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Hematological Change in Type II Diabetic Mellitus (TIIDM) patient Infected with intestinal parasites in Kirkuk/Iraq

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Type II diabetic (TIIDM), Intestinal parasite, Hematological parameters.

A B S T R A C T

Objective: Type II Diabetic Mellitus (TIIDM) is a group of metabolic syndrome described by decline sensitivity of target organs to insulin and confirm or relative insufficiency of insulin excretion followed by electrolytes, water, protein, fat and other metabolic disorders, these defect result in diabetic patient to be susceptible to infect with intestinal parasites.

Method: The current study is conducted on 106 Iraqi participants,(67 with TIIDM patients and infected with parasite and 39 TIIDM without parasitic infection as control),aged (25 – 75) years, whom diagnosed by Consultant physician, according to the clinical signs and laboratory diagnosis HbA1c and hematological test (WBC, NEU, LYM, Hb), during the period between November 2021 to March 2022. The practical part conducted at Kirkuk city in laboratories of Azadi Teaching Hospital (ATH). Two ml of blood sample were taken by intravenous injection and put in sterile tubes that contain anticoagulant EDTA and performed the following tests: HbA1c, Complete Blood Count (CBC).

Result: One hundred and six (106) participates (67 diabetic patients infected with parasite and 39 diabetic patients without parasitic infection (control) after the laboratory diagnosis, the result was: the ratio of white blood cell (WBC) and lymphocyte (LYM) increased, but depletion occurred in the ratio of Hb in TIIDM patient infected with parasite.

Conclusion: This study proved that *Blastocystis hominis* is the most common type of parasite that has an effect on type II diabetic patients that affect hematological parameters, and *Schistosoma mansoni* has the least effect.

Introduction

Significant shift has appeared in people's lifestyle, with the active improvement of modern society, particularly in their dietary habits. The extreme intake of fat, sugar, salt in the meal leads to an increase in the chronic metabolic diseases like diabetes and obesity 1.

Diabetes is a disease which is recurrent over the years, and has an extensive distribution. About 90% of the cases of diabetes mellitus are Type II diabetes (TIID). In worldwide TIID disease thought to be a severe health problem, both in terms of number of affected people, disabilities and premature deaths 2.

Type II diabetic mellitus (TIIDM) is a group of metabolic syndrome described by decline sensitivity of target organs to insulin and confirm or relative insufficiency of insulin excretion followed by electrolytes, water, protein, fat and other metabolic disorders, these defect result in diabetic patient to be susceptible to infect with intestinal parasite. Although the pathogenesis and causes of TIIDM are still confused, it's happening which is based on insulin resistance (IR) or insufficient insulin secretion. Irregular eating pattern can exchange the construction of intestinal micro-organisms (m.o.), and the infective m.o. becomes the main micro flora. Numerous studies recently indicate that the intestinal flora aid in the energy metabolism process, which is main cause to the incidence and enhancement of TIIDM 3.

Although they usually create non-aggressive diseases, intestinal parasites are an essential cause of death and sickness and considered a major public health problem in their transmission from person to person, particularly in developing countries where reduced sanitary conditions and absence of information which cause contamination of water sources and food with a subsequent period of parasite cycles 4.

Protozoa and helminth are the two main types of intestinal parasites which occur widely in immunocompromised patient such as those suffering from diabetic disease by its two type 5.

Diabetic disease affects the immune system; the function of the immune system in achieving this infection is assured. The immune system has an essential role in disease controlling, restrictive its transmission and hardness as well as aid in parasite elimination. In the worldwide about 3.5 billion people are affected by intestinal parasite. The spread of the parasites in developing countries differ depending on the economic, environment, political, cultural and social factors, lacking access to health care, malnutrition, increase injury rate and inadequate sanitation. The common methods of transmission are contaminated drinking water or food, and it may also spread from person to person through oral fecal contact, skin, insect bites. Intestinal parasites live in the gut of human and animals, and most of these parasites prefer the intestinal wall 6. So the aim of this study is to determine possible changes in the parameters as CBC and HbA1c in patients with TIIDM infected with intestinal parasite and TIIDM patients without parasitic infection.

Material and method:

Study population: The current study is conducted on 106 Iraqi participants,(67 with TIIDM and infected with parasite and 39 TIIDM patients without parasite (control),aged (25 – 75 years), and diagnosis by Consultant physician, according to the clinical signs and laboratory diagnosis (HbA1c and hematological test(WBC, NEU, LYM, Hb), during the period between November 2021 to March 2022. The practical part was conducted at the Kirkuk city in laboratories of Azadi Teaching Hospital (ATH).

