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Level of some essential minerals in patient serum infected with *Leishmania tropica/ major* in Al-Sharqat district, Salah Al-Din Government/ Iraq

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ABSTRACT

The study was conducted to determine level of some essential minerals (zinc Zn and iron Fe) in patients infected with *Leishmania tropica/ major*. study was conducted in Sharqat district, during September 2018 till April 2019, included 61 patients with leishmaniasis diagnosed clinically by dermatologist and confirmed by microscopic examination of lesion material. The samples were divided into eight age groups (2 ≤, 3-6, 7-12, 13-22, 23-32, 33-42, 43-52 and 53 ≥ years). Also, 101 healthy people are as a control group. The level of Zn and Fe in serum are measured by using automated spectrophotometer. The study determined a significant decrease P ≤ 0.01 in Zn and Fe level in both genders for all age groups when compared with control groups.

Introduction

Leshmaniasis is caused by obligate intracellular protozoan parasites *Leishmania tropica/ major* [1]. Life cycle of the parasite passes through two hosts, invertebrate intermediate host, female sand fly and definitive host is human [2]. Leishmaniasis is a major health problem with a high prevalence rate, Iraq is one of the countries where cutaneous leishmaniasis is widespread [3]. Cutaneous leishmaniasis is endemic in most tropical and subtropical countries, it affects mostly countries with lower living and economic conditions. Globally 350 million people are at the risk of leishmaniasis every year [4]. The parasite affects and multiplies within phagocytic cells [5]. Clinical symptoms or manifestations of the infection begin with appearance of a papule bulge, inflamed red, at the site of vector bite [6]. Essential elements are considered as important components of human body, they play important role in many vital activities in human body such as growth and development. Moreover, their importance in immune system and synthesis of hundreds of enzymes [7]. Few studies reported the role and effect of *L. tropica/ major* on level of essential elements in human body [8]. The aim of present study is to determine the relationship between the level of zinc and iron in persons infected with *L. tropica/ major* compared with healthy individuals.

Materials and methods

The study was conducted in Al-Sharqat district, Salah Al-Din Government since September 2018 till April 2019. The study included 61 patients infected with leishmaniasis (*L. tropica/ major*), their ages ranged (2 ≤, 3-6, 7-12, 13-22, 23-32, 33-42, 43-52 and 53 ≥ years), as well as 101 healthy people as a control group. The patients admitted to Al-Sharqat general hospital in Salah Al-Din goverment. Leishmaniasis diagnosed clinically by dermatologist and confirmed by microscopic examination of lesion material stained with leishman stain and examined microscopically at 100x [9]. About 5 ml of blood sample collected from all patients and the control group. level of zinc and iron are measured using automated spectrophotometer (SHIMADZU, Japan). Data were analyzed using Duncun's test and t. test at probability level P ≤ 0.01.

Results

The current study determined a decreased level of zinc in patients infected with *L. tropica/ major* in both genders and for all age groups when compared with control groups

A significant decrease P ≤ 0.01 was found in zinc level in males infected with *L. tropica/ major* 65.00 ± 0.01 compared to the control 107.14 ± 2.28 for the age group ≤2 years. It was found a significant decrease in zn lvel was found too in females infected with *L. tropica/ major* 73.00 ± 5.00 compared to the

control group 105.50 ± 2.25.
It was found that there was a significant decrease P ≤ 0.01 in the level of zinc when comparing infected male 71.00 ± 0.01 and control 105.40 ± 5.06 at the age of 3-6 years. The level of zinc also decreased significantly among infected females 69.00 ± 0.01 compared to control 99.33 ± 1.86.
The zinc level in infected male 69.43 ± 1.63 indicates a significant decrease P ≤ 0.01 in comparsion with the control group 123.27 ± 2.91 for the age 7-12 years. The zn level decreased significantly in infected female 65.33±3.84 when compared to the control group 98.50 ± 2.40.
A significant decrease P ≤ 0.01 of zn level was observed in infected mal of age group 13-22 years 66.73 ± 1.14 when compared with the control group 115.40± 4.34. It was also found a significant decrease among infected female 70.00±0.70 compared to control group 111.63 ± 2.14.
The results revealed a significant decrease P ≤ 0.01 in zinc level in infected male 64.63 ± 1.70 compared to male control 99.91 ± 5.09 for the 23-32 age group. The study also showed a significant decrease in zinc level among infected female 68.00 ± 0.01 compared to its level in control group 112.25 ± 2.71.
A significant decrease P ≤ 0.01 was found in level of zinc in infected male 64.56 ± 1.96 compared to the control 107.00 ± 4.03 for the 33-42 age group. Also, significant decrease among infected female 64.00± 0.01 when compared with the control 118.00 ± 6.00.
It was found that there was a significant decrease P ≤ 0.01 in level of zinc in infected male 66.00±3.74 compared to the control 114.50 ± 4.15 of age group 43-52 years. No infection was recorded among female within age group 43-52 years.
The level of zinc decreased significantly P ≤ 0.01 in infected male 69.00±4.00 compared to control 106.67 ± 8.02 for age group ≥53 years. And decreased in infected female 70.00 ± 1.53 compared to the control 115.00 ± 3.46. (Table 1).

