

RESEARCH ARTICLE

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PREVALENCE OF PARASITIC INFECTION AND RELATIONSHIP WITH ANEMIA IN AL-DOULLAB VILLAGE, BABYLON PROVINCE, IRAQ**ABSTRACT:**

This study was conducted from October 2011 till September 2012 to detect the prevalence of anemia and relationship with parasitic (protozoan and helminthes) infection. A total of 389 samples (feceses and blood) were examined from patients attended to primary health center in Al-Doullab Village (Babylon Province\ Iraq). Their ages ranged from 1-55 years. The overall percentage of anemia was 20.9% and the highest percentage incidences were 59.2% in females in comparison with males (40.8%). The overall percentage of parasitic infection was 60.15% distributed as 58.7% for females and 60.9% for males. The highest percentages were those of *Entamoeba histolytica* followed by *Enterobius vermicularis*, *Giardia lamblia*, *Ancylostoma duodenale*, then *Ascaris lumbricoides* and the lowest were *Trichuris trichura*. The percentage of anemia is higher in persons infected with *E. histolytica*, *G. lamblia*, *T. trichura* and *A. lumbricoides*, while the percentage of infection with *E. vermicularis* is higher in non anemic individuals. Otherwise the highest percentage of infection by *E. histolytica* appears in the age group 31- 40 while the lowest was in age group 41- 50 and more. As regard to infection of *G. lamblia* the highest infection was in age 1-10 while the lowest was in age 31- 40. *E. vermicularis* was dominant in age 41-50 and less in the age 1-10 years. The highest infection with *A. duodenale* was in the age 31-40 while the lowest was in age 11-20 years. The highest infection rate of *A. lumbricoides* was in the age 1-10 while the lowest was in age 11-20 years. The highest infection rate with *T. trichura* was in the age 1-10 while the lowest was in age 11-20 years. As regards to hemoglobin concentration and the type of parasite, the highest concentration was observed in case of infection by *G. lamblia* then *E. histolytica*, *A. lumbricoides*, *E. vermicularis*, *T. trichura* and the lowest was in *A. duodenale*. Concerning the concentration of hemoglobin in different age groups, the highest concentration was arranged in the age groups 41-50, 31-40, 1-10, 11-20, and 21-30 years.

KEY WORDS:

Parasitic infection, Anemia

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ARTICLE CODE: 26.01.13**INTRODUCTION:**

Intestinal parasites remain a major health problem in many developing countries. The World Health Organization estimated that there were 1000 million cases of ascariasis due to *Ascaris lumbricoides*, and 500 million cases of *Trichuris trichiura* infection worldwide (WHO, 1987). Chan *et al.* (1994) estimated that there were 1471 million and 1048 million cases of *A. lumbricoides* and *T. trichiura* infections, respectively. Soil borne parasitic infections has been increasingly recognized as an important public health threat all over the world, particularly in developing countries like India and Middle East. Among the parasitic infections, intestinal infections holds the prime place amongst the top ten global health challenges like amoebiasis, ascariasis, hookworm infection, trichiuriasis etc. (Brooker *et al.*, 2006). Intestinal parasitic infections are more prevalent among the poor sections of population. They are closely associated with low household income, poor personal and environmental sanitation, and overcrowding

limited access to clean water, tropical climate and low altitude.

Anemia is the common disease observed in tropic and subtropic areas. Iron deficiency anemia affects about 1.3 billion people with the highest prevalence and morbidity in young children and pregnant women (Al-Naemi *et al.*, 2011). From the available literature, the only study investigated the relationship between intestinal parasites and anemia was done in Mosul province (Al-Heali, 2009). She examined 499 stool samples and found six species of parasites and she attributed the incidence of parasitism to the hemoglobin decrease by 22% in the blood of infected persons. However anemia associated with *Schistosoma mansoni* infection was considered a serious public health problem and a risk factor in Egypt (Curtale *et al.*, 1998). Food and drinks are the main routes in which intestinal parasites can enter the body and to a certain extent other routes such as flies and mosquitoes are involved (Udonsi *et al.*, 1996). *Enterobius vermicularis*, *Entamoeba histolytica* and *Giardia lamblia* infect 42 millions in developing countries causing anemia and disorders as nausea, weakness, diarrhea (Mahfouz *et al.*, 1997). Patients with heavy infection may lose up to 220 ml of blood per day, but around 40% of iron may be reabsorbed before it leaves the intestine. Furthermore, a moderate *Ancylostoma deudendale* infection gradually produced an iron-deficiency anemia as the reserves of iron are used and its severity depends on the worm load and dietary iron intake of patients (Roberts and Janovy, 2005; Al-Naemi *et al.*, 2011).

