Hematological change in kala azar

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Abstract

Background: The parasite Leishmania donovani is the cause of the chronic infectious illness known as kala-azar, sometimes known as visceral leishmaniasis (VL). It is a prevalent illness in Iraq that is typified by a number of hematological parameter alterations in patients.

Aims of the study: Ascertain which haematological parameters are important for the disease, ascertain the parameters of Kala-azar patients and compare them with those of healthy individuals.

Methodology: This study was conducted at Baquba teaching Hospital in Diyala province . Using laboratory and clinical data from October 2023 to 14th February 2024 . Total of 56 patients with kala azar were included in this study and 30 control group.

Results : The haematological evaluation showed that the individuals with Kala-azar had significantly ($p = 0.001$) altered levels of hemoglobin, erythrocyte sedimentation rate, total white blood cell count, and platelet count.

Conclusion: According to the study's findings, haematological parameter alterations can aid in the diagnosis and treatment of Kala-azar patients.

Keywords: kala-azar ,Leishmania donovani **,** visceral leishmaniasis.

Introduction

Visceral Leishmaniasis(VL) or Kala Azar is endemic in more than 60 countries worldwide. Encompassing the Indian subcontinent, Central and South America, the Middle East, North Africa, and Southern Europe. It is mostly endemic in the Indian states of West Bengal and Bihar, as well as in a few isolated areas in Himachal Pradesh and the North-West region of the country.[1]

VL is a systemic infection of the reticuloendothelial system caused by protozoa Leishmania donovani (LD) of the genus Leishmania. Ross established the genus Leishmania in 1903. Charles Donovan identified the same parasite in spleen biopsies at the same time that Sir William Leishman found it in spleen smears.[2]

The parasite has two forms: aflagellate or amastigote and flagellate or promastigote.It is found and multiplies as an amastigote in the mononuclear phagocytic system (MPS), particularly in the marrow, liver, and spleen.This causes the MPS to hypertrophy, which disrupts the organs that house phagocytes and results in hematological symptoms.[3]

Since the reticuloendothelial system is the target of parasitization, hematopathologists are interested in this situation. In particular, the spleen enlarges dramatically. Additional symptoms of the illness include hepatomegaly, fever, and an unusual gray coloring of the hands, feet, belly, and face that gave rise to the term "kala azar," or "black disease."[4]

The following are signs of persistently deep involvement of the hematological system in VL: alterations in peripheral blood and bone marrow:

1- Hemoglobin values of 7–10 g/dl are frequently observed in VL, and normochromic normocytic anemia is a frequent and clinically relevant characteristic of the disease. In two sizable patient series, the average hemoglobin levels were 8.3 and 7.8 g/dl.[5]

2- One prominent and early sign of VL is leucopenia. Relative lymphocytosis is present together with neutropenia; the differential reveals nearly no eosinophils; and the diagnosis of VL is ruled out in the presence of a sizable number of eosinophils.[6]

3- Platelet counts are typically impacted during a protracted sickness. the average length of sickness was substantially greater in thrombocytopenic patients as compared to non-thrombocytopenics (9.2 ± 3.4 vs 4.2 ± 1.8 months). The average platelet count was determined to be 109 ± 82.3 x 109/l, and other investigations have shown an incidence of 55–65%.[7,8]

4- It is always seen that the erythrocyte sedimentation rate in VL regularly increases, most likely because to the release of acute phase reactants.

5- Erythroid hyperplasia, a rise in plasma cells, and intracellular parasites in the form of amastigote form in mononuclear phagocytes are often observed results. Depending on the related deficit, erythroid cells may exhibit mild to

severe megaloblastosis, low iron reserves, or dual deficiency characteristics.[9]

6- The prognosis for liver dysfunction is poor and it might manifest in late stages with jaundice, ascitis, and abnormal coagulation [10]. Liver impairment can be attributed either directly to the protozoa or indirectly to the parasites' immunological response.

