66% and 58. 88% respectively from the total samples examined for this group and 49.0 % and 37.1% from the total number of infected cases. The rate of amoebiasis was lower in age groups (1-3) and (10-12) years since it was 16.66% and 25.0 % respectively from the total number of samples examined for these ages.

Table (2): Prevalence of Amoebiasis according to the age group:

Age group	Cases of Amoebiasis	Infection rate (%)	Total No. exam for each age group	Positive from total infected cases (%)
1-3	25	16.66	150	8.7
4-6	140	66.66	210	49.0
7-9	106	58.88	180	37.1
10-12	15	25.0	60	5.2
Total	286	47.66	600	100%

Statistically significant at P<0.05

The distribution of Giardiasis through several age groups is shown in Table 3. It was clear; that the highest rate of Giardiasis occurred in the age groups 4-6 and 7-9 years old which were 18.09% and 17.22% respectively from the total samples examined for this group and it was 40.9 % and 33.3% from the total number of infected cases. The rate of Giardiasis was lower in age groups (1-3) and (10-12) years because the rate of infection was 10.0% and 15.0% respectively from the total number of samples examined for these ages.

Table (3): Prevalence of Giardiasis according to the age group:

Age group	Cases of Giardiasis	Infection rate (%)	Total No. exam for each age group	Positive from total infected cases (%)
1-3	15	10.0	150	16.1
4-6	38	18.09	210	40.9
7-9	31	17.22	180	33.3
10-12	9	15.0	60	9.7
Total	93	15.5	600	100%

Statistically significant at P<0.05

Table 4: shows the distribution of Amoebiasis and Giardiasis, significant difference was shown between the females and males in both cases (Amoebiasis and Giardiasis) at a P value > 0.05. In the case of Amoebiasis, the infection rate was higher in females than in males (69.9 %, 30.1%).) respectively. Also in the case of Giardiasis was higher in females than males respectively (64.5%, 35.5%) this difference was statistically significant at P<0.05

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Table (4): Positive cases of Amoebiasis and Giardiasis according to the age group and sex:

Age group and sex		*E. histolytica* cases	*G. lamblia* cases
1-3	Female	18	9
	Male	7	6
4-6	Female	96	21
	Male	44	17
7-9	Female	75	25
	Male	31	6
10-12	Female	11	5
	Male	4	4
Total	Female	200 (69.9 %)	60 (64.5%)
	Males	86 (30.1%)	33 (35.5%)
Overall		286	93

Statistically significant at P<0.05

DISCUSSION

Entamoebea histolytica and *Giardia lamblia* are the major parasitic health issue in children and their prevalence rates are varies depending on the level of hygiene and level of life. The purpose of this study was to determine the prevalence of two gastrointestinal parasites in children *Entamoebia histolytica* and *Giardia lamblia*

According to the findings of the present study, the infection rate with Amoebiasis and Giardiasis among the children in Duhok Province, Kurdistan Region, Iraq was (47.66% - 15.55%) respectively. This is in agreement with previous research that showed E. histolytica cysts can live up to one month in water and for at least two weeks in a humid, cool place. They can also survive passage through the intestines of flies and cockroaches and are resistant to chlorine levels typically used for water purification. However, these properties lack G. lamblia cysts (Al-khikani et al., 2019).These results are similar to the results of the study done in the north of Iraq, in Duhok and Erbil Cities by Yilmaz and Abdullah (2017). Another similar study was done by Omar Barwari and Ismael (2010) in Duhok city, they approved that the infection rate of Amoebiasis was higher than Giardiasis in Children (79.2%- 20.8%) respectively. These results disagreed with the results of the two studies done in Iran by Kia et al. (2008) and Dhubyan Mohammed Zaki (2022), they recorded that the infection rate of Giardiasis was higher in children than Amoebiasis. Nasiri et al., 2009, also recorded that the infection rate of Giardiasis was higher than Amoebiasis in children of Tehran, Iran. They hypothesized that this was because of immigration from endemic regions and immigration from various parts of the nation. As a result, Iran has continued to place a high priority on screening for intestinal parasitic infections.