Anemia is the most common disease among malnutrition communities and the main cause is insufficient protein, folic acid, B6 or B12 and vitamin C, while the other causes of anemia are intestinal helminthes, amoebiasis and malaria infections (Muhangi *et al.*, 2007). The most common symptoms are pale face, white eye, fatigue, nausea, and lip fractures (Ferreira *et al.*, 2007).

The aim of the present study is to investigate the relationship between the anemic individuals and the existence of intestinal parasites in different age groups at Al- Doullab village, Babylon province.

MATERIAL AND METHODS:

A total of 389 fecal samples were collected from patients attending to primary health center in Al-Doullab village (Babylon province), situated about 7 Km. northern Hilla city. Most of Al-Doullab village peoples are working in agriculture and animal breeding like cattle, sheep, goats, and poultry. Their ages ranged from 1-55 years and the period of sample collection from October 2011 till September 2012. Patients selected for this

study were usually suffering from diarrhea, vomiting and abdominal pain. Stool specimens were preserved in 15 ml vial containing 10% formalin as a fixative with fitted cover and the age of each patient was recorded. The stool samples were examined in advanced parasitology laboratory of Science College for women\Babylon Province by direct smear methods. A drop of Lugol's iodine was added and mixed with small piece of feces and examined under compound microscope to diagnose protozoan cysts and eggs of helminthes. Also floatation method was done to detect the eggs of *A. deudendale*, *A. lumbricoides*, *E. vermicularis* and *T. trichiura* (WHO, 1994). Hemoglobin was estimated according to Talib and Khurana (1996) by automated electronic counters (MS9), About 1 ml of blood was taken from patients, mixed carefully with rotator and then put the blood sample (15 microliter) in the equipment (MS9).

RESULTS:

As shown in table 1 the overall percentage of parasitic infection was 60.15% distributed as 60.9% and 58.7% in males and females, respectively.

Table 1. The overall percentage of parasitic infection in males and females

Gender	Examined No.	Non Infected No.	Infected No.	(%)
Males	251	98	153	60.9
Females	138	57	81	58.7
Total	389	155	234	60.15

Table 2 reveals the highest percentages of incidence were those of *E. histolytica* cysts (36.7%) followed by the eggs of *E. vermicularis* (32.9%) , cysts of *G. lamblia* (26.1%) , eggs of *A. deudendale* (2.13%) then eggs of *A. lumbricoides* and *T. trichura* (1.3% and 0.85%, respectively).

Table 2. The different intestinal parasites and their percentages

Parasites	Incidence of the recovered parasites	Incidence of infection
<i>Entamoeba histolytica</i>	86	36.7
<i>Giardia lamblia</i>	61	26.1
<i>Enterobius vermicularis</i>	77	32.9
<i>Ancylostoma deudendale</i>	5	2.13
<i>Ascaris lumbricoides</i>	3	1.3
<i>Trichuris trichura</i>	2	0.85
Total	234	100

As indicated in table 3, the percentages of *E. histolytica* , *G. lamblia*, *A. deudendale*, *T. trichura* and *A. lumbricoides* were 42.85% - 35.13%, 26.53% - 25.4%, 8.16% - 0.54%, 2.04% - 1.1% and 4.1% - 0.54% in anemic

and non anemic patients, respectively. On the contrary, the percentages of *E. vermicularis* were higher in non anemic (37.3%) than anemic individuals (16.32%).

Table 3. The intestinal parasites in patients with or without anemia

Parasites	With Anemia		Without Anemia	
	Infected No.	(%)	Infected No.	(%)
<i>Entamoeba histolytica</i>	21	42.85	65	35.13
<i>Giardia lamblia</i>	13	26.53	47	25.4
<i>Enterobius vermicularis</i>	8	16.32	69	37.3
<i>Ancylostoma deudendale</i>	4	8.16	1	0.54
<i>Ascaris lumbricoides</i>	2	4.1	1	0.54
<i>Trichuris trichura</i>	1	2.04	2	1.1
Total	49	100	185	100

Table 4 reveals that the percentages of anemic individuals were 79.1% and those without anemia were 20.9% (distributed as 59.2% females and 40.8% males) and the hemoglobin concentrations in the two groups were 10.45 ± 0.25 and 11.76 ± 0.15 gm/ 100 ml, respectively.

