Study of Some Immune and Blood Markers Associated with Infection with the Intestinal Parasite Entamoeba Histolytica in Diabetic Patients

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ABSTRACT

This study was conducted on patients visiting hospitals in city and suburbs of Najaf Governorate for the period from the beginning of (2022/10/1) to (2023/2/1) to determine the relationship between the initial intestinal parasites with diabetics by identifying some immune indicators (IGM, IGG, IGA) and the White Blood Cells, Erythrocetes sedimentation rate, hematocrit (packed cell volume), Haemoglobin, and Biochemicals traits (Blood Sugar, Hemoglobin A1C, serum creatinine, uric acid, High Density Lipoprotein–cholesterol, cholesterol, C- Reactive protein and Total Serum Bilirubin. This study included (157) samples, including (40) feces of people from the people who were proven that they were affected by parasites only, which were tested to determine some epidemic indicators of the parasite, including age and sex, and (17) blood sample for the people who were associated with their affliction by *Entamoebia histolytica* and disease Diabetes together, and (50) blood sample for people with diabetes only, in addition to the control sample (50) blood sample of healthy people. As for those infected with the Entamoeba histolytica parasite, the highest infection rate was recorded in females and the lowest in male , with a significant difference as the infection rate was (75%) (25%) respectively , as for the age group the highest infection rate was in the age group 1-10 years old, with a high significant difference, and the lowest infection rate in the group (21-40) years old, which amounted to (32.5 %)(25%) respectively . . The results also indicated that infection with the E. histolytica parasite and diabetes mellitus together were higher in females than in males, reaching (60.6%), (29.4%). The results of the current study showed about standards blood for people infected with parasite E.histolytica parasite and diabetes mellitus to Height in the concentration of Wbc and ESR and a decrease in the concentration of hematocrit and hemoglobin, which amounted to(9.7 cells / mm) , (30 mm / hr) , (42.7%) , (13.3 g / dl) , compared to control. which resulted in (7.5 cells/mm) , (20 mm/hr) , (43%) , and (14.5 g/dl) , respectively. On the other hand, only those with diabetes showed an increase in the concentration of white blood cells and a decrease in the concentration of hematocrit, hemoglobin and erythrocyte sedimentation rate. Proportions were (7.9 cells / mm) , (43 %) , (14.5mg/dl) , (20mm/hr) The results for the biochemical parameters of patients with E.histolytica parasite and diabetes mellitus showed an increase in the level of glucose, cumulative sugar, C-reactive protein and urea, a slight increase in the concentration of bilirubin and a decrease in the concentration of cholesterol, high-density lipoproteins and uric acid, with significant differences which amounted to (216 mg/dl) ,(7.9%),(13.1 mg/dl) , (40mg/dl) ,(1.05 mg/dl) ,(130mg/dl) ,(38mg/dl) , (3.4mg/dl) respectively compared to the control (93mg/dl) , (5.5%),(5.5mg/dl) ,(30mg/dl) ,(1mg/dl) ,(160mg/dl) ,(57.3mg/dl) , (4.3 mg/dl) respectively . As for diabetic patients only, there was a rise in glucose, glycated hemoglobin, C-reactive protein, high-density lipoproteins, uric acid level, cholesterol, urea, and a decrease in creatinine concentration, while the bilirubin concentration was within the normal level and the values were (213 mg/dl) ,(8.3%) ,(6.6 mg/dl) ,(6.4mg/dl)),6.6 mg/dl)) , (171 mg/dl) (34.2mg/dl)) (,0.9 mg/dl) ,(1mg/dl) respectively . Compared to the control range (93mg/dl), (5.5%), (57.3mg/dl) (5.5mg/dl), (4.3mg/dl), (160mg/dl), (30mg/dl), (0.95 mg/dl), (1mg/dl) The results showed that regarding the immune parameters of those infected with parasite and diabetes mellitus to decrease in the level of IgG and IgA and an increase in the level of IgM and the values were in the sick (1020mg/dl), (120mg/dl), 141 mg/dl) respectively compared to the control group (1150) (mg/dl, (235mg/dl), (135 mg/dl) respectively. In people with diabetes only, the study recorded a decrease in the concentration of IgA and IgM and an increase in IgG and the values were (221 mg/dl) (92mg/dl), (1206 mg/dl) respectively. Compared to the control range (235 mg/dl), (135 mg/dl) and (1150 mg/dl) respectively

Keywords: blood markers, intestinal parasite; diabetic patients.