In the current study, the prevalence of Amoebiasis and Giardiasis among children showed that females are more susceptible to infection than males (69.9 % and 64.5%) and (30.1% and 35.5%) respectively and this is not significant statistically, because the number of females participated in this study was higher than the number of males was (324 and 276) respectively. Similar data were reported in Erbil City, North of Iraq by Faqe Mahmood & Mustafa (2020), who approved that the infection rate of Amoebiasis was higher in females than the males. This data disagreed with data from a study done in the Duhok, province by Hasan et al. (2022), who suggested that the prevalence of Amoebiasis was higher in males than females (67.43% and 32.56%) respectively. The prevalence was higher in females than in males, according to a study by Nyenke et al. (2008), but the difference was not statistically significant at a $P < 0.05$. However, these results disagree with the results of Dogara, (2020), who recorded that

the prevalence of infection was higher in males than females (58.0% and 42%) respectively. The difference in infection rates between men and women may be due to the hormonal, behavioral, and immune response of the host (Sellau et al., 2020). Additionally, men are the working outside the house more than the female and are more susceptible to environmental contact, and they consume food and drink from street markets and in public settings, which raises their risk of contracting an infection (Tasawar et al., 2010; Singh et al., 2021)

The highest rate of infection was found in children when the origin of the drinking water was tap water than Distilled water (83.0% and 17.0%). Because the main source of infection with Amoebiasis and giardiasis is water, and it contains an infective stage (mature cysts). The water supply is contaminated with the stool of infected animals or humans. No matter the source and handling of water can easily contaminate it, especially in settings where caregiver sanitation and personal hygiene are generally subpar. By using contaminated hands and utensils, it is simple to contaminate food and drink. These data are similar to that that reported by Inaboet et al. (2002), who reported the infection rate was higher in children when the origin of the drinking water was tap water than Distilled water. This may be due to inadequate sanitation of drinking water and poor public health.

Conclusion: Urgent steps, such as long-term control measures and the improvement of personal hygiene practices, as well as sanitary and living conditions, must be taken.

REFERENCES

Adam, E. A., Yoder, J. S., Gould, L. H., Hlavsa, M. C., Gargano, & J. W. (2016). Giardiasis outbreaks in the United States, 1971-2011. *Epidemiol , Infect*.144(13):2790-2801. doi:10.1017/S0950268815003040

Al Saqur, I. M., Al-Warid, H. S., & Albahadely, H. S. (2017). The prevalence of *Giardia lamblia* and *Entamoeba histolytica/dispar* among Iraqi provinces. Karbala International Journal of Modern Science, 3(2): 93-96

AL-Khikani, F. H., Almosawey, H. A., Hameed, R. M., alhussain, B. A., Ayit, A. S., Al-Ibraheemi, M. K., & Alsalami, M. M. (2019). Prevalence of *Entamoeba histolytica* and *Giardia lamblia* Associated with Infectious Diarrhea in Al-Shomally population, Babil, Iraq. Biomed Biotechnol Res J., 9(3):245-248

Bazzaz, A. A., Shakir, O. M. & Alabbasy, R. H. (2017). Prevalence of two gastrointestinal parasites *Entamoeba histolytica* and *Giardia lamblia* within Samarra city, Iraq. Advances in Biosci and Biotechnol., 8:399.

Bobbi, S., Pritt, M. D., & Clark, G. (2008). Amebiasis. Mayo Clin Proc., 83 (10): 1154-60.

Chacin-Bonilla, L. (2013). Amebiasis: aspectos clínicos, terapéuticos y de diagnóstico de la infección. Rev Med Chile., 141: 609-615

Dhubyan Mohammed Zaki Z. (2022). Prevalence of *Entamoeba histolytica* and *Giardia Lamblia* Associated with Diarrhea in Children referring to lbn Al-Atheer Hospital in Mosul, Iraq. *Archives of Razi Institute*, *77*(1): 73–79. https://doi.org/10.22092/ARI.2021.356312.1820

Dogara, M. M. (2020). Prevalence of Amoebiasis among Children Aged 0-12 years in Health Facilities in Dutse Local Government Area. 6: 259 - 268.

Faqe Mahmood, S. A., & Mustafa, H. B. (2020). Molecular Identification and Prevalence of *Entamoeba histolytica*, *Entamoeba dispar* and *Entamoeba moshkovskii* in Erbil City, Northern Iraq. *Polish journal of microbiology*, *69*(3): 1–10. https://doi.org/10.33073/pjm-2020-028

Fekadu S., Taye K., Teshome, W., & Asnake, S. (2013). Prevalence of parasitic infections in HIV-positive patients in southern Ethiopia: a cross-sectional study.J Infect Dev Ctries., 7:868-72.

