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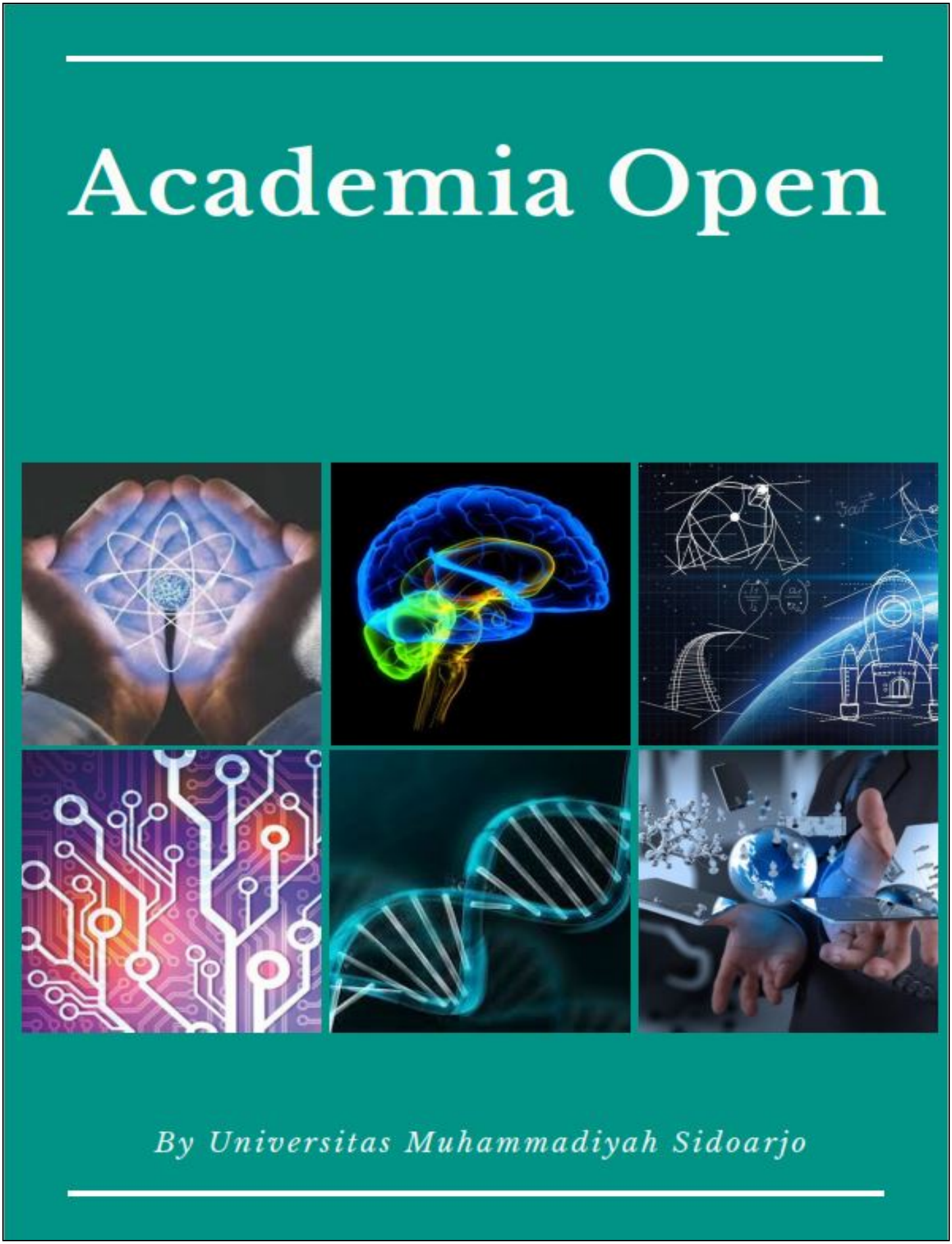

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Evaluation of Some Hematological Parameters for Patients Infected with Entamoeba Histolytica in Najaf Governorate

