

## Relationship between Anemia and Parasitic Infections in Shekhan District, Iraq

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**ABSTRACT:**

A total of 431 of stool samples were collected from patients consulting the governmental health center in Al-Shakhan district (Mosul, Iraq), their ages range from 1-50 years, the period of collection lie between January 2009-October 2009. The highest percentage of the occurrence of cysts was those of *Entamoeba histolytica* (35.8.0%) followed by eggs of *Enterbius vermicularis* (32.60%), then cysts of *Giardia lamblia* (26.81%), then the eggs of *Ancylostoma duodenale* (2.17%), then eggs of *Ascaris lumbricoides* (1.44 %) and the lowest was eggs of *Trichuris trichura* (1.08%). The percentage of anemia is higher in infected persons compared with uninfected as infection with *E. histolytica* (38.98% and 35% respectively), similarly *G. lamblia* (28.18% and 26.2% respectively), *A. duodenale* (8.47% and 0.4% respectively), *T. trichura* (5.08% and 0.0 respectively), and in *A. lumbricoides* (1.69% and 1.3% respectively), while infection with *E. vermicularis* the percentage of infection is higher in unanemic persons (36.8% and 16.9% respectively). Furthermore, the highest percentage of infection by *E. histolytica* occurs in the age 11-20 (40%) while the lowest was in the age 41-50 and more (21.4 %). As regard infection of *G. lamblia* the highest infection was in the age 1-10 (39.5%) while the lowest was in the age 31-40 (11.4%). The infection with *E. vermicularis*, the highest was in the age 11-20 (43.4%) and the lowest in the age 1-10 (19.7%). The highest infection with *A. duodenale* was in the age 11-20 (3%) while the lowest in the age 1-10 (2 %). As concern infection with *A. lumbricoides* the highest infection rate (3.1%) was in the age 1-10 while the lowest was in the age 11-20 (1%). Infection with *T. trichuris* the highest infection rate (2%) was in the age 1-10 while the lowest (1%) in the age 11-20. As regards haemoglobin concentration and the type of the parasite, the highest concentration was in case of infection by *G. lamblia* (11%), then *E. histolytica* (10.3%), *A. lumbricoides* (10%) then *E. vermicularis* (9.5%) then in case of *T. trichura* (9), then the lowest was in *A. duodenale* (8%). while concentration of hemoglobin in different age group: the highest concentration was in age group 41-50 (10.5 g/dl) and then the 31-40 (10 g/dl) then the age group 1-10 (9.7% g/dl) then in age group 11-20 (9.2 g/dl) and the lowest was in the age group 21-30 (8.1% g/dl).

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## INTRODUCTION

Anemia is a common disease observed in tropics. Iron deficiency anemia affects about 1.3 billion people with the highest prevalence and morbidity in young children and pregnant women (Gillespie et al.1991).The only study investigated the relationship between intestinal parasites and anemia was done persons in Nineveh Governorate (Al-Heali,2009), she examined 499 stool samples and found six species of parasites and she concluded that the haemoglobin decreased in the blood of infected persons with 22% . However anemia is considered a serious public health and *Schistosoma mansoni* is considered 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 certain extent other routes such as flies and mosquitoes (Greets and Gryseels, 2000). Furthermore, bad hygiene and social behavior in addition to general health can increase the possibility of anemia occurrence(El Kichaoi and Abd Rabou, 2004). Intestinal helminthes such as *Ancylostoma duodenale* infect 9000 million people in the world, while *Ascaris lumbricoides* and *Trichuris trichura* infect 800 million, and *Enterobius vermicularis* infect 42 million in developed countries(Lobo et al. 1998). Most of persons infected with parasitic infection suffering from nutrition, nausea, weakness, diarrhea, anemia (Pothinpak et al.2005). Patients with heavy infection may lose up to 200 ml of blood per day, but around 40% of iron may be reabsorbed before it leaves the intestine. Nevertheless, a moderate *Ancylostoma duodenale* infection will gradually produce an iron-deficiency anemia as body reserves of iron are used. Severity of anemia depend on worm load and dietary iron intake of patient (Roberts and Janovy, 2005).