1. Introduction

Infection with intestinal parasites occurs worldwide, and its high prevalence rates represent a major public health problem (2019. Villamizar et al) that Entamoeba histolytica is a pathogenic parasite that causes dysentery in humans Asymptomatic or severe disease histolytica infection can be with amoebic colitis and amoebic liver abscess. Dysentery remains an important cause of morbidity and mortality worldwide (Ghosh et al., 2019).

Diabetes is a chronic disease or a group of metabolic diseases and diabetes is characterized by a high level of glucose concentration in the blood, and because insufficient insulin production, or because the cells of the body do not respond to insulin properly. Permanent high blood sugar leads to long-term damage and failure of various organs of the body, especially the eyes, kidneys, nerves, heart and veins (Sneha and Gangil, 2019) There are immune interactions between helminths and their host . Helminths stimulate the immune system toward a strong type 2 immune response associated with tissue repair and immune response (Elliott and Weinstock, 2017).) These changes may affect the host's immune status and be affected by other comorbidities (Liu et al., 2010). There is an overlap between intestinal parasites and diabetes. The mechanisms that cause both diseases suggest that they may affect each other. (Elliott and Weinstock, 2017)) Infections caused by parasites may affect the frequency of diabetes. Either by increasing or decreasing it. Several studies have shown that exposure to helminth infections can prevent the development of chronic inflammatory diseases, such as type 1 diabetes and other immune disorders (Zaccone and Hall, 2012).

Objective of the study: The current study aims to :-

Study of the relationship in infection between histolytic antiamoeba parasite in patients with type II diabetes by identifying some hemostatic indicators (WBCs, Pcv, Hb, ESR), immunological (IgM, IgG, IgA) and biochemical in Najaf Governorate (B.sug, Hba1c, CRP, T.S.B, B.urea, chol, S.cr, HDL –C, U.A)

2. Materials and Methods

Place of study

The current study was conducted in hospitals in Najaf province and its suburbs and in some private pathological analysis laboratories.

Blood sample collection

Blood samples were collected by drawing (5ml) of venous blood using wine syringes and dividing the blood into two parts, the first section consists of (2ml), and placed in tubes containing anticoagulant (EDTA Tubes) and is stirred quietly for 5 minutes for the purpose of conducting complete blood picture tests and the second section consists of (3ml placed in (Gel tube) from which Serum was separated using a centrifuge at a speed of 3000 rpm for 5 minutes for the purpose of conducting immunological tests and biochemical tests .

Experiment Design

Samples numbering 157 people were collected and divided as follows

50 -1 people are not infected with either variant (diabetes or histolytic amoeba parasite) and is considered positive control

50 -2 people with diabetes only without a parasite and it is considered negative control

-3 40 people infected with the amoeba parasite that is sap without diabetes is considered negative control

4- 17 people infected with antiamoeba histopathic and diabetic

Hematological and immunological tests were performed in the samples of the infected and the control group .

Samples examination methods

Macroscopic examination

All fecal samples were examined in terms of texture, whether liquid or solid. Texture and color play an important role in the diagnosis of the sample.

Microscopic examination

Direct inspection method

Exit models were examined to search for the presence of the active phase or cystic phase using the direct swab method to detect the active phase or cystic phase of the E. histolytica parasite, and the swab was prepared by preparing a clean glass slide and a drop of physiological solution was placed on it 0.9% A small amount of stool was taken out and from different places of the model by wooden chopsticks that were mixed with the 0.9% physiological solution well until homogeneous with it, then the slide cover was placed and the samples were examined using light microscopy using a minimum magnification power of 10x and then a magnification power of 40 X (wHO, 1991)

Blood tests

- Count the number of blood cells

The blood was diluted with Turk's solution, which analyzes blood cells except leukocytes, and the Improve Neubauer chamber was used for this purpose (Ahmid and Salhi, 1994).