Evaluasi Beberapa Parameter Hematologi untuk Pasien yang Terinfeksi dengan Entamoeba Histolytica di Kegubernuran Najaf

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Abstract

General background: Amoebic dysentery caused by *Entamoeba histolytica* is a significant public health concern, particularly in regions with poor sanitation. It can lead to various complications, including changes in blood parameters. **Specific background**: Identifying changes in blood indicators during amoebic infections can aid early diagnosis and improve patient outcomes. **Knowledge gap**: There is limited research exploring gender-based differences in blood parameters of patients with amoebiasis. **Aims**: This study aimed to evaluate the effect of *E. histolytica* infection on specific blood parameters in male and female patients and to assess gender-based variations in these parameters. **Results**: A total of 45 patients (20 males, 25 females) diagnosed with amoebiasis were included, with samples collected between May 2023 and January 2024. Significant differences ($P \leq 0.05$) were observed between male and female patients in RBC, HB, HCT, and MCH, while no significant differences were noted for MCV, MCHC, RDW, PLT, WBC, or LYM. Male patients showed higher mean values of RBC (5.01 ± 0.65) and HB (14.6 ± 1.61) compared to females (RBC: 4.5 ± 0.54; HB: 12.28 ± 1.24). **Novelty**: This study highlights gender-specific alterations in blood parameters during amoebiasis, providing new insights into how gender affects physiological responses to *E. histolytica* infection. **Implications**: Regular monitoring of blood parameters, particularly RBC and HB, in patients with amoebiasis is crucial for early diagnosis and treatment. The findings also underscore the importance of gender considerations in clinical management and suggest the need for larger studies to confirm these results and explore their diagnostic and therapeutic implications.

Highlights:

1. Gender impacts blood parameters in amoebiasis patients.
2. Males show higher RBC and HB than females.
3. Regular monitoring aids early *E. histolytica* diagnosis.

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Keywords: Amoebic dysentery, *Entamoeba histolytica*, blood parameters, gender differences, early diagnosis

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Introduction

Low levels of environmental sanitation, cultural practices, poor socioeconomic status, and frequent exposure to contaminated water facilitate the transmission and widespread distribution of intestinal parasitic infections among parasites(1), intestinal parasites have proven to be highly prevalent and it is estimated that more than three billion people are infected with them in the world today(2). Nearly 450 million people suffer from parasitic infections, and about half of this number are children (3). Intestinal parasites often have no symptoms, however, they can be a cause of dehydration, mucous or watery diarrhea, nausea, abdominal pain, vomiting, fever, vitamin deficiencies, iron deficiency anemia, and physical and mental health disorders(4).

Intestinal parasites that infect humans are considered one of the most widespread health problems, especially in hot, tropical and subtropical regions. It is no less important than other microscopic causes, as it has the ability to infect most of the body's organs, which leads to pathological complications that sometimes end in death(5).

There is a need to control these parasites and reduce their impact on humans. In addition to its ability to reproduce in huge numbers, this has led to it not being completely eliminated, and there is widespread interest. Protozoa and intestinal helminths constitute a large group of parasites that live in the intestine. The parasite is either It is pathogenic, as it does not cause symptoms of disease, or it is pathogenic that attacks and destroys tissues, and this depends on the type and number of parasite, in addition to the duration of infection, food, and factors(6) . The current study aims to measure some blood indicators for men and female suffering from Entamoeba histolytica (cyst + trophozoite) and compare them.

Methods

Data collection and laboratory processing:

The current study included 45 stool samples taken from visitors to Al-Sadr Teaching Hospital, Al-Hakeem General Hospital, and General Hospital for both sexes and for different numbers of individuals in the family and for different ages.

Stool examination:

Macroscopic examination: The stool is examined with the naked eye, and the texture, color, and smell of the stool are taken into consideration. Note that the liquid stool contains more of the active, nutritious phases, and therefore it must be examined before 30 minutes of taking the sample.