Table 1: Comparison of zinc levels in serum of patients with *Leishmania tropica/ major* and control group in relation to patients age and gender. Rate ± standard error (µg / dl).

Sex / Age group (years)	Patients		Control	
	Male	Female	Male	Female
2 ≤	65.00±0.01 acB	73.00±5.00 cA	107.14±2.28 bB	105.50±2.25 bdDM
3-6	71.00± 0.01 acB	69.00± 0.01 cA	105.40± 5.06 bB	99.33± 1.86 bdAD
7-12	69.43± 1.63 acB	65.33± 3.84 cA	123.27± 2.91 bR	98.50± 2.40 dAD
13-22	66.73± 1.14 acB	70.00± 0.70 cA	115.40± 4.34 bRB	111.63± 2.14 bdM
23-32	64.63± 1.70 acB	68.00± 0.01 cA	99.91± 5.09 bB	112.25±2.71 bdM
33-42	64.56± 1.96 acB	64.00± 0.01 cA	107.00± 4.03 bB	118.00± 6.00 bdM
43-52	66.00± 3.74 acB	0	114.50±4.15 bRB	112.50± 9.11 bM
53 ≥	69.00± 4.00 acB	70.00± 1.53 cA	69.00± 4.00 bRB	115.00± 3.46 bdM

-Small letters indicate to horizontal comparison within a same age group.
-Capital letters indicate to vertical comparison between age groups.
-Different letters indicate a significant difference at the level of probability ≤ 0.01.

A significant decrease P < 0.01 in the iron level in male infected was revealed 52.00 ± 0.01 compared to the control 105.29 ± 2.04 for age group ≤2 years. A significant decrease was observed in infected female 63.50 ± 4.50 compared to control 105.00 ± 2.38.
Iron level decrease significantly P ≤ 0.01 in the infected male 72.00 ± 0.01 compared to control 111.60 ± 4.86 for age group 3-6 years. A significant decrease was seen in infected female 63.00 ± 0.01 when compared with control 120.33 ± 7.45.
At the age of 7-12 years, a significant decrease P ≤ 0.01 in iron level was seen in infected male 64.29 ± 1.44 compared to control 122.45 ± 2.47. A significant decrease in the affected female 62.33 ± 2.19 was absorved compared to the control 115.00 ± 3.03.
For the age 13-22 years significant decrease P ≤ 0.01 was observed in the iron in infected males 60.00 ± 1.10 compared to control 123.60 ± 2.64 for 13-22 also in affected female 64.25 ± 2.81 compared to control 116.50 ± 3.77.
Iron level decreased significantly P ≤ 0.01 in infected male 59.50 ± 1.45 with that of male control 111.55 ± 4.53 of 23-32 age and in the infected female 59.00 ± 0.01 compared to control 117.25 ± 3.66 of same age.
A significant decrease P ≤ 0.01 in of iron in the infected male 62.67 ± 2.47 was seen compared to the control group 118.44 ± 3.82 for the age 33-42 years and among infected females 51.00 ± 0.01 compared to the level control 119.5 ± 11.5.
Iron level decreased significantly P ≤ 0.01 among infected male 62.60 ± 3.12 compared to the control male 121.5 ± 18.0 of age 43-52 years. There was no

reported case of *L. tropica/ major* in female of the same age.

A significant decrease P ≤ 0.01 of iron in infected male 71.50 ± 6.50 was absorved in comparsion to control 107.00 ± 5.11 of age ≥53 years and also among infected female 65.67 ± 8.0 compared to the healthy group 118.00 ± 2.31. (Table 2).

Table 2: Comparison of iron levels in serum of patients with *Leishmania tropica/ major* and control group in relation to patients age and gender. Rate ± standard error (µg / dl).

