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College of Medicine

PREVALENCE OF INTESTINAL PARASITIC INFECTIONS AMONG DIARRHEAL CHILDREN IN DIYALA

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بسم الله الرحمن الرحيم

{ يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ }

صدق الله العلي العظيم

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Abstract

Background

Intestinal parasitic infections cause serious public health problem in Iraq . parasitic diseases constitute great medical, social and economic problems all over the world. There are two important epidemiological factors that make parasitic infections unique . First , parasitic infections have a high prevalence . Second , these dangerous Infections are most common among the poorest and disadvantaged communities and are most intense and frequent in school age children.

Aim of the study:

To know the distribution of intestinal parasites from children with diarrhea in Diyala province .

Patients and Methods :

This study was conducted in the Al-Batool Teaching Hospital in Diyala province. Since 1st October 2022 to 28th February 2023. In this study collected stool samples from100 child uffering from diarrhea with different gastrointestinal symptoms.

We collected data using prepared written questionnaire . The age range was between 2 month to 18 years . stool sample were collected from each patient use for: Macroscopic and Microscopic examination.

Results:

Microscopy found 39 case positive to parasite infection from 100 case. protozoa were more than helminthes. Females have more prevalence than male . the highest age group were 1-5 (22/39) . *Entamoeba histolytica/dispar* has association with bloody diarrhea (54.2%) and *Giardia lamblia* with oil fatty (58.3%) and *Entrobius Vermcularis* with watery liquid . Single parasite were 87.1% and co- infection 12.9% most of them were *E.histolytica* + *G. lamblia* .

Conclusion :

Intestinal parasites are very common in Baqubah City. *E. histolytica/dispar* is the most prevalent parasite there. Infection with intestinal parasites are still an important public health problem in Baqubah/Diyala province .

Keywords :Intestinal parasite , Infection, Diyala.

Introduction

Background

Intestinal parasitic infection is a major health problem in many developing countries. Most industrialized nations have been successful in reducing the rates of infestation by raising health standards and controlling the carriers or intermediate hosts. However, the issue is exacerbated in developing nations by geographic, socioeconomic, and unpredictable factors like natural disasters. These nations' predominant geographic characteristics—warm or hot, humid climates; high population density; lack of access to potable water; and poor health create the ideal environment for the development and spread of intestinal parasites. Inadequate research into infectious and parasitic diseases, a lack of focus on the issue in developing nations, and a lack of follow-up care are additional obstacles to reducing parasite infestation rates(1).

Different regions of the world have different infection rates. For instance, *Entamoeba histolytica* has a prevalence of 5% to 81% and is thought to affect 480 million people worldwide . The most prevalent intestinal parasite in the United States is *Giardia lamblia* , In Australia, 1.6% of the 3% to 7% of the population who had *G. lamblia* had no symptoms (2).

In a study in China , the most common causes of intestinal parasitic infections were *Enterobius vermicularis* (47.0%) , *Trichuris trichiura* (18.8%) , and *Taenia saginata* (17.2%)(3).

Estimates of the prevalence of intestinal nematode infections spread by soil globally are as follows: *Ascaris lumbricoides* cases number 1 billion, hookworm cases number 900 billion (*Ancylostoma duodenale* and *Necator americanus*), and *trichiuras* cases number 500 billion (4). another study have shown that younger people , particularly children , have a higher prevalence of intestinal parasitic infection
(5).

Children between the ages of 2 and 12 reported having %89.0 intestinal parasitic infections, according to a comprehensive survey conducted in Malaysia (6).

Although the infection varies from country to country , the severity of infection depends on the type of host , the host's dietary condition , the host's immunity , the presence of normal flora in the intestine , and the presence of other intestinal infections . Of these cases , about 10% were symptomatic and the remaining cases were asymptomatic (8).

The prevalence of intestinal infection Iraq was as follows : Basra (59.98%), Najaf (24.89%), Sulaimani (26.28%) , Nassiryah (12.02%) , Duhok (20.10%), and Anbar (7.08%) among the 1028640 stool samples collected from all of Iraq's governorates . There is a higher incidence of intestinal parasite socioeconomic infection in areas with poor sanitation , according to numerous studies (9). It is impossible to provide an accurate estimation of the economic significance of parasitic disease , It varies so greatly between countries and regions (10).

Risk factors for parasite infection

The majority of common intestinal parasitic infections in humans, with the exception of *E. vermicularis* , intestinal protozoa , are fecal borne infections that are spread either directly from person to person or indirectly through food and water . Protozoal infections can spread from person to person . The majority of the infection comes from people (carrier or patient) (11).