Microscopic examination: A stool sample the size of a pinhead containing the bloody and mucus parts is taken with a wooden stick, divided into two parts and placed on both ends of the glass slide. Then one drop of Normal solution with a concentration of 0.9% is added to one end in order to detect the nutritional and cystic stages, in addition to showing Red blood cells and white cells. To the second end, add a drop of aqueous iodine solution (Logols Iodine). Then the slide cover is placed on it and then examined with an optical microscope to search for the nutrient stages under a powerful optical microscope (40 x)(7) .

Blood collection:

5 ml of venous blood was collected from all patienys to test blood parameters. The samples were placed in sterile EDTA tubes containing an anticoagulant, and the samples were placed in the Hemolyzer Analyticon (Germany) automatic blood analysis device, where the device takes test samples, dilutes them automatically, and corrects errors in a way. Automatically then the results are read.

Determination of blood parameters:

Estimation of blood parameters was used which included(Red Blood Cells count RBC , Hemoglobin levels Hb , Hematocrit Hct , Mean Corpuscular Volume MCV, Mean Corpuscular Hemoglobin MCH, Mean Corpuscular Hemoglobin Concentration MCHC, Red Corpuscular Distribution Width RDW- CV , White Blood Cells count WBC, Lymphocytes Percentage LYM, Platelet PLT).

Statistical Analysis:

The obtained data, which included 45 cases of male and female patients with Entamoeba histolytica, was statistically analyzed using the SPSS version 23 statistical analysis program to express the results. There were substantial differences between the two groups, as indicated by the mean and standard deviation of $P \leq 0.05$.

Result and Discussion

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Result

The study included 45 infected people, 25 males and 20 females. We divided it into three age groups. The first age group was less than 30, number 20, 12 females, and 8 males. The second age group was 30-50, number 17, 7 males and 10 females, and the third age group was more than 50, number 8, 5 males and 3 females, as shown in Table 1.

Age (years)	N. male	N. female	Total
<30	8	12	20
30-50	7	10	17
>50	5	3	8
Total	20	25	45

Table 1. *patient group and disruption according age groups*

Table 2. Showed the highest significant differences in the mean (±SD) of RBC, HB, HCT, and MCH of male patients compared with female patients. While it appears there are no significant differences (p≤0.05) in the mean of MCV, MCHC, RDW-SD, RDW-CV, PLT, WBC and LYM in the male patients compared with female patients.

Gender	Male	Female	P-value
Mean ± SD RBC (106/L)	5.01 ± 0.65	4.5 ± 0.54	0.01
Mean ± SD HB (g /dL)	14.6±1.61	12.28±1.24	0.00
Mean ± SD HCT(%)	42.40 ±3.78	36.82±3.13	0.00
Mean± SD MCV(fl)	85.61±8.66	81.83±8.49	0.15
Mean ± SD MCH(pg)	29.66±3.71	27.42±3.54	0.04
Mean ± SD MCH(pg)	29.66±3.71	27.42±3.54	0.04
Mean ± SD MCHC (g/dl)	35.52±4.57	33.40±1.85	0.06
Mean ± SD RDW-SD (fl)	35.46±13.20	31.11±16.27	0.32
Mean ± SD RDW-CV	12.71± 1.11	12.70± 1.08	0.98
Mean ± SD PLT (103/µl)	250.0±72.39	277.08±90.14	0.27
Mean ± SD WBC	9.03±3.29	9.15±3.73	0.90
Mean ± SD LYM	13.77± 13.35	7.17± 10.20	0.07

Table 2. *Mean values (±SD) for hematological parameters in the patient groups according gender*

Table 3. shows that the comparison between male and female for under 30 years of age. It was observed that there were significant differences (p≤0.05) in the value of (HB and HCT). As well as there was observed that there were no significant differences in the value of (RBC, MCV, MCH, MCHC, RDW-SD, RDW-CV, PLT, WBC and LYM).