Table 5. The prevalence of intestinal parasites according to age groups

Parasites	Age group (years)									
	1-10		11-20		21-30		31-40		41-55 & more	
	No.	%	No.	%	No.	%	No.	%	No.	%
<i>Entamoeba histolytica</i>	31	37.3	33	36.2	9	36	10	40	3	30
<i>Giardia lamblia</i>	32	38.5	18	19.5	5	20	4	16	2	20
<i>Enterobius vermicularis</i>	15	17.8	36	39.1	11	44	10	40	5	50
<i>Ancylostoma deudendale</i>	2	2.4	2	2.2	0	0	1	4	0	0
<i>Ascaris lumbricoides</i>	2	2.4	1	1.1	0	0	0	0	0	0
<i>Trichuris trichura</i>	1	1.2	1	1.1	0	0	0	0	0	0
Total	83	100	91	100	25	100	25	100	10	100

Table 6 shows hemoglobin concentration (gm/100 ml) related to the type of parasite. The highest concentration was 11 ± 0.28 in case of infection by *G. lamblia*, 10.1 ± 0.25 in case of *E. histolytica*, 10 ± 0.35 in case of *A. lumbricoides*, 9.4 ± 0.31 in case of *E. vermicularis*, 9 ± 0.24 in case of *T. trichura*. The lowest concentration was noticed in case of *A. deudendale* (8.1 ± 0.29).

Table 6. Hemoglobin concentration according to parasite species

Parasites	Infected No.	Hb. Concentration (gm\100 ml.) \pm S.D.
<i>Entamoeba histolytica</i>	21	10.1 ± 0.25
<i>Giardia lamblia</i>	13	11 ± 0.28
<i>Enterobius vermicularis</i>	8	9.4 ± 0.31
<i>Ancylostoma deudendale</i>	4	8.1 ± 0.29
<i>Ascaris lumbricoides</i>	2	10 ± 0.35
<i>Trichuris trichura</i>	1	9 ± 0.24

Table 4. The percentage of Individuals without or with anemia and hemoglobin concentrations in the two groups

Type	Hb. Concentration (gm/ 100 ml.)	Infected No.	(%)
Individuals Without Anemia	11.76 ± 0.15	185	79.1
Individuals With Anemia	10.45 ± 0.25	29♀ 20♂	59.2 40.8
Total	389	234	100

Table 5 indicates the prevalence of parasites according to the age groups in years. The highest percentage of infection by *E. histolytica* appeared in the age group 31- 40 (40%) while the lowest was in the age group 41- 50 and more (30%). As regard to infection with *G. lamblia* the highest infection was in age 1-10(38.5%) while the lowest was in age 31- 40(16%). The highest infection rate with *E. vermicularis* was in age 41-50 (50%) and the lowest in the age 1-10 (17.8%). The highest infection rate with *A. deudendale* was in the age 31-40(4%) while the lowest was in age 11-20 (2.2%). The highest infection rate with *A. lumbricoides* (2.4%) was in the age 1-10 while the lowest was in age 11-20 (1.1%). The highest infection rate with *T. trichura* (1.2%) was in the age 1-10 while the lowest was in age 11-20 (1.1%).

Table 7 reveals the concentration of hemoglobin (gm/100 ml) in the different age groups, the highest concentration was in the order of age groups 41-55 and more (10.6 gm/100 ml), 31-40 (10 gm/100 ml), 1-10 (9.5 gm/100 ml), 11-20 (9.1 gm/100 ml) and 21-30 (8.0 gm\100 ml).

Table 7. Hemoglobin concentration according to age groups

Age group (years)	Infected No.	Hb. Concentration (gm\100 ml.) \pm S.D.
1-10	16	9.5 ± 0.33
11-20	15	9.1 ± 0.32
21-30	8	8.0 ± 0.27
31-40	6	10.0 ± 0.26
41-55 and more	4	10.6 ± 0.25

DISCUSSION:

The present study recovered six parasite species (two protozoans and four nematodes) in Al- Doullab village. The overall percentage of parasitic infection was 60.15% distributed as 58.7% in females and 60.9 % in males. The most abundant parasite was *E. histolytica* (36.7%) while the lowest was *T. trichura* (0.85%). The highest infection in the present study may be attributed to the loss of hygiene and environmental contaminations of drinking water, as well as most of individuals were farmers and not educational (Al-Mamouri, 2000).

