

## INTESTINAL PARASITE INFESTATION AND ITS RISK FACTORS: A CROSS-SECTIONAL SURVEY AMONG CHILDREN IN DUHOK CITY, KURDISTAN REGION IRAQ

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Submitted 15 July 2020; accepted 8 March 2021

### ABSTRACT

**Background:** A cross-sectional study concerning the prevalence of intestinal parasitic infection among children in Duhok city was carried out from September 2018 to the end of October 2019.

This study aimed to show the prevalence and establish some risk factors associated with gastrointestinal parasite infection in children of both sexes in the age group ranging from (<1-12) years old in Duhok city, Kurdistan Region, Iraq.

**Method:** A total of (1548) stool Specimens were collected and tested successively, 1310 from the Heevi Pediatric Teaching Hospital and 238 from the primary school in Duhok city. Both sexes in the age group (<1-12) years old were involved. All stool specimens were examined microscopically using wet mount smear, concentrations, and Modified Ziehl-Neelsen stain methods.

**Results:** The overall prevalence of intestinal parasitic infections was 869(56.14%). *Cryptosporidium spp.* 709(66.08%), *Entamoeba spp.* 302(28.15%), *Giardia lamblia* 61(5.68%) and *Ascaris lumbricoides* 1(0.09%) were the common parasites found. Among 869(56.14%) positive specimens, intestinal parasites were detected as a single 670(77.1%), double 194(22.32%), and triple 5(0.575%) infection. Male children between the ages of 1–5 years old showed the highest infection rate 280(31.81%). The prevalence of intestinal parasite infections was significantly related to gender ( $p < 0.05$ ) and the seasons of the year during the period of study ( $p < 0.001$ ). However, statistically significant associations between children infection with parasites and body weight and educational status of their parents were not observed. Modified Acid-Fast Stain used only for *Cryptosporidium spp.* detection.

**Conclusion:** In Heevi Pediatric Teaching Hospital, the wet mount method is the only method for detecting intestinal parasites; this can lead to missing detection of many parasites. Therefore, modified acid-fast stain and concentration methods are recommended to reach the best results. Education on personal hygiene and environmental sanitation is required to reduce the prevalence of intestinal parasites among children in Duhok.

Duhok Med J 2021; 15 (1): 81-95.

**Keywords:** Children, Duhok city, Intestinal parasitic infection, Risk factors.

Intestinal Parasitic infection (IPIs) are among the most common diseases around the world. Particularly, millions of persons are infected and ill with parasitic diseases within developing nations<sup>1</sup>. Children are more exposed to intestinal parasitic diseases than adults due to their immature immune system and poor sanitation<sup>2</sup>.

The main risk factors related to these diseases are unsuitable sanitation practices, lack of access to hygienic water, poor cleanliness, and health services<sup>3</sup> due to the low environmental condition and overpopulation<sup>4</sup>. The infestation rate with different intestinal parasites was raised since the need for treatment and the terrible hygienic situation, particularly

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<https://doi.org/10.31386/dmj.2021.15.1.8>

among households with low living levels<sup>5</sup>. These risk factors provide ideal conditions for the development, transmission and increased possibility of exposure to intestinal parasites<sup>6</sup>. Moreover, it has been influenced by the used analytic techniques and the number of examined stool cases<sup>7</sup>. Among the most significant intestinal parasites are intestinal protozoa like *Entamoeba histolytica*, *Giardia lamblia*, *Cryptosporidium spp.*, *Balantidium coli*, *Dientamoeba fragilis*, and intestinal helminths like *Ascaris lumbricoides*, *Trichuris trichiura*, and *Strongyloides stercoralis*<sup>8</sup>. These infections are a sign of keen community health problems, resulting in growth retardation, iron deficiency anemia, and other physical and mental health concerns in children<sup>9</sup>. Like in other developing nations in Iraq, intestinal parasite infections are considered major public health problems in various Iraqi provinces. Several epidemiological studies showed that disease incidence differs from area to area<sup>10</sup>. This survey was conducted because little information is available about the prevalence of intestinal parasitic infections and their related risk factors among children in Duhok city.