Favorable soil characteristics and frequent contamination of the environment by human feces are two major factors that maintain the endemicity of intestinal parasitic infections . Their spread within the community is primarily influenced by people's eating, urinating, personal hygiene , cleanliness , and level of education . Its prevalence in the

neighborhood can serve as a gauge for local living conditions , environmental sanitation, and socioeconomic status (12).

It is known that environmental factors , including water availability for domestic and personal hygiene, sanitation, and housing conditions , as well as socioeconomic – demographic – and health – related–behavioral– factors influence this infection. According to other study, the risk factors for giardiasis infection were old age and the presence of infected family members (13).

According to earlier research on enterobiasis , it is more common in crowded places or in families with numerous members . Socioeconomic status and educational attainment are two additional social variables that are frequently thought to be connected to the transmission of *E. vermicularis* . It can be inferred that household cleanliness and personal hygiene affect how easily *E. vermicularis* spreads (14).

Clinical manifestation of intestinal parasite infection

Despite the high prevalence of intestinal parasitic infections , very little morbidity and mortality are brought on by these infections. The WHO estimates that there may be as many as 3.5 million cases with clinical disease linked to intestinal infections admitted each year(15).

Hookworm infection can result in iron deficiency anemia, ascariasis can cause an often fatal intestinal obstruction, *trichuriasis* is linked to chronic dysentery and rectal prolapse. *Giardiasis* is linked to lactose intolerance, acute diarrhea, steatorrhea, and amebiasis to dysentery and extra intestinal complications ,The documented culprits are *Blastocystis hominis* and *Cryptosporidium paroum* (16).

Control and prevention intestinal parasite infection

An integrated strategy with participation from the community is the most efficient way to control intestinal parasitic infections. The long-term goal is to bring intestinal parasitic infections' prevalence, level of infection, and severity down to a point where they are no longer of public health concern. Theoretically, environmental sanitation improvements, such as secure feces and waste disposal, safe water supplies, and health promotion of food and personal hygiene, can reduce the spread of infections and prevent them altogether (17).

A social, economic, and educational development must go hand in hand with such measures because they are typically slow to work, expensive, and require significant investment. The above methods for controlling infection have become unrealistic due to limitations at the national and personal levels (18).

Aim of the study:

The aim of study was to know the distribution of intestinal parasites from children with diarrhea in Diyala province .

Patient and Methods

A total of 100 patient presenting with diarrhea to the Al Batool Teaching Hospital since 1st October 2022 to 28th February 2023. In this study using a prepared written questionnaire.

Stool samples: Each stool samples were placed in dry, sterile and clean and well blocked plastic container with top cover. Moreover, container was marked with name and number of each patient. Each fresh stool samples were examined under light microscopic with normal saline and Logules iodine, smears were prepared by add one drop of saline and the other with Logules iodine on clean slides and take small amount from stool by wood sticks from location when found blood and pus, and thoroughly emulsify the stool in saline and logulas iodine, thereafter each slide was covered with a cover slip. Slides were examined fully under the low (X10) and high (X40) powers of microscope.

Statistical analysis

Statistical package for the social science SPSS Version 26 was used for the description of the data . The result were presented in number , percentages , chi square was used to identify the association between the variables when p value less than 0.05 considered significant .

Results

From 100 specimens investigated, 39 were positive for intestinal parasites, which mean a prevalence of 39%.

Table (1) shows that, the rate of intestinal infection, for protozoa were (92.3%) significantly more than helminthes with (7.7%). *E. histolytica/ dispar* (61.5%), *G. lamblia* (30.8%) were the most common infection from total number of infected samples. The infection rate with helminthes, including *E. vermicularis,* which showed the highest rate prevalence more frequent in females than males. While there is no significant difference in

prevalence of intestinal parasite between the two sexes group ,being 15/39 (38.5%) in males and 24/39 (61.5%) in females.

Table (1): Distribution of intestinal parasite isolated according to gender.

Parasite	Gender		Total
	Male	Female	
Protozo:			
Entamoeba.hitolytica/dispar	9(60%)	15(62.5%)	24(61.5%)
Giardia lamblia	5(33.3%)	7(29.2%)	12(30.8%)
Total protozoal infection	14(93.3%)	22(91.7%)	36(92.3%)
Helminths*:*			
Entrobius vermicularis	1(6.7%)	1(4.2%)	2(5.1%)
Taenia spp.	-	1(4.2%)	1(2.6%)
Total helminthes infection	1(6.7%)	2(8.4%)	3(7.7%)
Total	15(100)	24(100)	39(100%)
P- value	0.1450NS		
P: Probability, NS: Not significant			

Table (2) shows that the prevalence of intestinal parasites is the highest in 1-5 years age group 22/39, followed by age group less than 1 year and 6-11 years (7 cases) respectively. Whereas age group of 12-18 year old revealing the lowest infection with 3 cases. Statistical analysis showed that there were highly significandifferences ($p \leq 0.001$) in distribution of intestinal parasites according to groups.

