Hematological changes in children suffering from visceral leishmaniasis (Kala azar).

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Abstract

This study was designated to investigate the changes that occur in certain clinical and hematological features in visceral leishmaniasis (VL) among Al-Mahawyl children, during the period 20/11/2000 - 20/4/2001. The total numbers used was 53 of both healthy and infected children from VL . Their ages were 1 month – 3 years. They were divided into two age groups. First group 1 month – < 1 year and second group 1 – 3 years old. The commonest presenting clinical features were fever, pale and hepatosplenomegally. The hematological changes studied RBCs count, Hb and PCV in both age groups of visceral leishmaniasis were significant ($P < 0.01$) decrease than control. The values of total WBCs, the percentage of neutrophil in both age groups of VL showed significant ($P < 0.01$) decrease. While the percentage of lymphocyte and ESR of this study indicated a significant ($P < 0.01$) increase in both age groups of VL. Whereas the values of platelets count showed significant ($P < 0.01$) decrease. The main changes may be attributed to hemolysis, hepatosplenomegally and ineffective erythropoisis as well as iron and folate deficiency.

الخلاصة

صممت هذه الدراسة لمعرفة بعض المتغيرات الحاصلة في بعض الصفات السريرية والدموية للمصابين بداء اللشمانية الحشوي (كالا أزار) للأطفال في منطقة المحا ويل للفترة ما بين ٢٠/١١/٢٠٠٠-٢٠/٤/٢٠٠١. شملت هذه الدراسة فحص ٥٣ طفل من المصابين وغير المصابين (الأصحاء). تراوحت أعمارهم بين ١ شهر إلى ٣ سنة. قسمت أعمارهم إلى مجموعتين عمريتين. المجموعة الأولى من ١ شهر -اقل من ١ سنة والمجموعة الثانية من ١ سنة – ٣ سنة. كانت الحمى والشحوب وبتضخم الكبد و الطحال من أهم المشاهدات السريرية المألوفة. تميزت التغيرات الدموية بانخفاض معنوي ($P < 0.01$). للعدد الكلي للكريات الدم الحمراء و تركيز خضاب الدم وحجم كريات الدم الحمراء المضغوطة (PCV) للأطفال المصابين مقارنة بالأصحاء. أما قيم العدد الكلي للكريات الدم البيضاء والنسبة المئوية لكريات الدم البيضاء المتعادلة للمصابين أظهرت انخفاضا معنويا ($P < 0.01$) .في حين سجلت قيم النسبة المئوية لكريات الدم البيضاء اللمفية ومعدل ترسيب كريات الدم الحمراء (ESR) للمصابين ارتفاعا معنويا ($P <$

(0.01. في حين سجلت قيم عدد الصفيحات الدموية انخفاضا معنويا (0.01 > P). ان المتغيرات الحاصلة في نتائج هذة الدراستيمكن ارجاعها بصورة رئيسية الى تكسر كريات الدم الحمراء وتضخم الكبد والطحال وقصور عملية تكوين كريات الدم الحمراء بالاضافة الى نقص الحديد وحامض الفوليك.

Introduction

Genus leishmania was created by Ross in 1903. In 1900 Sir William Leishman discovered the parasite in the spleen smears of a Soldier who died in Calcutta. In same year Charles Donovan found the same parasite in a spleen biopsy in Madras [1]

Visceral leishmaniasis also known as kala azar, is a vector borne disease caused by a protozoan of leishmania donovani. A phlebotomize sand fly transmits the parasite from person to other or via an animal reservoir [2].

Leishmaniasis is found in Mediterranean, Europe, America, Africa and Asia [3]. It is one of the serious public health problems in Iraq especially because of the limited control measures [4].

Transfusion of plasma, mononucleated cell fraction and blood of infected hamster donors induced visceral leishmaniasis in normal hamster receptors. This study indicating that all blood products were infectious [5]

It is sever debilitating disease, characterized by prolonged fever, splenomegally, hypergammaglobulinemia and pancytopenia [2]. The disease is accompanied by malnutrition and immunosuppression [6].