## **MATERIALS AND METHODS**

### **Study setting and duration**

Duhok city is the main municipality and the center of Duhok governorate (Duhok is spelled as Duhok, Dohuk, or Dahuk). It is the northernmost province of Iraq. Duhok city constituency occupies 31.3 hectares of land, (43.20-44.10) Longitude and (36.40-37.20) Latitude. The total population of Duhok province is approximately 1.5 million, whereas around 505,491 live in

Duhok city<sup>11</sup>. This cross-sectional study was carried out in Duhok city from September 2018 to the end of October 2019.

### **Samples and data collection and selection criteria**

Children were only included after written consent was obtained from parents on behalf of their children. Consent forms were given to interested parents to explain the objectives and procedures. In addition, a questionnaire form was also given for socio-demographic data, environmental factors, and behavioral sanitary habits of the children. Children on anti-parasitic medications three weeks before the research were excluded.

In Heevi Laboratory, the stool specimens were collected from each inpatient and outpatient; a fresh fecal specimen was collected with their parents' aid or accompanied individual. All children were included, with or without presenting clinical symptoms. The stool specimens were collected from children ( $\leq 6$  years) in school with their parents' assistant, disposable plastic containers with a wide clean universal; dry screw caps were pre-labeled with name, age, sex, and name of the school and given to parents of children. Children above six years of age were educated on the proper methods for collecting the stool Specimens.

**Number of stool specimens and study size**  
During the study period, a total number of (1548) stool Specimens were collected and tested successively, 1310 from the Heevi Pediatric Teaching hospital and 238 from primary schools in Duhok city. In order to achieve a 95% confidence level, the minimum study size was determined using the formula  $n = (Z^2 \times p(1 - p))/e^2$  where n

is the Specimen size,  $Z$  is the standard score of 95% confidence interval,  $p$  is the prevalence (since no previous data existed, 0.5 was used) and  $e$  is the margin of error (1.96) with a significance level set at  $P=0.05^{12}$ .

### Examination of stool specimens

Stool specimens were transported to the laboratory, and each stool specimen was examined macroscopically to find any abnormalities visible by the naked eye (color, consistency, presence of blood, mucus, pus, and large worms). The microscopical examination was done by direct smear and concentration techniques (Flotation and Sedimentation) for the presence of intestinal protozoa and helminths diagnostic stages. Modified Acid-Fast Stain was used for detecting the Coccidian parasites. Various methods are available for detecting parasitic intestinal infection, consisting of comprehensive techniques instructions<sup>13,14,15</sup>.

### Statistical analysis

Data were entered into the Microsoft Excel program. Using the Chi-square ( $\chi^2$ ) test, results were evaluated and analyzed to find associations between the prevalence of intestinal parasite infections and the risk factors among infected and non-infected children. Statistical significance was set at  $p < 0.05$ .

### Ethical approval

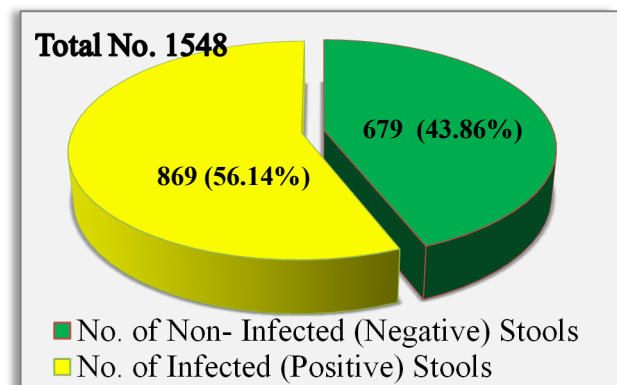
Scientific and Ethical approvals for the study were granted by the Scientific Committee of the College of Medicine/Duhok University (Scientific & ethical approval no. 690 on October 10<sup>th</sup>, 2018). Clearance from the General Directorate of Education in Duhok (approval no. 18064 on November 19<sup>th</sup>, 2018) was also obtained before collecting

specimens from the Heevi Pediatric Hospital. Selected several primary schools received a formal request from the College of Medicine, then children's parents and/or guardians were contacted to outline the study's aim and clarify the study's purpose.

## RESULTS

### Prevalence of intestinal parasites

In this research, a total of (1548) stool specimens were collected and tested from different ages of both sexes. The overall prevalence of the intestinal infection among the children's stool's total examined specimens is shown in Figure (1.). A total of 868 (56.07%) specimens were identified with the intestinal protozoan, and only one (0.06%) specimen was identified with intestinal helminths.