Sex / Age group (years)	Patients		Control	
	Male	Female	Male	Female
2 ≤	52.00 ± 0.01 acD	63.50 ± 4.50 cA	105.29 ± 2.04 bD	105.00 ± 2.38 bdG
3-6	72.00 ± 0.01 acB	63.00 ± 0.01 cA	111.60 ± 4.86 bDEF	120.33 ± 7.45 bdHG
7-12	64.29 ± 1.44 acBG	62.33 ± 2.19 cA	122.45 ± 2.47 bD	115.00±3.03 bdHG
13-22	60.00 ± 1.10 acGD	64.25 ± 2.81 cA	123.60± 2.64 bD	116.50 ± 3.77 bdHG
23-32	59.50± 1.45 acGD	59.00± 0.01 cA	111.55 ± 4.53 bDEF	117.25± 3.66 bdHG
33-42	62.67± 2.47 acBGD	51.00± 0.01 cA	118.44± 3.82 bDE	119.5± 11.5 bdHG
43-52	62.60± 3.12 acBGD	0	121.5 ± 18.0 bD	133.5± 17.6 bH
53 ≥	71.50± 6.50 acB	65.67± 8.01 cA	107.00± 5.11 bDF	118.00± 2.31 bdHG

-Small letters indicate to horizontal comparison within a same age group.
-Capital letters indicate to vertical comparison between age groups.
-Different letters indicate a significant difference at the level of probability ≤ 0.01.

Discussion

The present study determined a decrease of zinc level in both genders for all age groups. Similar findings determined in two previous studies [10,11] conducted in Tehran city, Iran on patients infected with *L. tropica/ major* infection. Similar results also reported in a study performed in Turkey *L. tropica/ major* infected patients [12], showed that iron level was decreased in patients infected. Essential elements are minerals that have several important roles in the metabolic and physiological processes in human body [13]. The variations in zinc level during the infections and inflammation may be explained by the important role of zinc and other chemical elements in immune system activity and inflammatory process during parasitic infections [14,15]. Zinc is an essential element for the synthesis of more than 200 enzymes, which have an important role in many metabolic processes, as well as their significant role in immunity and wound healing, that explain decrease level of zinc during infection and inflammation [16]. Zinc plays an effective and important role in regulation of both innate and adaptive immune responses. The immune system cells (monocytes, polymorphonuclear cells, natural killer cells, T cells and B cells) proliferation rate increase markedly when there is a defect or changes in zinc level [17,18]. The role of zinc in immune response is tightly regulated by the group of ZnT-ZIP (Zinc transporter-Zrt/Irt-lik protein) and Methallothionein proteins stored in the body [18]. Therefore, any abnormality in the immune response will be associated with a decrease in zinc level [17]. Some studies indicated that the low level of zinc in patients infected with *L. tropica/ major* is due to the effect of methalothionine that is synthesized in the liver and other tissues. However, in the blood circulation methallothionine is able to bind extremely to zinc atoms by stimulation of interleukin-1 (IL-1) that is elevated in the patients infected with *L. tropica/ major* as a result of the immune system response [19,20].

The present study reported decreased iron level in both genders for all age groups compared with the control group. Similar results determined in previous studies conducted in Qom, Iran [8] and [12] in Turkey, who indicated that level of iron has decreased in patients infected with leishmaniasis. Iron is one of elements that has a major role in the development of inflammatory diseases [21]. It plays an important role in the activity of immune system and immune response. The variations determined in the iron level can be explained by the inflammatory reactions during parasitic infection [14,15]. Iron plays an important role in tissue oxygenation process [22]. In vitro studies [23] reported role and relationship of iron with regulation of Tumor necrosis factor-alpha (TNF-α) and Interleukin-6 (IL-6) genes, in vitro, as well as level of these cytokines during inflammatory processes due to infection. *L. tropica/ major* is one of infections that associated with inflammation [11].

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مستوى بعض المعادن الأساسية لدى المصابين بطفيلي *Leishmania tropica major* في قضاء الشرقاط ، محافظة صلاح الدين/ العراق

اكرم عبد فرحان ، فاطمة شهاب الناصري

قسم علوم الحياة ، كلية العلوم ، جامعة تكريت ، تكريت ، العراق

الملخص

أجريت الدراسة الحالية لتحديد مستوى بعض المعادن الأساسية (الزنك والحديد) لدى المرضى المصابين بطفيلي *Leishmania tropica/ major*. إذ تمت الدراسة الحالية في مدينة الشرقاط خلال الفترة من سبتمبر 2018 حتى أبريل 2019. وشملت الدراسة 61 مريضاً مصاب بداء اللشمانيا الجلدية *Leishmaniasis*, إذ تم تشخيصهم سريرياً وذلك من خلال ملاحظة القرحة الجلدية ومن ثم تأكيد الإصابة بالفحص المجهري. وتم تقسيم عينات الدراسة إلى ثماني فئات عمرية (2 ≥، 3–6، 7–12، 13–22، 23–32، 33–42، 43–52 و53 ≤ سنة). كذلك شملت الدراسة الحالية 101 عينة للأشخاص الأصحاء كمجموعة سيطرة. وتم قياس مستوى Zn و Fe في المصل باستخدام جهاز الإمتصاص الذري. إذ حددت الدراسة انخفاضا كبيراً في مستوى الزنك والحديد عند مستوى معنوية P <0.01 في كلا الجنسين لجميع الفئات العمرية عند المقارنة مع مجاميع السيطرة.