Table (2): Distribution of intestinal parasite isolated according to age groups

Parasites	Age group (years)				Total
	<1	1-5	6-11	12-18	
E. histolytica /dispar	4(57.1%)	13(59.1%)	5(71.4%)	2(66.7%)	24(61.5%)
G. lamblia	3(42.9%)	7(31.8%%)	1(14.3%)	1(33.3%)	12(30.8%)
Total protozoal infection	7(100%)	20(90.9%)	6(85.7%)	3(100%)	36(92.3%)
Helminths					
E. vermicularis	-	1(4.54%)	1(14.3%)	-	2(5.1%)
Taenia spp.	-	1(4.54%)	-	-	1(2.6%)
Total helminthes infection	-	2(9.1%)	1(14.3%)	-	3(7.7%)
Total	7(100)	22(100)	7(100)	3(100)	39(100%)
P- value	0.0009*				
P: Probability, *=Highly significant (P≤ 0.001).					

Overall, considering single and double infection, the commonest parasite *was E. histolytica/dispar*, which was presented in (61.8%%) of the examined sample, the infection with a single parasite was more common (87.1%) than that with double parasites are shown in Table (3). The commonest double infection was between *E. histolytica/dispar* and *G. lamblia (*10.3%), followed by *E. histolytica/dispar* and *E. vermicularis* (2.6%).

Table (3): Distribution of intestinal parasites (single and double) according to type of parasite.

Parasites	Number positive	Percentage%
Single infection		
E. histolytica /dispar	21	61.8%
G. lamblia	11	28.2%
E. vermicularis	1	2.6%
Taenia spp	1	2.6%
Total	34	87.1%
Double infection		
E. histolytica+G. lamblia	4	10.3%
E. histolytica +E. vermiculais	1	2.6%
Total	5	12.9%
Total of infected samples	39	100

Out of 39 positive diarrheal stools collected with intestinal parasites, 33.3% of the specimens were Watery/liquid, 35.9% were bloody and 30.7% were oil fatty (Table 4). Association was detected between these types of diarrhea and some types of parasitic infections, like *G. lamblia* with oil fatty (58.3%), *E. histolytica/ dispar* with bloody (54.2%) and *E. vermicularis* with watery/liquid diarrhea (100%).

Table (4): Distribution of intestinal parasites according to types of diarrhea.

Parasites	Types of diarrhea						Total
	Watery/ Liquid	%	Bloody	%	Oil fatty	%	
E.histolytica / dispar	7	2.29%	13	54.2%	4	16.6%	24
G. lamblia	4	33.3%	1	8.4%	7	58.3%	12
E. vermicularis	2	100%	-	-	-	-	2
Taenia spp.	-	-	0	-	1	100%	1
Total	13	33.3%	14	35.9%	12	30.7%	39

Table (5) show that the rate of Abdominal pain was the most prevalent clinical aspect of intestinal infections which appeared in 19 (48.7%) cases. While patients suffering from weight loss 14(35.9%), fever was found in 12 (30.8%) cases, Vomiting in 5 (12.8%) patients. Fatigue were found in 3 (7.7%) cases, significant differences appeared in the distribution of clinical
aspects among patients at $p \leq 0.05$.

Table(5): frequency of clinical presentation of infected patients

Clinical presentations	Number of patients	Percentage%
Abdominal pain	19	48.7%
Weight loss	14	35.9%
Fever	12	30.8%
Vomiting	5	12.8%
Fatigue	3	7.7%
p- value ≤ 0.05		

The monthly distribution of parasitic infections gradually decreased from maximum in November to a minimum in January with only 2 cases, as showing in (Table 6).

Table (6): Distribution of intestinal parasitic infections cases by months.

Month	Number Examined	Positive Cases	Percentage (%)
October	36	9	23.1%
November	31	13	33.3%
December	22	9	23.1%
January	3	2	5.1%
February	8	6	15.4%
Total	100	P-value	37.5%
P-value 0.015**			
** Significant ($p \leq 0.05$)			

Discussion

Intestinal parasitic infections are widespread throughout the world, but they are particularly common in underprivileged communities in tropical and subtropical regions. In Diyala, epidemiological surveys on intestinal parasitic infections in children are crucial because they provide information on the city's hygienic conditions and help to develop strategies for the prevention of intestinal parasitic infections in children (19).