**Fig. 1: Prevalence of intestinal parasite infections among the total examined children stool specimens.**

### Socio-demographic Variables

Out of the total examined children, 880(56.84%) were males, and 668(43.15%) were females; among these, a total of 529 (60.87%) males and 340 (39.13%) females were positive. The mean age of the study participants was six years. The minimum age recorded was one day, and the maximum age was 12 years. Table 1 shows age groups together with gender factors. The rate of infection was higher in

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females than in males in age group less than one-year-old 164 (24.55%), while the rate of infection was higher in males than in females in age group ranged (1-5) years

old which was 280 (31.81%). There was a highly significant difference between males and females at level ( $p < 0.001$ ).

**Table (1): The percentage of Intestinal Parasitic Infections concerning (Sex) and (Age groups) in Children in Duhok city.**

Age groups (Years)	No. of examined		No. (%) of Infected	
	Male	Female	Male	Female
Less than one	359	232	148 (16.82%)	164 (24.55%)
1 – Less 5	338	301	280 (31.81%)	101 (15.12%)
5 – 12	183	135	101 (11.48%)	75 (11.23%)
<b>Total</b>	<b>880</b>	<b>668</b>	<b>529 (60.11%)</b>	<b>340 (50.90%)</b>

$\chi^2=13.097$ , D.F=1,  $P<0.001$  \*\*\*

\*\*\* Highly Significant Difference.

Of the 869 positive stool specimens examined, 670(77.1%) children were positive for single intestinal parasites and 199 (22.895%) children were positive for two or more intestinal parasites. Table(2) shows the intestinal parasitic species (single infection). *Entamoeba spp.* 107(15.97%), *Giardia lamblia* 32(4.78%), *Ascaris lumbricoides* 1(0.15%), and *Cryptosporidium spp.* 530 (79.10%). While the species of the co-infections of intestinal parasites, which were two

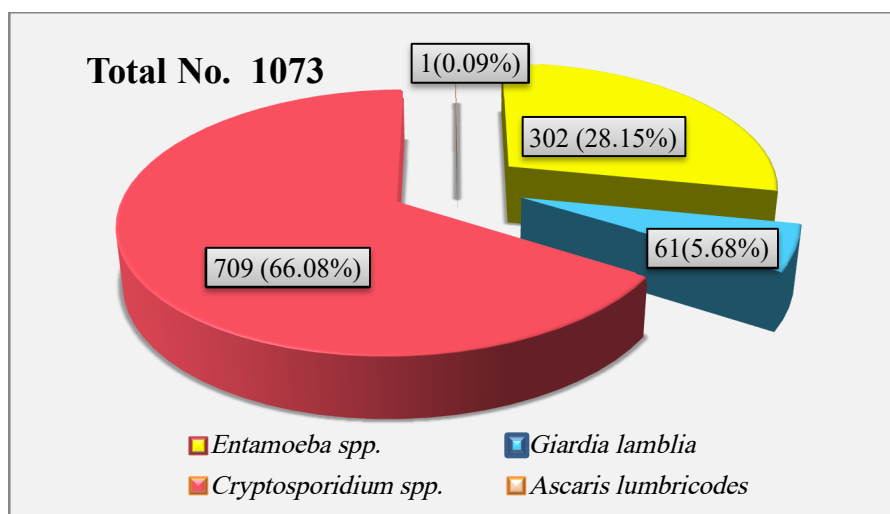
parasites present together (double infestations): *Entamoeba spp.* with *Giardia lamblia* 20 (10.31%), *Entamoeba spp.* with *Cryptosporidium spp.* 170(87.63%), and *Giardia lamblia* with *Cryptosporidium spp.* 4(2.06%). While the (triple infestations) was the only combination of *Entamoeba spp.*, *Giardia lamblia*, and *Cryptosporidium spp.* were combined 5(100%).