Similar parasitic species were previously reported from patients attended to hospitals in Babylon province by Al-Yassari (2004). The most abundant ones were *E. histolytica* (29.5%) and *G. lamblia* (13.7%). Al-Shirifi (2000) found that the most abundant parasites were *G. lamblia* (15.7%). while Al-Naemi *et al.* (2011) found that *E. histolytica* and *E. vermicularis* were the abundant parasites (35.8% and 32.6%, respectively). Al-Mamouri (2000) found that *E. histolytica*, *G. lamblia* and *E. vermicularis* were the predominant parasites with high rate of infection while *A. lumbricoides* and *A. duodenale* were less dominant. Al-Mussawi (2012) reports on the patients attended to the primary health centers in Babylon province revealed that the incidence of *G. lamblia* was 13.6%. Anyway, the abundance of *E. histolytica* is likely because of its simple life cycle as there is no intermediate host, and the infection comes usually through polluted food and drinks and the house flies also are very known a mechanical transmitter in such cases. Similar conclusion was drawn by Adedayo and Nasiiro (2004). The lowest infection by *T. trichura* (0.9%) is expected as the worm is one of the geohelminths which need some period (about 10 days) in the soil to be developed to the infective stage (Muhangi *et al.*, 2007). Such soil may be not available, beside that using chemical fertilizers instead of stool in farming may lead to reduction of infection.

Anemia was more noticed in individuals infected with *E. histolytica*, *G. lamblia*, *A. duodenale*, *T. trichura* and *A. lumbricoides*. The occurrence of parasitic-induced anemia may likely due to the effect of parasitism, or the individual is in low nutritional level. Furthermore the presence of parasites and the absence of anemia probably attributed to the parasitic infection in their early stage. Such findings are similar to the results of Koukounari *et al.* (2008) as they reported prevalence of anemia in Kenyan schoolchildren with intestinal parasitic infection. Also, Al-Zubaydi (2002) in Mishamish village in Babylon province found that 37% of anemic subjects were suffering

from the hookworm (*A. duodenale*) infection. Moreover, Al-Naemi *et al.* (2011) showed a relationship between anemia and parasitic infections in Shekhan district, Mosel province (Iraq) and all the conditions and peoples are similar in way of living, water supply, nutritional status, poor hygiene and sanitation.

Comparative study of infection made by Brenitlinger *et al.* (2003) in adult women in Mexico revealed that the hemoglobin level in hookworm-infected women was significantly lower than uninfected ones. Anyhow, anemia even if it is evident in the present population in Al-Doullab village it is not clear whether it is due to the palate and vitamin B12 deficiencies and hemoglobinopathies like sickle-cell anemia and thalassemia. The cause of anemia in this study is more likely due to mild iron deficiency which does not display microcytosis or other nutritional deficiencies similar to that found by Adedayo and Nasiiro (2004) in Dominican. Ferreira *et al.* (2007) in a community-based study in rural Amazonia found no statistically differences when the association was made between each parasite (*A. duodenale*, *T. trichura* and *A. lumbricoides*) and anemia.

About 49 anemic patients from 234 infected with parasites with a percentage 20.9% (distributed as 59.2% in females and 40.8% in males). These results agree with the study of the Al-Zubaydi (2002) and Al-Naemi *et al.* (2011). The highest anemia in females may be attributed to their work as farmers leading to contact with infective stages of parasites in addition to the poor hygiene and sanitation.

The highest percentages of *E. histolytica*, *G. lamblia*, *A. lumbricoides*, and *T. trichura* infection were observed in the age group 1-10 and 11-20 years while *E. vermicularis* and *A. duodenale* in age group 41-55 and 21-30 years, respectively. The highest percentage in this age means that the highest infection was in the childhood and adolescent group which means that the individuals are highly active and not care about their hygiene as they in close contact with soil and they play on the ground and less care about their hygiene. Similar results of children infection especially by *S. mansoni* was observed by Koukounari *et al.* (2008) in Kenyan schoolchildren. Also, similar conclusion was drawn by Muhangi *et al.* (2007) when they studied the relation between helminthes, malaria and HIV infection and anemia in pregnant women in Uganda. They claimed that farming and playing in moist soil resulting in higher exposure to infective eggs and exposure to malaria. Also, the usage of stool of humans and animals as plant fertilizers in the farms may lead to high

infection with these parasites (Al-Mamouri, 2000).

The results of highest concentration of hemoglobin in case of *G. lamblia*, are puzzling as it is well known that *G. lamblia* cause fatty stool with no blood loss (Roberts and Janovy, 2005). On the other hand, the present study showed that *A. duodenale* cause anemia compared to *G. lamblia* as it is known that blood loss per worm is about 0.03 ml per day in *Necator americanus* and 0.26 ml per day in *A. duodenale* infections (Roberts and Janovy, 2005). Possibly these fluctuations of anemia depend on the nutritional status of individuals which was not estimated in the present investigation, which is an important criterion in the determination of anemic individuals.

