

Detection and Estimation of Some Hematological and Immunological Parameters among Patients with Intestinal Parasites in Babylon, Iraq

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Abstract:

Background Parasitic infections caused by intestinal helminthes and protozoan parasites in humans are related with major health problem especially in the regions with poor sanitation and bad personal hygiene. **Objectives:** Present study is aimed to detection of intestinal parasites and study its effects on some hematological and immunological parameters on patients

Material and methods: The study was conducted in Al- Mahaweel district-hospital, Babylon. from May to September/2022. A stool and blood samples were collected from (100)patients and(30) control group to detection of intestinal parasitic infections and to estimate total count of RBCs and Hb , total and differential counts of WBCs and estimate some immunological parameters like as level of IL-5 and IgE in sera of patients and correlated with control group.

Results appear the infection rate (49%) and the infection rate rise significantly in females (64.2%) than males(29.54%) .There are many intestinal parasites were detected ,The high rate of infection with *E. vermicularis* (20.4%) while the lowest rate of infection with *A. duodenale*(8.6%). Hematological result reported a significant decreased in total count of RBCs and Hb of infected group (3.96×10^6 cell /mm³) and (8.72 mg/ 100 ml), respectively compared with control group (5.62×10^6 cell /mm³) and (11.87mg/ 100ml) respectively . A Significant increased were reported in total counts of WBCs of infected group (10.5 cell /mm³) as compared with control group (6.31 cell/mm³). Differential WBCs appears significant increase($p < 0.05$) in eosinophils (6.22%) in patients while no variation in number of other type of WBCs when compared with control group. Results of immunological data reveal to a significant elevation ($P < 0.05$) in both IgE, and IL-5 serum level among infected group when compared with control group.

Keywords: Intestinal parasite, hematological parameters immunological parameters, IgE, interleukin (IL-5).

Introduction

Intestinal parasites illness responsible for a serious health problem in tropic and sub tropic areas and commonly spread in developing countries, also highly distribution of infection by these parasites in regions with poor sanitary disposal of humans excreta and bad personal hygiene and more common infection occurs in

rural areas related to climate conditions , lake of safe water supply and contaminated soil.

There are many types of intestinal parasites include the helminths worm . the parasitic intestinal worms and the other one is protozoan intestinal parasites as single cell organisms called intestinal protozoa. The main and very common Intestinal protozoan parasite infect man is *Giardia lamblia* ,*cryptosporidium parvum* , *hymenolips*



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nana as well as *Entamoeba histolytica* which is cosmopolitan protozoan parasite infect the large intestine of man. it is a causative agent of intestinal amoebiasis. Main symptoms of this disease are persistent diarrhea (dysentery), the stool of patient contains blood and mucus, nausea, lower abdominal pain, fever, and flatulence. Amoebiasis is a serious, parasitic illness and the second cause of deaths after malaria that cause parasitic infections worldwide. The highest rate of infections is observed among individual live in the tropic areas. One of important intestinal helminthic parasites to man is *Enterobius vermicularis* which is a causative agents of pinworm infection and cause disease of human in any age especially children. soil-transmitted helminthic worm like as *Ascaris lumbricoides* commonly named round worm which is very common intestinal nematodes for man, *Trichuris trichiura* or whip worm, Hook worm; *Necator americanus* and *Ancylostoma duodenale* and *Strongyloid stercoralis* are also responsible for gastrointestinal illness of human (3). Anemia manifested in infected humans commonly due to iron deficiency, also the parasitic infection is main factor that causes of anemia in infected individuals. Hemoglobin represent the principle element that found within the red blood cell. Parasitic infections considered one of pathological conditions that lead to losses of Hb in addition to malnutrition, blood loss, and chronic infection, these are main factors to cause anemia(4). WBCs are one of important elements of blood of peripheral blood, that provided the protection against many pathogenic organisms and agents like as, parasites, bacteria, viruses, tumors, and other illness. there are 5 types of WBCs different in proportions, size and functions which are Neutrophil, Monocytes, Eosinophils, Basophils, Lymphocytes cells (5). Many of parasitic infections are removed and eliminated as a response of (Th2) immune cells, and this result in produce of immunoglobulin (IgE) and release of the eosinophils cells in site of infection. The interleukins produced by action of (Th2) cells elicit the activity of the eosinophils cells and recruit them in parasites sites where

they release granular proteins act as toxic effect which lead to destroy the parasites. The interleukin (IL-5) plays an important role, particularly for activation, proliferation and survival of eosinophils. These, indicated high levels of IgE in the sera of patients, particularly those infected with intestinal parasite(6).