**Table (2): Distribution of single, double, and triple infection by the intestinal parasites among the total examined children in Duhok city**

Single Infection with	No	%
<i>Entamoeba spp.</i>	107	15.97
<i>Giardia lamblia</i>	32	4.78
<i>Cryptosporidium spp.</i>	530	79.10
<i>Ascaris lumbricoides</i>	1	0.15
<b>Total</b>	<b>670</b>	<b>100</b>
Double Infection		
<i>Entamoeba spp.</i> + <i>Giardia lamblia</i>	20	10.31
<i>Entamoeba spp.</i> + <i>Cryptosporidium spp.</i>	170	87.63
<i>Giardia lamblia</i> + <i>Cryptosporidium spp.</i>	4	2.06
<b>Total</b>	<b>194</b>	<b>100</b>
Triple Infection		
<i>Entamoeba spp.</i> + <i>Giardia lamblia</i> + <i>Cryptosporidium spp.</i>	5	100
<b>Total</b>	<b>5</b>	<b>100</b>

Figure (2) shows the parasites' species recognized were *Cryptosporidium spp.* 709 (66.08%), followed by *Entamoeba spp.*

302 (28.15%), *Giardia lamblia* 61 (5.68%), and *Ascaris lumbricoides* 1 (0.09%).



**Fig. 2: Distribution of different intestinal parasites among the total examined children in Duhok city.**

Environmental Variables and water Supply for IPIs

Potential seasonal fluctuations were evaluated to determine the possible impact of parasitic infections at different seasons during the study period. The highest rate of infection was seen in autumn (fall) season

494 (56.85%), while the lowest rate of infection was seen in spring season 58 (6.67%), as shown in Table (3). There was a highly significant difference between seasons ( $p < 0.001$ ).

**Table 3: Distribution of Intestinal Parasitic Infections among the Total Examined Children According to (Seasons) in Duhok City**

Seasons	No. of Examined	No. (%) of Positive Stool	No. (%) of Negative Stool	(%) of Infection among Total Children
Autumn	862	494 (57.31%)	368 (42.69%)	56.85
Winter	214	96 (44.86%)	118 (55.14%)	11.05
Spring	124	58 (46.77%)	66 (53.23%)	6.67
Summer	348	221 (63.51%)	127 (36.49%)	25.43
<b>Total</b>	<b>1548</b>	<b>869(56.14%)</b>	<b>679(43.86%)</b>	<b>100</b>

$\chi^2=23.622$ , D.F=3,  $p < 0.001$ \*\*\*

\*\*\* Highly Significant Difference.

Children of the artificial milk type feeding group showed the highest infection rate of 547 (62.95%), while children of the breastfeeding group showed the lowest infection rate 58 (6.67%). The rate of

infection varied in different types of feeding groups. There was a highly significant difference between the groups ( $p < 0.001$ ), as shown in table (4).

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**Table 4: Distribution of intestinal parasitic infections among the total examined children according to (feeding-groups) in Duhok City**

<b>Feeding-Groups</b>	<b>No. of Examined</b>	<b>No. (%) of Positive Stool</b>	<b>No. (%) of Negative Stool</b>	<b>(%) of Infection Among Total Children</b>
Breast milk feeders	238	58 (24.37%)	180 (75.63%)	6.67
Artificial milk feeders	808	547 (67.70%)	261 (32.30%)	62.95
Both type feeders	181	62 (34.25%)	119 (65.75%)	7.13
Non-milk feeders	321	202 (62.93%)	119 (37.07%)	23.25
<b>Total</b>	<b>1548</b>	<b>869(56.14%)</b>	<b>679(43.86%)</b>	<b>100</b>

$\chi^2=182.612$ , D.F=3,  $p<0.001$  \*\*\*

\*\*\* Highly Significant Difference.

The distributions of intestinal parasitic infections according to children residential area. The highest infection rate was seen in children residing in camps 306 (35.21%), followed by children living in the villages

208 (23.94%). The lowest infection rate was seen in children living in the city center 319 (18.30%). There was a highly significant difference between different groups ( $p<0.001$ ) as shown in table (5).

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**Table 5: Distribution of Intestinal Parasitic Infections among the Total Examined Children According to (Residential Area) in Duhok City**

<b>Residential Area</b>	<b>No. of Examined</b>	<b>No. (%) of Positive Stool</b>	<b>No. (%) of Negative Stool</b>	<b>(%) of Infection among Total Children</b>
Centre of the City	319	159(49.84%)	267(57.67%)	18.30
District	463	196(42.33%)	160(50.16%)	22.55
Villages	380	208(54.74%)	172(45.26%)	23.94
Camps	386	306(79.27%)	80(20.73%)	35.21
<b>Total</b>	<b>1548</b>	<b>869(56.14%)</b>	<b>679(43.86%)</b>	<b>100</b>

$\chi^2=125.2$ , D.F=3,  $p<0.001$  \*\*\*

\*\*\* Highly Significant Difference.