- Measurement of the size of compressed cells

The capillary tube method was used to measure the volume of stacked blood cells (Hillman and Ault , 2002) and expressed results in percentage

- Estimation of hemoglobin level

The amount of blood fertility was estimated by dividing the volume of the stacked blood cells by

3.3 by describing hemoglobin as representing 1/3 of the volume of red blood cells (Rodac, 2002) and the results were expressed in g/dl

- Measurement of erythrocyte sedimentation rate

The westergreens method was used to calculate the erythrocyte sedimentation rate (Brown, 1976) and the results were expressed in hour/ml

Biochemical Tests

Glucose concentration -

The concentration of glucose in serum blood was estimated by using the enzymatic method (Trinder, 1969) as it included the use of the analysis kit processed by the Spanish company Bio systems and expressed the results mg/dl

Cumulative sugar estimation -

The cumulative sugar was calculated by the Cobas integra plus 400 device that works according to the principle of absorbance photometry.

C-reactive protein test -

This test is based on the immune interaction that occurs between the human C-reactive protein and the corresponding antibodies to the human CRP antigen associated with latex molecules (Latex), where the negative reaction indicates the absence of agglutination, while the positive reaction indicates the occurrence of visible and visible agglutination of latex molecules on the slide (ridker et al., 2005).

- Determination of the concentration of high-density lipoproteins of cholesterol in blood serum

Estimation of the concentration of high-density lipoprotein (HDL-C) of cholesterol in blood serum by using ready-made measuring kits from the Spanish company (Al Qazwinin et al., 2020) and this method depends on the precipitation of kilomicrons, low-density lipoproteins and very low-density lipoproteins. The results are expressed in mg/dl

-Determination of uric acid in serum

Determination of uric acid concentration in blood serum using Biolabo SA (Al Bayati and Al Hamdani , 2021) analysis kit (KIT) and expressed in mg/dl

- Determination of serum creatinine concentration

The level of creatinine was estimated according to the method (Tietz, 1986) chromatography method with protein precipitation. The results are expressed in mg/dl

-Determination of serum cholesterol concentration

Serum cholesterol concentration was estimated using Agappe ready-made analysis kit measured by a spectrophotometer at a wavelength of 505 nm (Jassim et al., 2016) and expressed in mg/dl

- Determination of serum urea concentration

Urea concentration was calculated using biolabo ready-made analysis kit (Andresen and Bhagavan, 1986) and the results were expressed in mg/dl

- Determination of the total amount of bilirubin in blood serum

The amount of bilirubin was estimated using the color method using ready-made analysis kit from the British company Randox. The total amount of bilirubin was measured in the presence of caffeine after its reaction with adiazotae sulfanillic acid (Sherlock, 1951) and the results were expressed in mg/dl

Quantification of immunoglobulins IgA, IgM, IgG -

Estimation of the level of immunoglobulins IgM, IgA and IgG by using
Single Radial Immunodiffusion (SRID) (Roitt et al., 1985)

3. Results

Table (1) Incidence of Entamoeba Histolytica by Sex				
Control		Patients		
Percentage %	The number	percentage %	number	Gender
30	15	25	10	Males
70	35	75*	30	Females
100	50	100	40	Total
		4.5		T arithmetic
		1.96		T tabular p <0.05

1- Infection with the parasite Entamoeba Histolytica by sex

The current results showed a variation in the incidence rates between males and females compared to the control group, as a significant difference was observed at the probability level (p < 0.05)) If females had the highest rate of infection, while the lowest rate of infection was recorded in males. The percentages were 75% and 25% respectively. As in Table (1)

Table (2) Incidence of Entamoeba Histolytica parasite by age groups		
Age Categories	Patients	Percentage %
1 - 10	13	32.5**
11 - 20	7	17.5
21 - 30	5	12.5
31 - 40	5	12.5
> 40	10	25*
Total	40	100
		11.8
		9.49

Infection with the parasite Entamoeba Histolytica by age groups

The results of the current study indicated a variation

in the rates of infection with the parasite according to different age groups, the results of the statistical analysis showed that there are high significant differences at the level of probability (p < 0.05)) as the highest percentage of infection was in the age group (10-1) years and in the age group >40 and the lowest percentage of infection in the age group 40-21)) years and the values were (32.5%), (25%), (12.5%) respectively. As in Table (2)

Table (3) Incidence of Entamoeba Histolytica parasite by sex for people with diabetes				
Control		Patients		Gender
Percentage%	number	Percentage %	number	
32	8	29.4	5	Males
68	17	60.6*	12	Females
100	25	100	17	Total
		4.2		T arithmetic
		1.96		T tabular p <0.05