Ghandour, A. M., Zahid, N. Z., Banaja, A. A., Kamal, K. B., & Bouq, A. I. (1995). Zoonotic intestinal parasites of hamadryas baboons, Papio hamadryas, in the western and northern regions of Saudi Arabia. J. Trop. Med. Hyg., 98: 431-439.

Graczyk, T. K., Knight, R., & Tamang, L. (2005). Mechanical transmission of Human protozoan parasites by Insects. Clin. Microbiol. Rev., 18(1): 128-132.

Hajissa, K., Abd Elha Pritt, B.S., & Clark, C.G., (2008). Amebiasis Mayo Clinic Proceedings, 83 (10):1154-1160 Research 1(2):130-134

Haque, R., & Petri, Jr, W.A. (2006). Diagnosis of amoebiasis in Bangladesh.Archives of Medical Research, 37:273-276.

Hasan, H. K., Mero, W. M. S., & Mohammed,A. B. (2022). A comparison of the efficiency of microscopic and ELISA techniques in the diagnosis of Entamoeba species in Duhok province, Kurdistan region /Iraq. Bulletin of

National Institute of Health Sciences. 140(6):1343-4292

Homan, W. L., & Mank, T. G. (2001). Human giardiasis: genotype linked differences in clinical symptomatology. Int J Parasitol., 31: 822-6.

Inabo, H., Galadima, M., Ogbadu, L.J., & Okuofu, C.A. (2000).Prevalence of Entamoeba histolytica and Giardia lamblia in primary school pupils in five rural villages around Kaduna and Zaria, Nigeria.The Nigerian Journal of Parasitology, 21: 61-67.

Kia, E. B., Hosseini, M., Nilforoushan, M. R., et al. (2008). Study of Intestinal Protozoan Parasites in Rural Inhabitants of Mazandaran Province, Northern Iran. *Iranian J Parasitol*, 3(1):21-25.

Leber, A. L., & Novak, S. M. (2011). Intestinal and urogenital Amebae, flagellates, and ciliates.In Manual of Clinical Microbiology. Volume 2. 10th ed. Edited by Murray, P. R., Baron, E. J., Pfaller, M. A., Tenover, F. C., & Yolken, R. H. Washington, DC: ASM Press., 1391– 1405.

Nasiri, V., Esmailnia, K., Karim, G., Nasir, M., & Akhavan, O. (2009). Intestinal parasitic infections among inhabitants of Karaj City, Tehran province, Iran in 2006-2008. *The Korean journal of parasitology*, *47*(3): 265–268. https://doi.org/10.3347/kjp.2009.47.3.265

Nyenke, C., Chukwujekwu, D. C., Stanley, H. O., & Awoibi, N. K. (2008).Prevalence of Intestinal Amoebiasis in Infant and Junior School Children in Degema General Hospital and Environs,J. Appl. Sci. Environ. Manage., 12(3): 83 – 87.

Omar Barwari, A. J., & Ismael, S.S. (2011). Detection of Pathogenic Strains of Entamoeba Histolytica in Children Using ELISA Technique in Duhok. Detection of Pathogenic Strains of Entamoeba Histolytica in Children Using ELISA Technique in Duhok, 8(2): 109-119.

Ouattara, M., N'Guéssan, N. A., Yapi, A. , & N'Goran, E. K. (2010). Prevalence and spatial distribution of Entamoeba histolytica/dispar and Giardia lamblia among schoolchildren in Agboville area (Côte d'Ivoire). PLoS Negl Trop Dis., 4: e57

Ralston, K. S., & Petri, W.A. Jr. (2011). Tissue destruction and invasion by *Entamoeba histolytica*. Trends Parasitol., 27 (6):253-62.