Anemia is the most common disease among malnutrition and among the main causes is insufficient protein , folic acid , B6 or B12 and vitamine C, while the other causes of anemia are intestinal helminthes, amoebiasis and malaria (Koukounari et al. 2008). The most common symptoms are pale blood, eye white, feeling of tire, nausea, lips fractures(Shubair et al.2005).

The aim of the present study is to investigate the relationship between the anemic persons and the presence of intestinal parasites in different age group in a sample taken from Shekhan district, Mosul, Iraq.

## MATERIALS AND METHODS

A total of 431 of stool samples were collected from patients consulting the governmental Health Center in Al-Shekhan district. Al –Shekhan district situated about 50 Km northern of mosul city, it is a hilly area with continental climate similar to mosul climate especially in spring and autumn, while in winter temperature range for -5 to 8c and in summer 40-50 c. Its population can be estimation to be more than 70.000 person including the center out its suburbs. The water supply come from wells situated in the hilly area. Most of Shekhan people are working in agriculture especially wheat and barley in addition to animal breeding such as sheep, goats, and poultry. Their ages range between 1-50 year, the period of collection lie between January 2009- October 2009.Patients attending this governmental outpatient clinic are usually suffering from common cold, diarrhea, renal colic, dermatological problems, diabetes, heart pressure, breast cancer, gynecological diseases, and sterility. The patient who suffer from diarrhea, and abdominal pain, and vomiting were selected for this study. Stool specimens were preserved in a 15 cc vial containing 10% formaline as a fixative with fitted cover and the age of the patient was recorded for each sample, and stored for two –three days. Two to three slides from each vial were prepared, a drop of Lugols iodine was added, then examined under the microscope by direct method according to Neimeister et al. (1990). Haemoglobine was estimated using Sahli method (Lewis et al., 2001). The normal haemoglobine levels:

Age	Hemoglobin levels
Less than 7 days	17 to 22 h/dl
1 Week	15 to 20 g/dl
1 Month	11 to 15 g/dl
Children	11 to 13 g/dl
Adult males	14 to 18 g/dl
Elderly males	12.4 to 14.9 g/dl
Adult females	12 to 16 g/dl
Elderly females	11.7 to 13.8 g/dl

## RESULTS

As indicated in **Table (1)**, the highest percentage of the occurrence of cysts was those of *Entamoeba histolytica* (35.8.0%) followed by eggs of *Enterbius vermicularis* (32.60%), then cysts of *Giardia lamblia* (26.81%), then the eggs of *Ancylostoma duodenale* (2.17%), then eggs of *Ascaris lumbricoides* (1.44 %) and the lowest was eggs of *Trichuris trichura* (1.08%).



**Table (1): the different intestinal parasites and their percentages.**

Parasite	Total number of infection	Percentage of infection
<i>Entamoeba histolytica</i>	99	35.8
<i>Giardia lamblia</i>	74	26.81
<i>Enterobius vermicularis</i>	90	32.60
<i>Ancylostoma duodenale</i>	6	2.17
<i>Ascaris lumbricoides</i>	4	1.44
<i>Trichuris trichura</i>	3	1.08
<b>total</b>	<b>276</b>	<b>100.0</b>

As shown in **Table(2)**, the percentage of anemia is higher in infected persons compared with uninfected as infection with *E. histolytica* (38.98% and 35% respectively), similarly *G. lamblia* (28.18% and 26.2% respectively), *A. duodenale* ( 8.47% and 0.4% respectively) *T. trichura* (5.08% and 0.0 respectively), and in *A. lumbricoides* (1.69% and 1.3% respectively), while infection with *E. vermicularis* the percentage of infection is higher in unanemic persons(36.8% and 16.9% respectively).

**Table(3)**, indicated the revealed parasites listed with their age group . The highest percentage of infection by *E. histolytica* occurs in the age 11-20(40%) while the lowest was in the age 41-50 and more(21.4 %). As regard infection of *G. lamblia* the highest infection was in the age 1-10 (39.5%) while the lowest was in the age 31-40(11.4%).