Incidence of Entamoeba Histolytica parasite by sex in people with diabetes

The results of the current study showed that there is a variation in the incidence of parasite and diabetes between males and females compared to the control group. If the highest rate of infection in females. The lowest incidence was in males (60.6%) (29.4%) respectively. As in Table (3)

Table (4) Comparison between people with diabetes carrying the parasite Entamoeba Histolytica and those with diabetes only with control based on blood parameters				
LSD P < 0.05	Control M ± SD	diabetic patients M ± SD	Diabetes and G. lamblia infection together M ± SD	blood parameters
1.1	7.5±1.3	8.4±2.2	*9.7±2.1	WBC
1.3	43±2.1	*40.5±3.6	42.7±4	PCV
1.6	14.5±1.5	*12.4±1.4	13.3±1.8	Hb
5.5	20±5.3	19.4±12.1	*30±10.7	ESR

The effect of diabetes, Entamoeba histolytica parasite and diabetes only on the criteria

The results of the current study showed . Table (4) to increase the total number of white blood cells and the sedimentation rate of red blood cells with significant differences (p<0.05) The values were (9.7 cells / mm) and (30 mm/hr) respectively compared to the control group (7.5 cells / mm) and (20 mm/hr) respectively
The results also indicated a decrease in the concentration of compressed blood cells and hemoglobin with no significant difference and the values of the infected were (42.7%), (13.3 g/dl) respectively compared to the control group (43%), (14.5 g / dl).
The results of the current study for people with diabetes only indicated an increase in the concentration of white blood cells and reached in those affected by 8.4 (cell / mm) compared to the control group (7.5 cells / mm) and the results showed a decrease in the concentration of compressed blood cells and hemoglobin and the rate of sedimentation of red blood cells and the values in the affected (40.5%), (12.4 g / dl), (19.4 mm / hr) compared to the control group (43%), (14.5 g/dl) , (20 mm/hr)

Table (5) Comparison between people with diabetes, Entamoeba Histolytica parasite and people with diabetes only with control based on biochemical parameters				
LSD P < 0.05	Control M ± SD	diabetic patients M ± SD	Diabetes and G. lamblia infection together M ± SD	Parameters biochemical
10.6	93±21.5	213.4±100.8	*216±10.3	Bl . Sugar
2.6	5.5±1.5	*8.3±3.6	7.9±0.7	Hbalc
4.9	5.5±3.1	6.6±1.4	*13.1±6.3	C.R. protein
5.6	57.3±6.9	64.4±8.7	*38 ±6.2	HDL - C
1.3	4.3±1.1	6.6±1.6	*3.4±1.6	Uric acid
	0.95±0.2	0.9±0.4	1.13±0.2	S.Creatinine
12.4	160±15.4	171.6±26.8	*130±22.1	Cholesterol
4.2	30±6.1	34.2±15	*40 ±7.2	B. urea
	1±0.02	1±0.23	1.05±0.01	T.S.B

5- Study the effect of diabetes, Entamoeba histolytica parasite and diabetes only on biochemical parameters

The results of the current study indicated that the concentration of (glucose - cumulative sugar - C-reactive protein - creatinine - urea - bilirubin) in patients infected with histolytic amoeba parasite and diabetes led to a significant increase in normal values and the values were shown in Table (4-13) It was (216 mg/dl), (7.9%), (13.1 mg/dl), (1.13 mg/dl), (40 mg/dl), (1.05 mg/dl) respectively compared to the control group (93 mg/dl),(5.5%),(5.5 mg/dl),(0.95 mg /dl), (30 mg/dl), (1 mg/dl)

The current results also showed a decrease in the concentration of (high-density lipoproteins - uric acid - cholesterol) and the values were (38 mg / dl), (3.4 mg / dl), (130 mg / dl) compared to the control group (57.3 mg / dl), (4.3 mg / dl), (160 mg / dl)

The results of the current study also showed that the total concentration of (diabetes - cumulative sugar - C-reactive protein - high-density lipoproteins - uric acid - cholesterol - urea) in patients with diabetes

It only led to an increase in normal values and the values were (213.4 mg /dl), (8.3%), (6.6 mg /dl), (64

.4 mg /dl), (6.6 mg /dl), (171 mg /dl), (34 .2 mg /dl) compared to the control group (93 mg dl), (5.5 mg/dl), (57.3 mg /dl), (4.3 mg /dl), (160 mg /dl), (30 mg / dl) respectively