In the present study, the prevalence of protozoan infections 36 (92.3%) was higher than rate of helminthes infections 3(7.7%). The protozoal infections widespread may be due to the easy transmission routes of these intestinal parasites happens via fecal- oral route, either directly from person-to-person or indirectly by eating or drinking fecally contaminated food and water, at the same time the simple life cycle of protozoan that not require intermediate host. The result of the study compatible or closed with study was conducted in Thi-Qar Province that found protozoan more than helminthes infections[20], also another studies in Ouagadougou, Burkina Faso, show protozoan (95.93%) more than helminthes (2.25%) [21] and in Nepal that found protozoan more than helminthes (20.61% and 10.30% respectively) (22).

The most prevalent parasites were *E. histolytica dispar* and *G. lamblia* this may be due to the fact that these protozoan cysts are highly resistant to chlorine disinfection, beside their small size (range 1-17 μm) enables them to penetrate water treatment systems and cause waterborne disease even following the consumption of treated drinking-water, at the same time cysts of *G. lamblia* and *E. histolytica dispar* resistance to high temperature degree may be more than 50c and to low temperature and humidity (-1 c°) that mean can transmission through any season and soil [23]. Similar researches involved the same two gastrointestinal parasites or/with other relevant ones carried out in parts of the Mediterranean and developing world, which are classified as over populated, to their prevalence in these countries, Iran [24], Portugal [25], Ghana [26], as well

as in parts of Iraq, like Tikrit [27] and Karbala [28]. In contrast to protozoan infection. The prevalence of helminthes infection in this study was low (7.7%). Similar observation have been made in studies performed in the other countries[29]. The reason for this may be due to unfavorable ecological environment and other prevailing socio-cultural factors that influence helminthes survival and transmission [30].

Both gender, males and females in various ages, were exposed to chance of infection because all of them were living under the same climates and conditions of disease, but the result in present study found that more females were infected than males , this result obtained elsewhere in Baghdad [31] but were higher in Mosul city [32]. These variations might be due to physiological, behavioral as well as immune differences between genders, endocrine activity as male bodies are more tolerant than those of females [33]. The most affected group of patients with intestinal parasites, those with 1-5 years old 22/39, otherwise the group with 12-18 year the less affected group. This is a clear indication of hygiene related cause where children less 5 years are more susceptible to be exposed to unhealthy food than 12-18 or less developed immune system [34].

The main double infection were between *E. histolytica* and *G. lamblia* (10.3%) of total mixed infection, followed by that between *E.* histolytica and *E. vermiculais* (2.6%). This is related to the unhygienic habits of children and this may indicated that the modes of transmission and epidemiology patterns of these parasites may play a role in their presence together [35]. Indeed, the detection of parasitic co-infection can be considered the true first step in patient's recovery, as the treatment of only one parasite and neglect the other may lead to the failure of treatment [36].

Association was found between the types of diarrhea and some kinds of parasitic infections, like *G. lamblia* with oil fatty, this may be due to the malabsorption of fats, fat-soluble and vitamins may occur. When daily losses of fat in feces are greater than 7 grams, this condition is classified as steatorrhea [37]. *E. histolytica/dispar* association with bloody diarrhea,

This may be due to the damage of the epithelial cell layer attracts human immune cells and these in turn can be lysed by the trophozoite, which releases the immune cell's own lytic enzymes into the surrounding tissue, creating a kind of chain reaction and leading to tissue destruction which can also involve blood vessels leading to bloody diarrhea or amebic dysentery.

The high rate in present study of infection in watery /liquid diarrhea fecal sample may be indicate to acute phase of disease or may be related to large number of parasites especially trophozoite forms which lead to diarrhea. However, the infection with these parasites usually present with mild to abundant watery diarrhea, with or without mucous, rarely with blood or leukocytes[38].

In this study seven common symptoms recorded in humans, The main observation from this study is the co-existence of high distribution of abdominal pain of patients with diarrhea, The other common symptoms observed in the patients were weight loss, fever, vomiting, flatulence, anorexia, and fatigue. All or some of these clinical aspects have been mentioned in study about parasitic infections with various incidence rates in each study. These differences may be related to the differences in study area, selected diarrheal patients, Host factors such as immune status, nutritional status and age, as well as differences in virulence and pathogenesis of parasitic infections.

The monthly distribution of parasitic infections gradually decreased from maximum in November to a minimum in January with only 2 cases.

Conclusion

Intestinal parasites are very common in Baqubah City. *E. histolytica/dispar* is the most prevalent parasite there. Infection with intestinal parasites are still an important public health problem in Baquba/Diyala province.

Recommendations

In the present study recommend more studies about this topic and how to decrease the prevalence of parasite infection by increase perception of the risks factor , symptoms , at the time concentrate on the control and prevention of parasitic infection in Diayla province .

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