The distribution of intestinal parasitic infections (IPIs) according to the source of water, the highest rate of infection was shown in tap water (river, well, or rain) 489(56.27%), and the lowest rate of

infection was demonstrated in filtered water 119(13.69%). There was a highly significant difference among different sources ( $p<0.001$ ), as shown in table (6).

**Table 6: Distribution of intestinal parasitic infections among the total examined children according to (water source) in Duhok City**

Source of Water	No. of Examined =	No. (%) of Positive Stool	No. (%) of Negative Stool	(%) of Infection among Total Children
Tap water	896	489(54.58%)	407(45.42%)	56.27
Filter water	251	119(47.41%)	132(52.59%)	13.69
Both water	401	261(65.09%)	140(34.91%)	30.03
<b>Total</b>	<b>1548</b>	<b>869(56.14%)</b>	<b>679(43.86%)</b>	<b>100</b>

$\chi^2=21.695$ , D.F=2,  $p<0.001$ \*\*\*

\*\*\* Highly Significant Difference.

The distribution of intestinal parasite infection according to clinical features, is shown in table (7). Intestinal parasitic infection were significantly related to cases presenting symptoms of diarrhea 334 (38.4%). There was a highly significant

difference between different groups at ( $p<0.001$ ) level. The rates of other clinical features did not show significant variances between intestine parasite-infected and non-infected stool specimens.

**Table (7): Distribution of Intestinal Parasitic Infections, among the Total Examined Children According to (Clinical Aspects) in Duhok City**

Clinical Presentation	No. of Children with the clinical manifestation	No. (%) of Children with Positive Stool	No. (%) of Children with Negative Stool	(%) of Infection Among Total Children with Positive Stool
non bloody diarrhea	492	334(67.89%)	158(32.11%)	38.43
Fever	85	33 (1%)	52(61.18%)	3.80
Vomiting	32	13 (35.23%)	19(59.38%)	1.50
All (D., V.,& F.,)	453	289 (63.8%)	164(36.20%)	33.26
Abdominal pain	88	31 (33.82%)	57(64.77%)	3.57
Bloody diarrhea	131	73 (40.63%)	58(44.27%)	8.40
Constipation	72	22 (30.56%)	50(69.44%)	2.53
Asymptomatic	94	39 (41.49%)	55(58.51%)	4.49
Others	101	35 (34.65%)	66(65.35%)	4.03
<b>Total</b>	<b>1548</b>	<b>869(56.14%)</b>	<b>679(43.86%)</b>	<b>100</b>

$\chi^2=113.743$ , D.F=8,  $p<0.001$  \*\*\*

\*\*\* Highly Significant Difference.

#D.= Diarrhea, V.= Vomiting, and F.=Fever

## DISCUSSION

Intestinal parasitic infection are still presenting a hazardous public health

problem among children in Duhok city. Studying the prevalence of infection among children in different regions of the country and associated risk factors is

necessary to recognize high-risk groups and design proper control measures.

In this present study, the overall prevalence of IPIs was high (56.14%) because many variables were affecting and increasing the rate of infections, such as lower socio-economic status, poor living conditions, residence, living in large size household, insufficient source of drinking water, large numbers of non-breast feeders, and low personal sanitation of children.

In the present study, the high rate of infection was in agreement with other studies in different regions of the world, for instance, in Argentina<sup>16</sup>. The prevalence also revealed an agreement with other studies in Iraq, e.g., in Baghdad<sup>17</sup>. At the same time, our results contrast with other previous studies in other countries, e.g., in Iran<sup>18</sup> and in Egypt<sup>19</sup>.

This study showed that the intestinal protozoan infection (56.04%) was significantly higher than the intestinal helminthic incidence; *Ascaris* only one case of helminth species detected (0.06%). Different reports presented *Ascaris* as the only most common intestinal worm among children; this likely may be attributable to the direct transmission of infection and the high resistance of the infective egg to unsuitable conditions in the region that prolong and supports illness<sup>20</sup>.