The infection with *E. vermicularis*, the highest was in the age 11-20(43.4%) and the lowest in the age 1-10(19.7%). The highest infection with *A. duodenale* was in the age 11-20(3%) while the

**Table (2): intestinal parasite in patients with or without anemia**

Parasite	With anemia		Without anemia	
	Number	Percentage	Number	Percentage
<i>Entamoeba histolytica</i>	23	38.9	76	35.0
<i>Giardia lamblia</i>	17	28.18	57	26.2
<i>Enterobius vermicularis</i>	10	16.95	80	36.8
<i>Ancylostoma duodenale</i>	5	8.47	1	0.4
<i>Ascaris lumbricoides</i>	1	1.69	3	1.3
<i>Trichuris trichura</i>	3	5.08	0	0.00
<b>total</b>	<b>59</b>	<b>100.00</b>	<b>217</b>	<b>99.7</b>

lowest in the age 1-10(2 %). As concern infection with *A. lumbricoides* the highest infection rate (3.1%) was in the age 1-10 while the lowest was in the age 11-20(1%). Infection with *T. trichuris* the highest infection rate (2%) was in the age 1-10 while the lowest ( 1%) in the age 11-20.

As indicated in **Table (4)**, showing haemoglobin concentration and the type of the parasite, the highest concentration was in case of infection by *G. lamblia* (11%), then *E. histolytica* (10.3%), *A. lumbricoides*(10%) then *E. vermicularis* (9.5%) then in case of *T. trichura*( 9 ), then the lowest was in *A. duodenale*(8%).

**Table(5)**, showing the concentration of hemoglobin in different age group. The highest concentration was in age group 41-50(10.5 g/dl) and then the 31-40(10 g/dl) then the age group 1-10 (9.7% g/dl) then in age group 11-20( 9.2 g/dl) and the lowest was in the age group 21-30(8.1% g/dl).

## DISCUSSION

As seen in Table(1), six parasites have been encountered in persons consulting Shekhan district health center including two protozoans( *E. histolytica* and *G. lamblia*) and four nematodes namely *E. vermicularis*, *A. duodenale* , *A. lumbricoides*, and *T. trachura*. In the present study *E. histolytica* was the most abundant parasite (35.8%) while that with lowest infection was *T. trichura*(1%).

Similar parasites were previously reported from the school pupils and food handler by Al-Daody(1998) the most abundant one was *E. coli* 24.7% Al- Shirifi (2000) found that the most abundant parasites was *G. lamblia* (15.69%) while *E. histolytica* was 8.45% . Al-Abbady (2001) found the abundant parasites was *E. coli* while *E. histolytica* was only 11.07%. Hama(2007)found that *E. vermicularis* was the predominant helminthes with high rate of infection (29.8%) while *G. lamblia* was the most abundant among protozoa in schoolchildren in Erbil province (37.44%). Anyhow the abundance of *E. histolytica* is likely because its life cycle is simple as there is no intermediate host, and the infection comes usually through polluted food and drinks and the house flies also is very known mechanical transmitter in such cases, similar was drawn was conclusion by Niazi et al.1976.The lowest infection by *T. trichura* is expected as the worm is one of the geohelminths which need some period about 10 days in the soil to be developed to infected stage

**Table (3): prevalence of intestinal parasites by age in 276 patients**

parasite	Age (year)									
	1-10		11-20		21-30		31-40		41-50	
	n	%	n	%	n	%	n	%	n	%
<i>E. histolytica</i>	35	35.4	40	36.7	10	32.3	11	40.7	3	30.0
<i>G. lamblia</i>	38	38.4	21	19.3	9	29.0	4	14.8	2	20.0
<i>E.vermicularis</i>	19	19.2	43	39.4	12	38.7	11	40.7	5	50.0
<i>A. duodenale</i>	2	2.0	3	2.8	---	---	1	3.7	---	0.0
<i>A.lumbricoides</i>	3	3.0	1	0.9	---	---	---	0.0	---	0.0
<i>T. trichura</i>	2	2.0	1	0.9	---	---	---	0.0	---	0.0
total	99	100.0	109	100.0	31	100.0	27	100.0	10	100.0

(Markell et al.1999) such soil may be not available, in other hand using chemical fertilizer instead of stool in farming may lead to reduction of infection.