7- Deranged platelet function studies were described by Dube et al.[11] in their research on VL patients. Twenty-five parasitologically positive Indian VL patients and twenty-five age- and sex-matched healthy controls participated in platelet function investigations. Of the patients, 92% had varied degrees of thrombocytopenia, and 44% had platelets < 60,000 mm3.

Aims of the study

The aim of the study was to ascertain which haematological parameters are important for the disease, ascertain the parameters of Kala-azar patients and compare them with those of healthy individuals.

Methodology

This cross-sectional form of descriptive study was conducted in Diyala . For this study, a total of 56 Kala-azar patients, up to 60 years old (35 men and 21 females), were chosen. There were no concomitant conditions present in any of the Kala-azar patients, including diabetes mellitus, hypertension, thalassemia, lymphoma, leukemia, malaria, and enteric fever.

Thirty (30) healthy individuals from the same sociodemographic background—sixteen (18 men and twelve females—were also included as a control group. Clinical diagnosis and a serum rK39 immunochromatographic test were used to diagnose the patients.

The study was approved by Council of the College of Medicine, Diyala University . Verbal informed consent was obtained from all patients included in the study.

In addition to conducting interviews and making observations, standardized questionnaires were used to gather data. Once the diagnosis was established, the patients' haematological profiles—particularly their Hb level, ESR, total WBC count, and platelet count—were examined.

Specimen collection: Two milliliters of spontaneous venous blood were drawn from each participant using a disposable syringe. Following that, the blood samples

were quickly moved to the test tube with a label that included an anticoagulant, such as ethylenediaminetetraacitic acid (EDTA).

Hematological study: According to several suggested procedures, the following parameters were measured: hemoglobin level, ESR, total WBC count, and platelet count.

Statistical analysis: The data obtained from this study was analyzed with SPSS program (version20). Results were expressed as Mean±Standard error of the Mean (SEM). Statistical significance was assessed by t test. A p value ‹0.05 was considered statistically significant.

Result

Table 1 shows that out of 56 Kala-azar patients, 25 (44.60%) belonged to the 18–40 age range, whereas 21 (37.50%) were older than 40 and 10 (17.90%) were younger than 18.

Table (1): Age distribution of study patients

Age group	Frequency	Percentage
<18 years	10	17.9%
18-40 years	25	44.6%
40-60 years	21	37.5%

Table 2 indicates that of the individuals in the control group, 17 (56.66%) belonged to the 18–40 age range, while 6 (20.00%) were over 40 and 7 (23.34%) were under 18.

Table (2): Image distribution of control group.

Age group	Frequency	Percentage
<18 years	7	23.3%
18-40 years	17	56.6%
40-60 years	6	20%

Of the 56 individuals diagnosed with Kala-azar, 35 (62.5%) were male and 21 (37.5%) were female. Table 3 indicates that of the control group, there were 18 (60%) males and 12 (40%) females.

Table(3) : Sex distribution in study group and control group.

Sex	Control group		Study group	
	Frequency	Percentage	Frequency	Percentage
Male	35	62.5%	18	60%
Female	21	37.5%	12	40%

Table 4 demonstrates that each patient Of the patients, 36 (100%) had a fever, and 43 (76.8%) had lost weight. Of the patients, 34 (60.7%) had skin darkening, while 21 (37.5%) experienced bleeding. In terms of clinical manifestations, a

significant proportion of patients had anemia 23 (50%) and splenomegaly 42 (75%) more frequently. However, lymphadenopathy, hepatosplenomegaly, and hepatomegaly were less frequent.

Table (4): Sign and symptoms of kala azar patients

Signs and symptoms	Frequency	Percentage
Fever	56	100%
Weight loss	43	76.8%
Darkening of skin	34	60.7%
Bleeding	21	37.5%
Anemia	23	50%
Splenomegaly	42	75%
Hepatomegaly	11	19.8%
Hepatosplenmegaly	7	12.5%
Lymphadenopathy	5	8.9%

In comparison to controls, the ESR (81.34 ± 5.29 mm/hour) and Hb level (10.56 ± 0.36 g/dL) of Kala-azar patients were considerably lower. On the other hand, total count of WBC and platelet were lowered to their lower normal limit in all Kala-azar patients as shown in table 5.