Our results disagree with Hussein and Meerkhan<sup>21</sup>. Their results showed that the highest infection rate was with *Entamoeba histolytica*, followed by *Giardia lamblia*, *Enterobius vermicularis*, and *Cryptosporidium spp.* among samples that he affirmed to collect. However, their study mentioned that all the stool samples

were examined by direct microscopic examination and formalin-ether concentration methods. These methods cannot detect *Cryptosporidium spp.* and *Enterobius vermicularis* easily as they claimed. Furthermore, they mentioned that their study (with a period of six months) depended on the data and samples collected from the Heevi Pediatric Hospital. However, they did not mention the necessary code for them nor the date of approval by the Duhok Health Directorate ethical committee. These are very essential for such a study considering the ethical issues involved. Therefore, our study presented here is the first documented and ethically approved one that reports the infection of the patients in Duhok children's hospital with intestinal parasites. The findings were close to a local study was led by Rhadi team in Basrah Province<sup>22</sup>, which found intestinal protozoans were more than worms' infections, and in Iran<sup>23</sup>. The high prevalence of protozoan parasites could be due to protozoan's simple life stage that does not need an intermediate host. It could also be due to the easy transmission methods of infection, such as fecal-oral ways, either directly from person to person or indirectly by eating or drinking fecal contaminated food and water<sup>24</sup>. In contrast, a local study in Iraq by Ihsan team presented the rate of intestinal helminths infections was higher than other intestinal infections among children<sup>25</sup>, also a study in Rwanda<sup>26</sup>.

Socio-demographic, environmental, and hygienic factors were also studied in the present study; both gender, males and females, were exposed to the chance of intestinal parasite diseases; the highest rate



of infections was found in boys than in girls. A similar study in Saudi Arabia presented a higher infection rate in males than females<sup>27</sup>. This could be due to males being more in interaction with environmental situations than females. Males are more exposed to unhygienic environments as they play with contaminated soil, play with pets on grounds, or swim in unhygienic water during outside activities. At the same time, females may stay inside the household.

The prevalence of intestinal parasitic diseases was noticeable in all age groups. In an agreement with a local study in Iraq, Kurdistan Region, in Erbil governorate<sup>28</sup>; the highest rate of infection was found in the age group of (1-5) years old, followed by the age group of less than one year, whereas a low infectivity rate was found in the age group of (5-12) years old. This may be explained that young children creep on the dirty ground. This group of children could be more included in outdoor activities, leading to intestinal parasite transmission. Indifference, a study in Mosul showed the highest infection rate within children aged more than 5 years<sup>29</sup>.

In the current study, the most significant risk factor of parasitic infections was feeding practice; children fed with artificial milk had a higher incidence rate of infections than breastfed children, this result in agreement with the study in Baghdad<sup>17</sup>.

The rate of infections varied according to seasonal and environmental variations. The highest infection rate was found in the fall season, followed by the summer season, and the lowest rate of infection was found in winter and spring. There was a highly significant association between

the season and the intensity of intestinal parasite infections. A study in Saudi Arabia, in Riyadh city, showed the highest rate of infections among patients were found in the fall season period<sup>30</sup>. This could be attributed to the variance within the tested number of patient's stool specimens. Also, the high rate of infection in the summer season, related to favorable weather conditions such as high temperature and humidity, affects the spread of intestinal parasites among children.

According to the source of drinking water, infection incidence was higher among children who drink tap water. This high prevalence may be associated with low water quality, broken-down sewage lines, and low chlorine levels. In an agreement, different reports from different countries have verified untreated water sources as the main risk cause of intestinal parasitic diseases<sup>16</sup>.

*Cryptosporidium* spp. was the most predominant intestinal protozoan infection detected by the modified acid-fast stain. In agreement with other studies, *Cryptosporidium* spp. is the most prevalent intestinal parasite, a local study conducted in Erbil<sup>31</sup>. Also, reports from other countries were found similar findings in the United Arab Emirates<sup>32</sup>. This could be explained that the staining method Modified Zeihel-Neelsen, for coccidian intestinal parasites usually do not use and practice in laboratories; Modified Zeihel-Neelsen Staining method, particularly among children with intestinal parasitic infections after concentration method, is necessary for this area.