Materials and methods:

Samples collection:

Stool samples:

Stool sample collected through the period from May to September/2022, (30) stool sample from healthy individual as control and (100) stool sample from patients with gastrointestinal manifestations of both sexes in different age which admitted to Al- Mahaweel district-hospital, Babylon province, Iraq.

each samples of stool from infected and control group were put in clean, dry screw cap, one gram of stool was taken and analyzed in laboratory within thirty min. the samples were examined microscopically by direct wet mount fecal smear method also the sample was mixed with ten millimeters of formal saline ten percentage solution to preserve and fixed the samples to detect if there any one of intestinal parasites. Also stool samples was examined macroscopically by the naked eye to observe blood or mucus in stool, color, quantity, consistency, formed, semi formed or liquid stool also to look for blood or mucus in stool sample in addition to indicate found of the larva stage or mature worm of nematodes or proglottids of cestodes parasite (7).

Blood samples:

The blood samples (5 ml) of patients and control group were collected and divided in to two parts; one part (two milliliters) of blood put in a sterile tube contain anticoagulant (EDTA tube) were used for hematological study. The second part of blood sample (three milliliters) put in gel tube and centrifuged at 5000 rpm for ten minutes to obtain of serum then the sera was kept by freezing (-20 C.) until used for immunological tests.

Hematological study:

RBCs count, assessment of Hb , total and differential WBCs counts were done according to (8).

Immunological study:

To estimate level of interleukine-E(IU/ml) in sera, we used the (ELISA) test by using the kit made in Bussero-MI- Italy .

To estimate level of interleukin-5 (Pg. /ml) in sera of infected and control group we used ELIZA test by using the kit made in DRG-Germany .The immunological measurement test was conducted according to the manufacture’s instructions.

Statistical analysis:

To find differences according the various data chi-square(x2) tests as well as LSP were utilized for statistical analysis of the samples by using stratigraphic program.

Results

According to clinical symptoms and laboratory diagnosis we found that the total percentage of infection was (49 %) as in table-1-.

Table 1. Intestinal parasites infection%

Region	Examined No.	Infected No.	Infection%
Al-Mahawel	100	49	49

The data of resent study reveal to significant variation (p<0.05) in rate of intestinal parasitic infection by sex . The rate of infection in female (64.2%) while in males (29.54%) as in table-2-.

Table 2. Intestinal parasitic infection by sex.

Sex	Examined No.	Infected No.	Infection%
Female	56	36	64.2%
Male	44	13	29.54%
	100	49	50%

Significant differences(p<0.05)

The results in table (3) appear (7) types of intestinal parasites, the highest percentage of infection occurs with *Enterobios vermicularis* (20.4%) then followed by *Entamoeba*

histolytica(18.36%). The lowest is *Ancylostoma doudenali* (8.16%).

Table 3. Infection rate % of laboratory isolated of different types of intestinal parasites.

Type of parasite	Infected No.	Infection%
<i>Enterobios vermicularis</i>	10	20.4%
<i>Entamoeba histolytica</i>	9	18.36%
<i>Giardia lamblia</i>	8	16.32%
<i>Entamoeba coli</i>	7	14.28%
<i>Hymenolepis nana</i>	6	12.24%
<i>Ascaris lumbricoides</i>	5	10.36%
<i>Ancylostoma duodenale</i>	4	8.16%
Total	49	100%

Table-4- Hematological investigation: The data of present study reveal to significant decrease (p<0.05) in total count of RBCs (3.960×10⁶ cell /mm³) and Hb (8.72 mg/ 100ml) in infected group in compared with control group, RBCs and Hb (5.62× 10⁶cell /mm³) and (11.87mg/ 100ml) respectively. The result of differential and total count of WBCs was (10.56 cell /mm³) show significant increase in infected group in compared with control group was (6.35 cell/mm³) .