Sellau, J., Groneberg, M., Fehling, H., Thye, T., Hoenow, S., Marggraff, C., Weskamm, M., Hansen, C., Stanelle-Bertram, S., Kuehl, S., Noll, J., Wolf, V., Metwally, N., Hagen, S., Dorn, C., Wernecke, J., Ittrich, H., Tannich, E., Jacobs, T., Bruchhaus, I., Altfeld, M., & Lotter, H. (2020). Androgens predispose males to monocyte-mediated immunopathology by inducing the expression of leukocyte recruitment factor CXCL 1. Nature communications, 11(1): 3459

Singh, A., Banerjee, T., Khan, U., & Shukla, S. (2021). Epidemiology of clinically relevant Entamoeba spp. (E. histolytica/dispar/moshkovskii/bangladeshi): A cross sectional study from North India. PLoS neglected tropical diseases, 15(9): e0009762

Speich, B., Marti, H., Ame, S. M., Ali, S. M., Bogoch, I.I., Utzinger, J., et al. (2013). Prevalence of intestinal protozoa infection among school-aged children on Pemba Island, Tanzania, and effect of single-dose albendazole, nitazoxanide and albendazole-nitazoxanide. Parasit Vectors., 6:3

Stanley, S. L. Jr. (2003). Amoebiasis. Lancet, 361: 1025- 1034.

Tasawar, Z., Kausar, S., & Lashari, M. (2010). Prevalence of Entamoeba histolytica in humans. Pakistan journal of pharmaceutical sciences, 23(3):344–348.

Wegayehu, T., Tsalla, T., Seifu, B., & Teklu, T. (2013). Prevalence of Intestinal parasitic infections among highland and lowland dwellers in Gamo area, South Ethiopia.BMC Public Health, 13:151.

Yilmaz, H., & Abdullah, A. M. (2017). Prevalence of Intestinal Parasites (Entamoeba species and *Giardia lamblia*) in Duhok and Erbil cities, Northern Iraq. J Microbiol Exp., 4(6): 00132. DOI: 10.15406/jmen.2017.04.00132

الخلاصة

الهدف: تعتبر *Entamoeba histolytica* و *Giardia lamblia* من مشاكل الصحة العامة الخطيرة الشائعة لدى الأطفال في البلدان النامية. الهدف من هذه الدراسة هو تحديد مدى انتشار هذه الطفيليات بين الأطفال في محافظة دهوك ، إقليم كردستان العراق. تم جمع ستمائة عينة براز من أطفال من كلا الجنسين وفئات عمرية مختلفة تتراوح أعمارهم بين 2-12 سنة يعيشون في مدينة دهوك وبعض القرى المجاورة ، الذين زاروا العيادة الخارجية (مستشفى هيفي للأطفال) وبعض المختبرات الخاصة (معمل فين الخاص ومختبر سردم الخاص) ، كردستان العراق ، خلال الفترة من حزيران - تشرين الثاني من عام 2021 وتم فحصها مجهرياً بالطريقة المباشرة وطريقة التعويم للكشف عن الطفيليات بما في ذلك *Entamoeba histolytica* و *Giardia lamblia*.

النتائج: كانت نسبة انتشار المتحولة الحالة للنسج والجيارديا اللمبلية بين 600 طفل (47.66٪ - 15.55٪) على التوالي. تم العثور على أعلى معدل لكل من داء الأميبات وداء الجيارديات عند الأطفال أن مصدر مياه الشرب كان ماء الصنبور 83.0٪ وكان أقل معدل عند الأطفال أن مصدر مياه الشرب كان الماء المقطر 17.0٪. هذا يشير إلى أن الطفيليات المعدية المعوية لا تزال تشكل مصدر قلق للصحة العامة في المناطق التي تكون فيها تدابير الصرف الصحي والنظافة ضيقة. تكشف الدراسة الحالية أيضًا أن انتشار كل من داء الأميبات وداء الجيارديات كان أعلى بشكل ملحوظ في الذكور منه للإناث وأعلى في الفئات العمرية (4-6 و7-9). ظهر فرق معنوي بين الإناث والذكور في كلتا الحالتين (الأميبات وداء الجيارديات) عند قيمة P> 0.05. في حالة داء الأميبات كان معدل الإصابة أعلى في الإناث منه عند الذكور (69.9٪ ، 30.1٪) على التوالي. أيضا في حالة داء الجيارديات كان أعلى في الإناث من الذكور على التوالي (64.5٪ ، 35.5٪) وكان هذا الاختلاف ذا دلالة إحصائية عند P <0.05

الخلاصة: يجب اتخاذ خطوات عاجلة ، مثل تدابير التحكم طويلة المدى وتحسين ممارسات النظافة الشخصية ، وكذلك الظروف الصحية والمعيشية