Adenosine and AMP (adenosine monophosphate) in the salivary glands of the sand fly phlebotomus have anti platelet, vasodilator and immunodula-tory properties. It is proposed that these salivary nucleotide help the fly to blood feed and may affect leishmania transmission [7].

In endemic area incidence of clinical disease decrease with age indicating that immunity is acquired in population overtime. This disease typically affect children less than five years of age in new word and Mediterranean region [8].

Visceral leishmaniasis is characterized by progressive anemia usually normochroic, normocytic. As well as there is leucopenia with

granulocytopenia and reduced number of platelets [9].

Materials and methods

Subjects

A total of 53 subjects, 31 with visceral leishmaniasis and 22 healthy subjects as control. They were selected randomly during the period 20/11/2000 – 20/4/2001in Mahawyl hospital / Babil. They were diagnosed by demonstrate leishmania antibody in their sera by using indirect immune fluorescent test in central health laboratory in Baghdad [11] and by demonstrate leishmania bodies in the bone marrow [10].

The subject ages were arranged into two groups. First group from 1 month to < one year. Second group from one to three years old [12].

In this study there were 20 subjects in first group, 10 subjects in second group.

Methods

Blood was collected by antecubital veinpuncture at 9-11 A.M. Red blood cell counts (RBCs), hemoglobin Hb, packed cell volume (PCV) and erythrocyte sedimentation rate (ESR) were performed according to the methods of Pittiglio and Sachar, 1987. [13]. While total, differential leucocytes and platelets count were determined by using the methods of Talib, 1996. [1] .

Results were statistical analyzed using t-test, p-value less than 0.05 was considered significant [14].

Result

Visceral leishmaniasis was seen throughout the year. The highest number of cases was recorded during February and March (table 1).

Recarding clinical manifestation fever, pallor were chief complaint in all the cases. Hepatomegaly was detected in 23 cases (73 %). Splenomegaly was detected in 27 cases (87 %). Anemia was present in all cases (100%) (Table 2).

Hematological changes were shown in table 3. RBCs, Hb, and PCV values in both infected age groups were decreased significantly ($P < 0.01$) than values of normal subjects (controls). The results of total leucocytes and platelets counts were decreased significantly in both infected age groups than controls. Whereas the values of ESR was significantly increased ($P < 0.01$) when compared with the controls

(table 4).

Differential leucocyte count percentage (neutrophils, lymphocytes and monocytes) were shown in table 5. Values of neutrophils percentage in

both infected age groups were significantly ($P < 0.01$) lower than controls. Whereas the values of lymphocytes percentage in both infected age groups were significantly ($P < 0.01$) higher than normal subjects. The values of monocytes % of both age groups of VL recorded nonsignificant difference with control (Table 5).

Discussion

Visceral leishmaniasis is seen throughout the year, suggesting that the sand flies, which are the vectors of kala azar are present throughout the year. The highest number of cases was recorded during February and march (Table 1). This is agreement with other study [10].

Clinically, the fever which is the striking feature of VL, was present in all cases (table 2). This was observed by others [3], [15], [10]. Hepatomegaly and splenomegaly are usual in our study (table 2) agree with other studies [16-19]. All infected subjects had anemia of varying degrees. This results may be due to the iron deficiency which is caused by depletion of bone marrow stores as well as megaloblastic erythropoiesis is probably due to folate deficiency caused by poor diet. Other factor in the pathogenesis of the anemia in VL is hemolysis, hypersplenism and ineffective erythropoiesis [16] ,[6].