Table 4. Hematological parameter of study groups.

Study groups	RBCs×10 ⁶ cell /mm ³	Hb mg/ 100ml	WBCs cell /mm ³
Infected	3.960± 4.520*	8.72 ± 0.21*	10.56 ± 0.93*
Control	5.62±4.81	11.87±0.13	6.35 ± 4.92

Significant differences* =

Table -5- The number of eosinophil cells (6.22%) increased significantly in infected group when compared with control group, while no changes in number of Lymphocytes, Monocytes and

Neutrophil when compare with results of control group.

Table 5. Differential WBCs count of study groups.

Study groups	Neutrophils%	Lymphocytes%	Monocytes %	Eosinophil%
Infected	65.97±0.600	26.82±0.221	1.91±0.6122	6.22±0.822*
Control	65.88±0.750	27.94±0.425	2.95±0.110	3.11±0.906

significant differences* =

Table -6- Current study appears rise in serum level of immunoglobulin -E and interleukin -5 in infected group when compared with healthy group and the result of statistic analysis refer to significant differences between two study groups.

Table 6. Concentration of IgE and IL-5 in sear of study groups

Mean level of IgE and IL-5 concentration	Infected group (M±SD)	Control group (M±SD)
IgE (IU/ml)	*149.833±13.35	80.517±22.344
IL-5(pg./ml)	24.933±4.966*	14.935±2.744

*=significant differences

Discussion:

The high rate of prevalent with intestinal parasites infection in patients inhabit rural areas ,many people who complains from parasitic infection because many factors such as poor public health practices, increase of vectors which transmit the parasites and bad nutrition states also utilize of river unsafe water for washing and drinking , many of people in rural areas woke as farmers and usually contact with contaminated soil . This result is agreement with results of study by(9) who explain that the infection rate with intestinal parasites in person from rural region was highest than in person inhabits urban regions.

It is clear that the high infection in females table-2- may be due to the household activities, like preparation of food and cleaning which might expose them to parasites . the results of current study show agrees with the one of (10) which found that girls had greater prevalence of nematodes infection(pinworms) than boys also

the result agrees studies conducted by(11). while the study of (12) reported no significant differences among infected male and female group, and she believed that may be due to the same socioeconomic level and culture condition.

As show in table -3- the high frequent of infection with *Entrobious vermicularis* may be attributed to many factors, particularly lack of adequate , poor hand hygiene , The parasite has simples life cycle of all intestinal worm, in addition the eggs develop into infectious larvae within short time within six hours and it has many ways to transmitted like anus to mouth, person to person, wearing soiled clothing and via airborne(13).

Infection by *Entamoeba histolytica* is worldwide distribution . The cysts of parasite do not killed by chlorination of water and transmitted through contaminated drinking water is very common and most important factor to acquire infection ,house flies act as a main vector for transmission of parasite(14) .

Giardia lamblia infected mainly responsible for causing watery diarrhea particularly in small age more than adults , the transmission of this parasite occurs via many ways in addition the small number of cysts required to cause infection (15) .

Entamoeba coli detection as nonpathogenic parasite in man, that mean ingestion of contaminated food and water , also may indicate that the patient ingestion or exposure to pathogenic organisms (16) . *Hymenolips nana* occurs by presence of the intermediate host such as rodents or grain beetles in houses ,These worms has direct and indirect life cycle and its egg stage is highly infectious for man and do not requires to intermediate host to complet its life cycle also the autoinfection of this parasite increase the

ability of repeated the infection with this parasite (17) .

Ascaris lumbricoides infection is more common in rural areas, it is spread related with poor sanitary disposal of human feces particularly when human feces used without treated as a fertilizer of soil in addition humans defecate on the field increase of distribution of parasite . *A. lumbricoides* produced high amount of eggs with thick mamillated shell ,this enable eggs to survive for several years in soil (18).