Gender	Male 8	Female 12	P-value
Mean ± SD RBC (106/L)	5.11 ± 0.77	4.62 ± 0.55	0.14
Mean ± SD HB (g /dL)	14.52±2.30	12.20±1.04	0.02
Mean ± SD HCT (%)	41.45±4.86	36.64±2.91	0.03
Mean± SD MCV(fl)	82.07±10.47	80.02±9.88	0.66
Mean ± SD MCH(pg)	28.91±4.95	26.67±3.75	0.29
Mean ± SD MCHC (g/dl)	34.71±2.22	33.31±1.50	0.14
Mean ± SD RDW-SD (fl)	31.45±13.56	82.21±15.64	0.63
Mean ± SD RDW-CV	12.92± 1.59	12.39± 0.90	0.41
Mean ± SD PLT (103/µl)	10.79±14.93	3.35±1.65	0.20
Mean ± SD WBC (103/µl)	10.67±4.01	10.79±3.87	0.94
Mean ± SD LYM	266.0± 73.03	283.9±164.67	0.58

Table 3. *Mean values (±SD) for hematological parameters in the patient under 30 years' old*

Table 4. shows that the comparison between male and female form age 30 to age 50. It was observed that there were significant differences (p≤0.05) in the value of (RBC, HB, and HCT). As well as there was observed that there were no significant differences in the value of (MCV, MCH, MCHC, RDW-SD, RDW-CV, PLT, WBC, and LYM).

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Gender	Male 6	Female 10	P-value
Mean ± SD RBC (106/L)	5.28 ± 0.51	4.47 ± 0.60	0.01
Mean ± SD HB (g /dL)	15.01±1.22	11.95±1.38	0.00
Mean ± SD HCT(%)	43.98±2.89	36.02±3.21	0.00
Mean± SD MCV(fl)	82.07±10.47	80.02±9.88	0.46
Mean ± SD MCH(pg)	28.91±4.95	26.67±3.75	0.39
Mean ± SD MCHC (g/dl)	34.71±2.22	33.31±1.50	0.38
Mean ± SD RDW-SD (fl)	31.45±13.56	82.21±15.64	0.79
Mean ± SD RDW-CV	12.92± 1.59	12.39± 0.90	0.58
Mean ± SD PLT (103/µl)	246.85±85.59	290.80±118.50	0.38
Mean ± SD WBC	7.80±2.72	7.57±309	0.87
Mean ± SD LYM	19.22± 14.26	11.68±14.61	0.30

Table 4. *Mean values (±SD) for hematological parameters in the patient from age 30 to 50.*

Table 5 shows that the comparison between male and female older than 50 years. It was observed that there were no significant differences (p≤0.05) in the value of (RBC, HB, HCT, MCV, MCH, MCHC, RDW-SD, RDW-CV, PLT, WBC, and LYM).

Gender	Male 5	Female 3	P-value
Mean ± SD RBC (106/L)	4.47±0.30	4.47±0.41	0.98
Mean ± SD HB (g /dL)	14.48±0.66	13.70±0.55	0.13
Mean ± SD Hct(%)	14.72±2.69	40.20±1.90	0.39
Mean± SD MCV(fl)	94.28±3.54	90.06±4.56	0.25
Mean ± SD MCH(pg)	32.46±1.28	30.73±1.62	0.20
Mean ± SD MCHC (g/dl)	38.78±8.38	34.10±0.59	0.28
Mean ± SD RDW-SD (fl)	45.88±4.34	44.83±2.23	0.66
Mean ± SD RDW-CV	12. 28± 0.79	12.83± 0.23	0.20
Mean ± SD PLT (103/µl)	228.80±85.99	204.00±45.70	0.53
Mean ± SD WBC	45.88±4.34	44.83±2.23	0.66
Mean ± SD LYM	10.90± 8.45	7.40±9.19	0.61

Table 5. *Mean values (±SD) for hematological parameters in the patient older than50 years.*

As for Table 6., the results show that the comparison between males and females infected with both cyst and trophozoite parasites It was observed that there were significant differences (p≤0.05) in the values of RBC, HB, HCT, and LYM, while there were no significant differences in the values of MCV, MCH, MCHC, RDW-SD, RDW-CV, PLT and WBC.