As indicated in Table(2), the percentages of anemia were more in infected persons with *E. histolytica*, *G. lamblia*, *A. duodenale* and *T. trichuris*, *A. lumbricoides*. The presence of the parasite which accompanied by anemia is likely due to the effect of parasitism, or the person is in low nutritional level. On the other hand the presence of parasite and the absence of anemia may be because the parasitic infection is in its early stage. Such finding is similar to the results found by Le et al. (2007) as she found more prevalence of anemia in schoolchildren with intestinal parasite infection in rural Vietnam especially in case of *Trichuris* infection(76%). In other study conducted in Kenya , Koukounari et al.(2008) found the children heavily infected with *S. mansoni* were more likely to be anemic compared with uninfected children.

However, in a group study of youngster in northern Brazil, Ferreria et al.(1998) found no statistical difference when the association was made between each parasite (*A. duodenale*, *T. trichuris*, *A. lumbricoides*) and anemia. similar study was conducted in Paragoüy( Labiano abello et al.1999).

However, in a study conducted by Mupfasoni et al. (2009) in northern Rwanda concerning polyparasite in helminth infections and their association to anemia nor the odds of stunting were found to be significantly different in the three

polyparasite infection profiles.

In Mexico, Brenllinger et al.(2003) after a comparative study of infection and anemia in adult women found haemoglobin levels in hookworm-infected women - were significantly lower than uninfected woman anyhow anemia even if it is evident in the present population in Shekhan district it is not clear whether it is due to falcate and vitamin B12 deficiencies and haemoglobinopathies like sickle-cell anemia and thalassemia. The cause of anemia in our sample is more likely due to mild iron deficiency which does not display microcytosis or other nutritional deficiencies similar to the results of Tysuyuoka et al. (1999) in Aracaju sergipe Brazil.

As seen in Table(3), the highest percentages of infection was in the age 11-20 and 1-10 by *E. histolytica* , *G. lamblia* , *E. vermicularis*, *A. duodenale*, *T. trichura*. The highest percentage was in this age means that the highest infection was in the childhood and adolescent group which mean the persons are highly active and do not care about their hygiene as persons are in close contact with pollutant with soil as 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 similar conclusion was drawn by Erosie etal. (2001), (see Le et al.2007) when studies the relation between hookworm infection and haemoglobin status in rural elementary school

**Table (4): concentration rate of hemoglobin according to parasites species**

parasite	n	Haemoglobin g/dl
<i>E histolytica</i>	23	10.3
<i>G. lamblia</i>	17	11
<i>E. vermicularis</i>	10	9.5
<i>A. duodenale</i>	5	8
<i>A. lumbricoides</i>	1	10
<i>T. trichura</i>	3	9

**Table (5): concentration rate of hemoglobin according to age group**

Age group	n	Haemoglobin g/dl
1-10	19	9.7
11-20	17	9.2
21-30	10	8.1
31-40	8	10
41-50	5	10.5



children in southern Ethiopia as they claims that farming and playing in moist soil resulting in higher exposure to infective egg and filariform larvae in the soil. Scholchildren in rural Vietnam was also highly infected with the highest prevalence for *T. trichura* , *A. lumbricoides* as concluded by Le et al. (2007). while Table(4),showing the highest concentration of hemoglobin was in case of *G. lamblia*.These results are puzzling as it is well known that *G. lamblia* cause fatty stool with no blood (Roberts and Janovy,2005). Anyhow possibly a virulent strain ( see Roberts and Janovy, 2005) may exist in Shekhan and caused such anemia . On the other hand in the present results *A. duodenale* seem to cause less anemia compared to *G. lamblia*. However, it was also known that blood loss per worm is about 0.03 ml per day in *N. americanus* and 0.26 ml per day for *A. duodenale* (Roberts and Janovy, 2005) Possibly these fluctuations of anemia depends on nutritional status of individuals which were not estimated in the present investigation, as nutritional status is an important criterion in determination of anemic persons.

As regard Table (5), the anemia in older group is expected as immunity usually decrease and intestinal parasites with more percentage while the lowest anemia was in the age 21-30 which is the climax of young stage . It puzzling that the highest concentration of hemoglobin in age 41-50 while lower in age 21-30 . These seem to contradict with the above results in Table(6) and Fig(6). These results need more confirmation by examining the nutritional status of individual examined in health center, and make more larger sample of Shekhan district.

It is suggested that further study searching for anemia in Shekhan 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 of individual which could reveal more information about their occurrence, which later on facilitate its treatment.

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