Table (5): Comparison of hematological parameters among study group and control group.

Parameters	Study group	Control group	P value
ESR(mm/hr)	81.34 ± 5.29	30.63 ± 2.8	<0.0001
Hb(g/dl)	10.56 ± 0.36	14.62 ± 0.21	<0.0001
Platelets($\times 10^9$ /L)	150.26 ± 11.5	313.5 ± 8.81	<0.0001
WBC(per µL)	4312.4±263.6	7140 ± 281.5	<0.0001

Discussion

The goal of the current study was to compare the haematological alterations in patients with visceral leishmaniasis (Kala-azar) to those in the healthy group in order to discover any possible abnormalities. The patient's diagnosis and course of therapy benefit greatly from these haematological alterations.

Because every patient came from the same area, there were less variations in the genetic makeup of the human population, fewer variations in the behavior of parasites, and fewer variations in the clinical treatment that was seen in different areas.

The study found that the prevalence of Kala-azar in males was 62.5%, whereas in females it was 37.5%. According to Boggiatto et al. [12], there were more male patients (40, 56.3%) than female patients (31, 43.7%).

Singh et al. [13] found in another study that the prevalence of VL infection was greater in men than in women in India. Males had a greater prevalence of Kala-azar (51.22%) than females did (36.96%), according to the Bhowmick [14] research. These results were quite close to what we found. These can be the result of differences in vocation.

The most noticeable signs in people with Kala-azar were fever and weight loss, which might be brought either by an infection or hunger. Additionally, there was skin discoloration and bleeding that may have been brought on by thrombocytopenia. Anaemia was more common among the symptoms in the individuals. Patients with Kala-azar may have intravascular volume constriction if they have anemia.[15] A crucial component of the clinical presentation in our investigation was splenomegaly (75%) in 13 cases.

Splenomegaly was reported to be present in 100% of patients in one study by Islam et al. [16], but it may not be present in immunocompromised patients, such as those who are HIV positive, receive renal transplants, have haematological malignancies, or are on long-term steroids therapy.

According to a number of studies [17, 18], splenomegaly may not exist in instances that are acute or in the early phases of the illness. In addition, those individuals exhibited lower rates of lymphadenopathy, hepatosplenomegaly, and hepatomegaly.

Patients with VL had lower hemoglobin concentrations than healthy controls. This result is in line with the findings published by Collin et al. [19] and Rahim et al. [20]

32 of the 56 patients in our research had thrombocytopenia, with a mean platelet count of 150.26x109/L; however, Dhingra et al.[21] 11 out of the 18 patients with a mean platelet count of 84 x 109 /L had thrombocytopenia recorded.

While elevated ESR was identified in 88% of patients by Rai et al. [22] in our investigation, it was found in 81.34% of cases. Leucopenia is a prominent and early sign of viral lymphocytopenia. Numerous investigations have revealed leucopenia in about 75% of VL patients.[23, 24]

In this research, 54% of the patients had leucopenia, and the mean WBC count was 4312.4±263.6/µL, which may have been brought on by hypersplenism.

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Conclusion

According to this study, the diagnosis of Kala-azar is associated with hematological alterations. Additionally, it proved that fever, weight loss, skin darkening, anemia, and splenomegaly be considered as important indicators and symptoms for diagnosing Kala-azar, especially in the province of Diyala.

Recommendation

It is imperative to do more research to examine other haematological and biochemical alterations associated with Kala-azar such as ADH,ACTH, Renin, Aldosterone, Cortisol, Urine aldosterone , TSH and T_4free at two additional stages: during and after therapy.