Infection with *Ancylostoma duodenali* is very common and worldwide distribution particularly in the inhabitant practice, poor sanitary disposal of human excreta , It can infect human commonly the farmers who work barefoot in fecal-contaminated soil (19). The results of hematologic study in table -4- show decrease in total count RBCs also low haemoglobin (Hb) . this may be due to that intestinal parasites cause digestive disturbance and malabsorption of nutrition like as vitamins,fat and proteins also protozoan parasite usually produce high number of trophozoites which feed and attach to intestinal villi and that lead to mechanical blockage ,malabsorption and finally malnutrition (20) .Other parasitic worms can suck about (0.5 ml) of blood/ single worm per day from infected man, in addition some intestinal parasites cause loss of blood at site of attachment in intestinal tract in response to an anticoagulant release by adult worms (7). Some of parasites release toxin act as haemolysin, which destroyed the RBCs and cause anemia also lower in haemoglobin level [21]. A further study conducted in Iraq revealed significant variations in haemoglobin levels between healthy and infected individuals (22).

In table -5-the results show increase in total WBCs count especially the eosinophil cells may be due to immune response of patient against parasitic infection and ability of eosinophil to destruction and eliminate the parasites via attachment with its surface wall and secret of specific granules which destroy the external wall of parasite . High eosinophilia occurs due to larvae migration of some helminthic parasitic

infection which lead to tissue damage , inflammation ,allergic reaction and then eosinophil exudate in response to these damage (23). Many of studies refer that increase of eosinophil cells due to the action of interleukin-5 which produced by the (Th2) cell also IL-5 is the most important interleukin play an important role in the transform and maturation of eosinophils also it has ability to activate accumulation of eosinophil in site of infection . thus, the principal cause of the increase number of eosinophils cells in circulation in case man infected with parasitic illness(6).

The immunological results of present study in table- 6- appear that the concentration of IgE was (149.833±13.35 IU/ml) and IL-5 was (24.933±4.966 pg. /ml) in infected group was high when correlated with the data of healthy group , the serum level of IgE and IL-5 was (80.517±22.344 IU/ml), (14.935±2.744 pg. /ml) respectively. The statistic analysis appears a significant difference within results of two study groups.

The high serum level of IgE in patients with intestinal parasites may be due to host immune response or host defense mechanism against toxins release from parasite during infection (24). In most parasitic infections the defense occurs by activating Th2 - cells, producing immunoglobulin E and activating the function of eosinophil cells. The elevation of IgE levels usually aid in eliminated of parasites, other mechanism contributing to eliminate of parasitic infection is Ab-Dependent Cell- Mediated Cytotoxicity by immunoglobulin E surfacereceptors activity. studies of intestinal protozoa infection in rodent have implicated IL -6 in anti-protozoan immunity and observed decrease in ability of clear infection in case of IL -6 deficient mice (25).

The elevation in serum level of interleukin 5 in patients with intestinal parasites in present study is due to the immune system response of patients against intestinal parasites by Th 2 cells which responsible for produce a high levels of IL-4, IL-5, IL-10, IL-13 and IL-21 and these

interleukins responsible for regulate and control of hypersensitivity reaction, which involves(B-lymphocytes) change their produce from Abs to IgG and IgM only, high amount of eosinophil, , mast cells, goblet cells and other inflammatory cells that participate in destruction of parasite (26, 27).

Conclusions:

The current study appears high prevalence rate of intestinal parasitic infection in Babylon, Iraq, and the prevalence of infection were more common with *Enterobious vermicularis*, followed by *Entamoeba histolytica* .The data of study explain a great variation in the results of hematological parameters among infected individual by intestinal parasites . we observed reduce in hemoglobin level and rise in the WBCs within eosinophils cells and no change in other type of WBCs. the data of present study referred to elevation in serum level of immunoglobulin -E furthermore interleukin- 5 in patients with intestinal parasites compared with healthy persons.

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