The results also showed a slight increase in the concentration of creatinine and its value was in patients (0.9 mg / dl) compared to those who were not infected (0.95 mg / dl). The estimation of bilirubin concentration showed that the concentration within normal limits was reached in patients (1mg/dl) and in the control group (1mg/dl). Table (5)

LSD P < 0.05	Control M ± SD	diabetic patients M ± SD	Diabetes and G. lamblia infection together M ± SD	Immunoglobulins
		Table (6) Comparison between people with diabetes carrying the parasite Entamoeba Histolytica and those with diabetes only with control based on immune elements		
20.7	235±10.25	221±92.3	*120±22.3	IgA
66.3	1150±19.3	1206±590	*1020±7.5	IgG
10.3	135±12.2	92±20.7	*141±5.3	IgM

6- Measuring the concentration of immunoglobulins

The current study showed an increase in the rate of concentration of immunoglobin IgM in infected people, as it reached (141 mg/dl) compared to the control group, which reached 135 mg/dl, while the results showed a decrease in the rate of concentration of immunogloglobin IgG and IgA with significant differences, and the values were 1120 mg / dl), (120 mg / dl) respectively compared to the control group (mg/dl 1150). (235 mg /dl) respectively

The results of the current study for people with diabetes only indicated a decrease in the level of IgA and Igm and the values were (221 mg/dl, (92mg/dl) respectively compared to the control group (235 mg/dl), (135mg/dl), while the results showed an increase in the level of immunoglobulin IgG and amounted to (1206 mg / dl) compared to the control group (1150 mg/dl). Table (6)

4. Discussion

The relationship of sex to infection with the parasite Entamoeba histolytica

The results of the current study indicated a variation in the rates of infection with the parasite between males and females compared to the control group, and a significant difference was observed. The study showed that females have the highest rate of infection, while the lowest rate of infection was recorded in males.

The results of this study are consistent with the study (Hammad et al., 2022) in Kufa, which recorded the highest rate of infection in females infected with the parasite and the lowest rate of infection in males, and the values were 54.3% and 45.7%, respectively .

While the result of this study did not agree with a study conducted in Baghdad, where males

recorded the highest incidence while females had the lowest infection rate, and the values were 51.89% and 48.10%, respectively (Nayyef et al., 2022).

The reason for the difference in infection between the sexes may be attributed to several physiological factors that affect this, the most important of which is the hormonal difference between the sexes, which leads to fluctuations in the immune response as a result of hormonal disorders in the endocrine glands (Zuk and McKean, 1996) or that the reason for the high incidence of infection for females is due to lack of public health and lack of health culture and contact with animals, especially in rural women.

The relationship of the age group to infection with the Entamoeba Histolytica parasite

The results of the current study indicated a variation in the rates of infection with the parasite according to age groups, and the results of the statistical analysis showed a high significant difference, as the highest rate of infection was in the age group (1-10) years and the lowest rate of infection in the age group (30-21) years

Consistent with (2021) Sabry et al., in Salah Al-Din Governorate, where the highest percentage of infection was recorded in the age group (1-10) years and the lowest rate of infection in the age group (21-30) years, and the rates were 13.23% and 3.70%, respectively.

These results were different with a study conducted in Basra, where the highest incidence was recorded in the age group (-2130) years and the lowest percentage in the age group (Rhadi, 2021).

The reason for the chance of children in this age group being exposed to the parasite through contaminated food and water, in addition to behavioral reasons related to the tendency of children to discover the environment around it through taste and touch, which increases the

likelihood of infection with microbial infection (Al Ezzy et al., 2015).

The relationship of sex to infection with the parasite Entamoeba Histolytica and diabetes mellitus

The results of the current study showed that there is a variation in the rate of parasite infection and diabetes between males and females compared to the control group, and the results of the statistical analysis showed significant differences at the level of probability ($p < 0.05$)

If the highest rate of infection in females. And the lowest percentage of infection in males. The result of this study is consistent with (Al Moussawi and Neamah, 2021), which indicated that the highest incidence in females infected with intestinal parasites and diabetes mellitus and the lowest incidence in males was 57.6% and 42.3%, respectively.

While the current study did not agree with the study (Siddiqua et al., 2017), where the highest incidence rate was in males infected with parasite and diabetes mellitus and the lowest percentage in females, the rates were 17.46% and 14.48%, respectively.