Followed by, amoebiasis was one of the most prevalent intestinal protozoan

diseases. Next, giardiasis was showed the lowest rate of infection compared to amebiasis; all age groups of both genders were disposed to both protozoa infections. The present study's finding is similar to local studies led in Al-Najaf<sup>33</sup>.

In concern with diarrhea symptoms, the present study showed similarity to a study done in Iran<sup>34</sup>, which found intestinal infections in diarrheic and non-diarrheic patients, but the infection prevalence was considerably higher in diarrheic patients. The intensity of infections was highly significantly associated with diarrhea and have presented different intestinal parasites as serious risk factors of diarrhea.

In this study, anemia was the most observed disease among children infected with intestinal parasite infections (the result note showing in the result section); this could be due to the effect of heavy existence of intestinal parasites and low nutritional level of a child. An agreement with a study done in Egypt<sup>35</sup> presented the highest intestinal parasite infection rate with anemia in this region. In contrast to other countries, a study in Kenya<sup>36</sup> found the highest rate of intestinal parasite infections among young children without anemia; this may be due to the identified parasite infections were probably in their early life development.

In the current study, while the prevalence rates of intestinal parasites were almost comparable with those of similar studies conducted in other regions of Iraq, the prevalence rates of infections are of public health significance. In the early detection of parasitic infection and successful treatment, early identification of some recorded clinical manifestations can help. Required health policies, health education,

enhancement of socio-economic conditions, screening, and deworming of childhood intestinal parasites are recommended.

The study revealed that parasitic diseases are significant common health problems in Iraq, Kurdistan Region, especially in Duhok province. Therefore the infection controller processes and different strategies for planning active prevention programs are must be considered. In order to advance cleanliness and health education, improvement of awareness policies, particularly among young mothers with insufficient knowledge of intestinal parasite infections among children of different ages, is required. Also, other techniques for diagnosing intestinal parasite infections in the Hevii pediatric laboratory should be added to avoid the missing diagnosis of other parasite species.

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پوخته

بملا فبونا مشه خوریین رویفیکان وفاکتریین مه ترسیان: لیکولینه کا بقریره ل دهف زاروکان ل باژی ری دهوک / همری ما کوردستان ی ، یی راقی.

ئهف فهکولینه هاته ئهجام دان لدووربه لاقبونا نهخوشیین پاراسایتین (مشه خوریین) رویفیکان بین جوراوجور دناف زاروکان دا ژ (نه یلول / ۲۰۱۸) تا کو (تشرینا نیکی / ۲۰۱۹) ل باژی ری دهوک ی ، همری ما کوردستانی ، نیراقی.

سهرجه می (۱۵۴۸) سامپلین دهست ئافا ستوویر هاتنه کومکرن و پیشکنینکرن ژ زاروکیین سهرمدانا نه خوشخانا هیقی یا فیرکری یا زاروکان کری ل پاریزگه ها دهوک ی . ژ هردوو رهگزان دژیین دنافهرا (۱۲-۱) سالیی دا . ههمی سامپلین دهستنافا ستوویر هاتنه پیشکنینکرن ب ریباژین جودا جودا .

ریژهیا به لاقبونا پاراسایتین رویفیکان بین جوراوجور ل دهف زاروکان (۵۶،۱۴٪) بوو . پاراسایتین رویفیکان بین جوری پروتوزوان ریژهیا به لاقبونا وان زیدهربوون ژ بین جوری پاراسایتین کرمان . بهر به لاقترین جورین پاراسایتین رویفیکان ل دهف وان راروکان بریز ئهف جورهبوون *Cryptosporidium spp.*, *Entamoeba spp.*, *Giardia lamblia*, *Ascaris lumbricoides*.

هردوو رهگزان جوداهیهکا مهزن وگرنگ نیشان دا . نیران ژیا مینان (۶۰،۸۷٪) ؛ ریژهیا هره مهزن یا نه خوشیی تومارکرن (۳۹،۱۳٪) . ده رباره ی فاکته ری شیرفه حوانی ریژهیا هره مهزن یا نه خوشیی ل دهف زاروکیین کوما شیرئ دهست کرد (۶۲،۹٪) ، و ریژهیا هره کیم یا نه خوشیی ل دهف زاروکیین کوما شیرئ دهیکئ (۶،۶٪) هاته تومارکرن .