Hematological changes (table 3,4,5) show significant decrease of RBCs count due to destruction of RBCs in the reticuloendothelial system by macrophage due to abnormal RBCs such as poikilocytosis and anisocytosis [6] ,[10]. They show significant decline in Hb concentration in both infected age groups as compared to the control subjects. This result is in agreement with other study [20]. These due to decrease red blood cells that are caused by iron and folate deficiency [16]. They show significant decrease PCV in both infected age groups as compared to the control subjects due to decrease of RBCs count and the decrease of Hb concentration [21]. They show erythrocyte sedimentation rate (ESR) significant increase in both infected age groups due to decrease number of RBCs and lower PCV [1] ,[22]. They show significant decrease of white blood cells (WBCs) count in both infected age groups in comparison with control subjects in this study. This is in agreement with results of several reservoirs [16], [23], [10]. This decrease in WBCs count is due to spleen sequestration and with massive parasitzation of reticuloendothelial system [24]. They

show significant decrease in platelets in both infected age groups as compared to the control subjects.

This in agreement with other studies [25], [16], [23], [10]. This reduction may have been resulted from increased peripheral destruction rather than failure of production [26] ,[16]. They show significant decrease of neutrophil percentage in both infected age groups compared to control subjects in our study.

This is in agreement with other studies [25], [6], [10], [16]. They show significant increase of lymphocyte percentage in both infected age groups. This is in agreement with the results of other researcher [23] since there is a direct interaction of the peripheral blood T cells with L. donovani.

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Table 1 Monthly and yearly distribution of cases with visceral leishmaniasis.

Year	Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.
2000	No. of cases	2	5	4	4	2	3
	Month	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	No. of cases	1	---	---	---	*1**	*1**
Year	Month	Jan.	Feb.	Mar.	Apr.		
2001	No. of cases	*6**	*11**	*11**	*1*+1*		

* This indicates number of cases were included in our study .

Table 2 Distribution of clinical symptoms and signs of 30 cases with visceral leishmaniasis.

Symptoms and signs	Number of cases	Percentage (%)
Fever	31	100 %
Pallor	31	100 %
Anemia	31	100 %
Hepatomegaly	23	73 %
splenomegaly	27	87 %
Pneumonia	1	3.3 %

Table 3 Changes in red blood cells (RBCs), hemoglobin concentration (Hb) and packed cell volume (PCV) in visceral leishmaniasis.

Age	RBCs count (million/mm3)		Hb concentration (mg/dl)		PCV %	
Year	Patient	control	Patient	control	patient	control
1 month – <1year	2.94 ±0.21	5.90 ±0.15	6.27 ±0.28	13.4 ±0.39	21.9 ±1.55	41.8 ±1.11
1 – 3 years	2.94 ±0.14	5.14 ±0.08	6.28 ±0.36	11.9 ±0.20	20.8 ±1.36	36.8 ±0.77

Values are means ± SE.
Values of patients are significantly ($p < 0.01$) decreased comparison with control.

Table 4 Changes in the white blood cells (WBCs) count, erythrocyte sedimentation rate (ESR) and platelets count in visceral leishmaniasis.

Age	WBCs count (thou./mm3)		ESR (mm/hour)		Platelets (thou./mm3)	
Year	Patient	control	Patient	control	patient	control
1 month – <1year	4.04 ±0.29	9.23 ±0.63	27.1 ±2.69	7.50±1.07	62.0 ±0.80	206 ±0.12
1 – 3 years	4.17 ±0.36	7.98 ±0.41	29.7 ±2.12	7.79±0.85	72.4 ±0.79	212 ±0.11

Values are mean ± SE.
Values of patients are significantly ($p < 0.01$) changed comparison with control.

Table 5 Changes in the percentage of neutrophils, lymphocytes, and monocytes in visceral leishmaniasis.

Age	Neutrophils (%)		Lymphocytes (%)		Monocytes (%)	
Year	Patient	control	Patient	control	patient	control

1 month – <1year	20.8 ±3.24	67.8 ±2.11	75.4 ±3.63	24.7 ±1.14	4.86 ±0.41	4.45 ±0.49
1 – 3 years	29.6 ±3.07	66.8 ±2.23	69.9 ±3.85	24.8 ±1.24	3.95 ±0.43	4.23 ±0.39

Values are mean ± SE.

Values of patients are significantly ($p < 0.01$) changed comparison with control in neutrophils and lymphocytes, while they are non-significant in monocytes.