Females may be more susceptible due to a weakened immune system that comes with diabetes and due to female participation in agriculture and domestic work (Chandi and Lakhani, 2020). The sex-based distribution of intestinal parasitic infections depends on many cultural, social and environmental factors,

which in turn vary from region to region (El-sherbini and Abosderay, 2013).

4-The relationship of blood standards for people with diabetes Entamoeba Histolytica parasite and diabetes only

The results of the current study showed that there were significant differences in blood standards between E.histolytica and diabetes compared to the control group .

An increase in the total number of white blood cells is observed. Decreased concentration of compressed blood cells and hemoglobin in infected patients. This study is consistent with the findings of (Al Mousawi and Neamah, 2021) in Najaf, where an increase in the concentration of white blood cells, a decrease in the concentration of hemoglobin and the percentage of the volume of stacked cells were recorded in people infected with intestinal parasites and diabetes mellitus.

With regard to the sedimentation rate of red blood cells, the results of the study showed a high sedimentation rate of red blood cells, and this result is consistent with a study conducted in Dhi Qar, as an increase in the sedimentation rate of red blood cells was recorded (Al Salehy and Mohammed, 2020).

The reason for the increase in white blood is due to the response of the immune system against pathogens, especially acidic cells, which play a crucial and important role in the elimination of parasites. These cells move in large numbers of blood to the site of infection with the parasite, attach to the surface of the parasite and begin to attack and kill it (Behm and ovington, 2000). The low concentration of hemoglobin is due to bleeding-related blood loss through dysentery and ulceration (Hammad et al., 2022).

As for people with diabetes only, the results of this study showed an increase in the concentration of white blood cells. The result of this study was similar to a study in Ethiopia (Arkew et al., 2021) which recorded a significant increase in the level of WBC for people with diabetes.

The results showed a decrease in the concentration of compressed blood cells and this result was consistent with a study in Nigeria that indicated a decrease in stacked blood cells (Umeji et al., 2019). With regard to the concentration of hemoglobin, the results of the study indicated a decrease in its concentration, this result is consistent with the study (Kizilgul et al., 2018), whose study indicated a decrease in the level of hemoglobin for people with diabetes.

. As for the sedimentation rate of red blood cells, the current study showed a decrease in their concentration, this result is similar to the study (Elimam et al., 2019), which indicated a decrease in the concentration of ESR for people with diabetes.

These changes in the components of the blood are due to many reasons, the most important of which is the high level of sugar in the blood that causes oxidative stress in the membranes of red blood cells, which are rich in unsaturated fatty acids that cause the breakdown of red blood cells, which leads to a decrease in the level of hemoglobin, in addition to complications associated with diabetes such as kidney failure, which has a role in reducing the total volume of stacked blood cells and hemoglobin, and thus anemia occurred (Al jubori , 2013)

5- Relationship of biochemical parameters for diabetes, Entamoeba Histolytica parasite and diabetes only

The results of the current study showed significant differences ($p<0.05$) between individuals infected with E.histolytica and diabetes mellitus and healthy individuals in some biochemical parameters.

The results of this study showed an increase in the level of glucose and cumulative sugar in people with parasite and diabetes compared to the control group. The results of the study were similar to the findings of (Drawany et al., 2019), as the results recorded an increase in the level of cumulative sugar and random sugar in people with intestinal parasites and diabetes.

In the same context, the current results showed a decrease in the concentration of high-density lipoproteins of cholesterol in those affected compared to the control group that the result of

this study differed with its findings (ozsan, 2022), as an increase in the concentration of high-density lipoproteins of cholesterol was recorded in people with intestinal parasites and diabetes mellitus.

. With regard to the rate of concentration of uric acid, the current study showed a decrease in its concentration, this study did not agree with the study (Ali and Alattar, 2018), as a high significant increase in the concentration of uric acid was recorded. As for the concentration of creatinine, the results showed a slight increase in its concentration, consistent with (Ali and Alattar, 2018), which recorded an increase in the concentration of creatinine for those infected with the parasite.

The current study also showed a decrease in the rate of cholesterol concentration, this study is consistent with what was mentioned (ozsan, 2022), which indicated a decrease in cholesterol concentration in people with intestinal parasites and diabetes mellitus.