Collection of Blood Samples: Two ml of blood sample were taken by intravenous injection used sterile medical device and put in plastic tubes that contain anticoagulant EDTA and performed the following tests:-HbA1c and Complete blood count (CBC).

Collection of Stool Samples: Stool samples were collected in clean container to avoid contamination with water, urine or any other disinfectants, examined by the naked

eye for color, presence of blood or mucus, odor then were examined by the direct method in which lughole's iodine and normal saline were used and indirect method by floatation with zinc sulfate.7

Result and discussion

Intestinal parasite infect immunocompromised individual, one of these is type II diabetes (TIIDM) 8. The most important reasons that encourage the infection TIIDM with intestinal parasite are generalized weakness of immunity , humoral immunity disorders and reduction in T-cell response ,Innate immunity deregulation , Gut microbiota alterations ,lack of health education, poverty, inadequate hygiene, Impairment of multiple organs 9,10.

Table 1. Parasites type effect on some hematological parameters.

Type of parasite	number	Mean of WBC	Mean of NEU	Mean of LYM	Mean of HB
Blastocystis hominis	29	9.196 ab	55.78 bc	36.54 cd	12.668 c
Entamoeba histolytica	15	9.000 ab	59.72 a	33.72 e	13.700 Bc
Ascaris lumbricoides	4	9.425 ab	57.77 ab	32.60 e	14.380 b
Taenia saginata	3	10.767 a	52.73 c	40.57 b	13.467 bc
Giardia Lamblia	3	9.067 ab	58.93 ab	34.87 de	13.767 bc
Balantidium coli	8	8.570 b	60.27 a	33.33 de	12.310 c
Enterobius vermicularis	2	8.500 b	48.20 d	41.90 b	12.530 c
Entamoeba coli	2	6.350 c	59.55 a	32.15 e	14.000 b
Schistosoma mansoni	1	10.200 a	53.80 c	38.30 bc	16.400 a
Control	39	7.500 bc	60.68 a	32.38 e	13.376 bc
p-value		0.025	0.023	0.021	0.027

*The same letters mean there are no differences between them under the level of significantly 0.05.

**The different letters mean there are differences between them under the level of significantly 0.05.

The results were indicated that the most common type of parasite that infects TIIDM is B. hominis. The inflammations of intestine and mucosal invasion have been shown in animal models of blastocystosis. In DM, the theory of impaired intestinal mucosal integrity might explain the increased rate of infection with Blastocystis this in agreement with11, and by comparison with control on the term hematological change as (mean of WBC the result was 9.196 : 7.500 respectively) with difference between them under the level of 0.05.(and about mean of LYM the result was 36.54 : 32.38 respectively) with difference between them under the level of 0.05, and the result of mean of NEU was 55.78 : 60.68 respectively) with difference between them under the level of 0.05. The ratio of WBC and LYM was affected and became higher in patient with TIID patient infected with parasite than control one, the most important reasons that encourage increasing white blood cell ratio may be due to the stimulation of the immunity contrary to the care of pathogens, particularly acid cells, which play an important and essential role in the removing of parasites. Large numbers of WBC change its position from the circulatory system to the site of the infection of parasite to adhere to the surface of the parasite and begin to invade it and murder the parasite 6.

Also between infection, the less common type of parasite that infect TIIDM is S. mansoni, in agreement with studies in China indicated that a history of Schistosoma infection was passively correlated with the prevalence of TIID and metabolic syndrome, and closely associated with glycemic parameters improving 12. and by comparison with control on the term of hematological change as (mean of WBC the result was 10.200: 7.500 respectively) with difference between them under the level of 0.05.(and about mean of LYM the result was 38.30 : 32.38 respectively) with difference between them under the level of 0.05. and the result of mean of NEU was 53.80 : 60.68 respectively) with difference between them under the level of 0.05.The ratio of WBC and LYM was affected and became higher in patient with TIID patient infected parasite than the control one, due to the same reason mentioned above 6.

Red blood cells (RBC) count made less in amount considerably in diabetic patient in agreement with previous study 13, this occur because of non-enzymatic glycosylation in the membrane protein of RBC which is associated instantaneously with the case of hyperglycemic, because increase level of glucose giving rise to the toxic products alteration which causes reduction in bone marrow production, which acted upon the shape of RBCs which cause low hemoglobin production and anemia. There is large impact on blood parameters occurs because infection with intestinal parasites, which is considered main cause for making the ratio of Hb low and rise WBCs ratio, the parasites create an obstacle in the digestive system of patients which cause difficulties in there absorption process, specifically in the period when the parasite attach to the intestinal villi, which in agreement with this reference 6.

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