ل گوری فاکته ری نیشه جیبونی ، ریژهیا هره مهزن یا نه خوشیی دبویهرین ل دهفرا گوندان دژین دا (۵۹،۴٪) ، و ریژهیا هره کیم یا نه خوشیی ل دهفرا باژی ری دا (۴۰،۵٪) هاته تومارکرن . ل گوری گوهارتننن وه رزی سالین دا ، ریژهیا هره مهزن یا نه خوشیی د وه رزی پاییزی دا (۵۶،۸٪) ، و ریژهیا هره نزم یا نه خوشیی دوه رزی بهاری دا (۶.۶٪) هاته تومارکرن .

دههمان دم دا فاکته ری ژیده رین ئاف فهخوارنی . ریژهیا هره مهزن یا نه خوشیی دکوما ئافا نه چاره سه رگری دا (۵۶.۲٪) ، و ریژهیا هره نزم یا نه خوشیی دکوما ئافا چاره سه رگری دا (۱۳.۶٪) هاته تومارکرن . هه روه سا ریژهیا به لاقبونا بلند یا نه خوشین پاراسایتین رویفیکان و باندور وفاکته رین دیتر هاتینه شروهه کرن .

## الخلاصة

### انتشار الطفيليات المعوية وعوامل الخطر: مسح شامل بين الأطفال في مدينة دهوك ، إقليم كردستان العراق

أجريت هذه الدراسة للتحري عن انتشار عدوى الطفيليات المعوية بين الأطفال خلال فترة (ايلول / ٢٠١٨) ولغاية (نهاية شهر تشرين الاول / ٢٠١٩) في مدينة دهوك، إقليم كردستان، العراق.

تم فحص (١٥٤٨) نموذجا من عينات البراز التي جمعت من الأطفال في مستشفى هيفي التعليمي للأطفال في محافظة دهوك. شارك كلا الجنسين من الفئات العمرية (أقل من ١-١٢) سنة. تم فحص جميع عينات البراز مجهريا بالطريقتين المباشرة وغير المباشرة (التركيز) واتضح ان الفحص بطريقة التركيز اكثر دقة من طريقة الفحص المباشر للكشف عن عدوى الطفيليات المعوية. وتم استخدام طريقة صبغة زيل-نيلسن المعدلة للكشف عن اكياس البيضية لطفيليات الأمعاء الكروية (داء خفيات الابواغ).

بلغ معدل انتشار عدوى الطفيليات المعوية بين مجموع عينات البراز المصابة (٥٦,١٤%). حيث معدل انتشار عدوى البروتوزوا المعوية أعلى من العدوى بالديدان المعوية. كانت الطفيليات المعوية الأكثر انتشاراً بين الاطفال هي *Cryptosporidium spp.* و *Entamoeba spp.* و *Giardia lamblia* على التوالي، وكانت الاقل انتشارا في هو *Ascaris lumbricoides*.

لوحظ وجود فروقات احصائية معنوية بين الاصابات في الذكور والاناث ( $P < 0.001$ )؛ سجلت أعلى نسبة اصابة بالذكور (٦٠,٨٧%) مقارنة بالاناث (٣٩,١٣%). وحسب عامل الرضاعة، لوحظ أعلى معدل للعدوى في مجموعة الأطفال الذين يرضعون باللبن الاصطناعي (٦٢,٩%) ، وأقل معدل إصابة بين الأطفال الذين يرضعون رضاعة طبيعية (٦,٦%).

وبحسب عامل الإقامة، فإن أعلى نسبة إصابة سجلت بين الحالات التي تعيش في الريف (٥٩,٤%)، وأقل نسبة إصابة في الحالات التي تعيش في المدينة (٤٠,٥%). وحسب فصول السنة المختلفة، حيث سجلت أعلى نسبة إصابة في الخريف (٥٦,٨%)، وأقل نسبة إصابة في الربيع (٦,٦%). ونظرا لتأثيرعامل مصادر مياه الشرب ونسبة الإصابة، سجل أعلى معدل إصابة في مجموعة المياه غير المعالجة (٥٦,٢%)، وأقل معدل إصابة في مجموعة مياه التصفية (١٣,٦%). كما تمت مناقشة تفاصيل معدل الانتشار المرتفع للعدوى بالطفيليات المعوية وتأثيرات بعض العوامل الأخرى.