The anemia in the older group is expected as immunity usually decreased and

the intestinal parasites, as well will increased, while the lowest anemia was in the age 21-30 years which is the climax of young stage. Nevertheless, the highest concentration of hemoglobin in the age 41-50 years seems to be contradicted. These results need more confirmation by examining the nutritional status of individual examined in the health center, and make more larger sample in Al-Doullab village, Babylon province.

We suggest further study searching for anemia in Al-Doullab village especially as related to nutritional status and searching other causes of anemia such as chronic infection, inflammatory disease and hemoglobin pathies like sickle-cell anemia and thalassemia are needed which could reveal more information about its occurrence.

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انتشار الاصابات الطفيلية وعلاقتها مع فقر الدم في قرية الدولاب، محافظة بابل، العراق

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بالفئة العمرية (31-40) أما الإصابة بالدودة دبوسية فكانت اعلى نسبة للإصابة (50%) بالفئة العمرية (41-50) واقل نسبة (17.8%) بالفئة العمرية (1-10) ، أما الدودة الشصية فكانت اعلى (4%) بالفئة العمرية (31-40) واقل (2.2%) بالفئة العمرية . (11-20) وكانت اعلى نسبة (2.4%) للصر الخراطيني بالفئة العمرية (1-10) واقل نسبة (1.1%) بالفئة العمرية . (11-20) اما الإصابة بالديدان السوطية فاعلى نسبة (1.2%) بالفئة العمرية (1-10) واقل نسبة (1.1%) بالفئة العمرية (11-20) . أما علاقة تركيز الهيموغلوبين مع نوع الطفيلي فكان اعلى تركيز للهيموغلوبين بالإصابة مع طفيلي الجيارديا الاميبية (11%) ثم اميبيا الزحار (10.1%) ثم الصفر الخراطيني (10%) ثم الدودة دبوسية (9.4%) تبعها الدودة السوطية (9%) واخيرا الدودة الشصية . (8.1%) اما علاقة تركيز الهيموغلوبين مع المجاميع العمرية ، فكان اعلى تركيز في الفئة العمرية (41-50) بمقدار 10.5 غم/ 100 مل ثم الفئة العمرية (31-40) بمقدار 10 غم/ 100 مل تبعها الفئة العمرية (1-10) بمقدار 9.5 غم / 100 مل ثم تلاها الفئة العمرية (11-20) بمقدار 9.1 غم / 100 مل واقلها كانت الفئة العمرية (21-30) بمقدار 8 غم / 100 مل.

أجريت الدراسة الحالية في الفترة من تشرين الاول 2011حتى ايلول 2012 للكشف عن فقر الدم وعلاقته بالإصابات الطفيلية أوالحيوانية وديدان. تم تجميع 389 عينة براز ودم وفحصت وذلك للأشخاص المتردين على مركز الرعاية الأولية في قرية الدولاب محافظة بابل والذين تراوحت أعمارهم بين (1-55) عاماً وفحصت عينات البراز بطريقة التطويق للكشف عن الأكياس والبيض وكذلك تحديد فقر الدم بالمرضى المصابين وكانت نسبة الإصابة الكلية بفقر الدم (59.2%) في الاناث و 40.8% في الذكور .(نسبة الإصابة الكلية بالطفيليات المعوية 60.15% توزعت 58.7% في الاناث و 60.9% في الذكور وكانت اعلى نسبة بالطفيليات قيد الدراسة هي لأميبيا الزحار تبعها الدودة دبوسية ثم الجيارديا الاميبية ثم الدودة الشصية ثم الصفر الخراطيني وكانت الدودة السوطية اقل نسب الإصابة. نسبة الإصابة بفقر الدم كانت عالية في الاشخاص المصابين بالطفيليات مقارنة بغير المصابين في اميبيا الزحار (42.85%) ، 35.13%على التوالي (ثم الجيارديا الاميبية % 26.53) ، 25.4%على التوالي (تبعها الدودة الشصية % 8.16) ، 0.54%على التوالي (ثم الدودة السوطية % 2.04) ، 1.1% على التوالي (ثم الصفر الخراطيني % 4.1) ، 0.54% على التوالي (بينما كانت الإصابة بالدودة دبوسية أعلى بالأشخاص غير المصابين بفقر الدم مقارنة بالمصابين) 37.3%، 16.32% على التوالي وظهرت اعلى نسبة للإصابة (40%) بأميبيا الزحار بالفئة العمرية31-40 عاماً واقل (30%) بالفئة العمرية 41-50 عاماً، بينما كانت في الجيارديا الاميبية في الفئة 1-10 عاماً بمقدار 38.5% واقل نسبة كانت 16%

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