Gender	Male	Female	P-value
Mean±SD RBC (106/L)	5.05±0.74	4.61±0.37	0.06
Mean ± SD HB (g /dL)	14.40 ±1.80	12.41± 1.28	0.02
Mean ± SD Hct(%)	14.70±4.13	37.15±2.99	0.02
Mean± SD MCV(fl)	83.88±9.50	81.20±7.87	0.39
Mean ± SD MCH(pg)	28.87±4.16	27.28±3.41	0.24
Mean ± SD MCHC (g/dl)	35.89±5.47	33.46±1.94	0.13
Mean ± SD RDW-SD (fl)	34.33±13.42	29.91±16.03	0.38
Mean ± SD RDW-CV	12.88± 1.26	12.67± 1.14	0.62
Mean ± SD PLT (103/µl)	263.21±81.72	249.66±66.27	0.61
Mean ± SD WBC	8.61±2.97	9.28±3.99	0.57
Mean±SD LYM	15.42±15.00	5.22±7.30	0.03

Table 6. *Mean (±SD) for hematological parameters in the patient with C + T GenderMale 14*

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Discussion

Infection with the parasite E. histolytica is one of the major health problems in many tropical and subtropical regions, especially in developing countries (8). Environmental factors, age, gender, and health habits play an important and prominent role in the occurrence of infection intestinal bacteria are easily transmitted through water and Food contaminated with infectious cysts, which vary in their ability to resist gastric and intestinal juices (9). As for species that do not form cysts, their transmission is direct. Also, the most widespread intestinal parasite infection in third world countries is amoebiasis, or what is called dysentery. Dysentery amoebic and giardiasis. One of the most important factors that help increase the incidence of these parasites is the deteriorating economic conditions and wrong social habits (10).One of causes of the increases in parasite infections is use the river water ,liquefied water , or other peoples unsterilized tools (11,12).

In Table No. 2, there is a significant difference between the number of red blood cells, hemoglobin and hematocrit between males and females, even though the number of blood cells,HB and HCT are within the normal ranges for the international reference , but there are closer to the lowest range ,the reason may be that this parasite causes disturbance in the digestive system and also secretes a motile feeding stage that attaches to the villi of the intestine and absorbs renin from them(13) . The renin-angiotensin system, especially Ang II , contributes to the regulation of red blood cell mass and plasma volume, and is therefore the ultimate regulator of hemoglobin and hematocrit levels(14) . In addition, infection with the parasite E. histolytica leads to necrosis and damage to the intestinal mucosa, which negatively affects the sites of absorption of necessary substances. In addition to the bleeding caused by necrosis of the membrane, infection with intestinal parasites has a great impact on blood values(15) . In general, intestinal parasite infestation is strongly associated with anemia because it causes malabsorption, nutritional deficiencies, and blood loss in the gastrointestinal tract(16,17) .Changes in values occur of RBC , HB , HCT , MCV , MCH, MCHC, RDW-SD, RDW-CV this indicated anemia due to iron deficiency ,also the parasite can cause diarrhea in the patients(18,19) . Samples of those infected with the cyst and trophzoite phase were studied due to the large number of people infected with these stages. It was noted that there were significant differences ($p \leq 0.05$) in hemoglobin, hematocrit and lymphocytes between males and females ,also, in the research, we did not mention the case of cysts only or trophozoites only due to the small number of patients, this is consistent with a study(20). Where it was found that most cases of infection were in the cyst and trophozoite phase. this result because the cyst and trophzoite represents the chronic stage of infection with the disease and causes recurrent diarrhea

Conclusion

The study showed the extent to which intestinal parasite infection affects blood indicators, and that examining the complete blood count is of great importance to help diagnose the infection and may be a guide to further treatment and follow-up. However, it is recommended to conduct more studies with a larger sample to confirm the results of the study and the validity of these indicators. In diagnosing infection with Entamoeba histolytic parasite.

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