As for the concentration of urea . The results showed a rise in the concentration of urea and this result differed with a study that recorded a decrease in the concentration of urea for people infected with the parasite (Yousria and mm, 1991) As for the concentration of the amount of bilirubin, the results showed a slight increase and this result is similar to the study (Yousria and mm, 1991), which recorded an increase in the concentration of bilirubin for those infected with the parasite .

As the C-reactive protein has an essential and important role against inflammation by binding to neutrophils, which is characterized by an effective role against infections, so the C-reactive protein works to stimulate the immune response and get rid of dead cells and the causes of disease, as other studies have shown that C-reactive protein plays an important role in cellular immunity when it binds to macrophages receptors and activates them (Kocazeybek et al., 2003)

The results of this study for people with diabetes only indicated an increase in the concentration of diabetes level and cumulative sugar, with a significant difference as a result of this study similar to the findings of (Ahmed et al., 2022), which indicated an increase in diabetes levels and cumulative sugar .

The study also showed an increase in the concentration of C-reactive protein, consistent with (Seo and shin, 2021), which indicated an increase in the concentration of CRP for people with diabetes. The current study also showed an increase in the concentration of high-density lipoproteins of cholesterol and in the level of uric acid, this result differs with the study (Majid et al., 2018), which recorded an increase in the level of HDL and uric asid for people with diabetes.

As for the level of creatinine, the results of the current study showed a slight decrease in the level of creatinine, this study agreed with what was stated by (Bamanikar et al., 2016). As for the concentration of cholesterol and urea, the results of

the study indicated an increase in their concentration, and this result is consistent with a study in Mosul that recorded an increase in the concentration of cholesterol and urea for people with diabetes (Al-Jubouri, 2013).

The current study indicated that the concentration of bilirubin within normal limits differed from the study of et al., 2015 (Abbasi) where a decrease in the level of bilirubin was recorded for people with diabetes.

The high cholesterol in diabetes is due to the increased activity of the enzyme cholesterol _ acyltransferase and this enzyme is responsible for the absorption of cholesterol in the intestines, and the high cholesterol in the blood serum may be due to the suppression of low-density lipoprotein cholesterol in people with diabetes, and this is confirmed by many studies (Shahraki et al, 2004)

The reason for the rise in urea is due to the occurrence of degradation and breakdown of proteins due to the effect of the kidney in this disease and therefore the concentration of urea will increase because it represents the final product of the metabolism of protein decomposition (Tatti et al., 2000).

The relationship of immunoglobulins to people with diabetes, Entamoeba Histolytica parasite and diabetes only

The current study showed an increase in the concentration of IgM in people infected with E. histolytica parasite and diabetes mellitus compared to the control group

This study is consistent with the study (Saad and Mohammed, 2022) in Tikrit, where an increase in the level of igM was recorded in people infected with parasite and diabetes. The results showed a decrease in the concentration of IgG in people with parasite and diabetes mellitus compared to the control group. The results of this study did not agree with (Saad and Mohammed, 2022) in Tikrit, as an increase in the level of IgG was recorded for people with parasite and diabetes mellitus.

The results also showed a decrease in the rate of IgA concentration in people with parasite and diabetes mellitus.

The result of this study did not agree with (Saad and Mohammed, 2022) as an increase in the level of IgA was recorded for people with parasite and diabetes mellitus.

The reason for the rise of IgM is because it is the first antibody formed in the immune response against infections. IgM formation begins at the beginning of the injury and continues to increase for several weeks before it begins to decrease when IgG formation begins, and since most of the cases in this study were of the acute type, IgM is one of the most immunoglobin that caused its concentration to increase (Saad and Mohammed, 2022)

As for people with diabetes only. The results of the study showed a decrease in the level of IgA The

result of this study is consistent with the study (Al jobouri, 2020) which indicated a decrease in the concentration of IgA for people with diabetes.

While the results showed an increase in the level of IgG immunoglobin, this result is similar to a study conducted in Egypt that recorded an increase in the level of IgG for people with diabetes (Metwally et al., 2020).

The results also showed a decrease in the level of IgM and the result of the current study is consistent with the study (Saleh, 2011) which recorded a decrease in the concentration of IgM for people with diabetes.

It was found that a high concentration of IgG in patients with type II diabetes indicates that immune function or activation plays an important role in the development of type II diabetes and that a high level of IgG in the blood can predict diabetes mellitus from type II (Packiavathy and Ramalingam, 2010).

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