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Study on Haematological parameters in Kala-azar Patients of Bangladesh

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ABSTRACT

Introduction: *Kala-azar or Visceral Leishmaniasis (VL) is a chronic infectious disease caused by the parasite Leishmania donovani. It is an endemic disease in Bangladesh and characterized by various haematological parameter changes in patients. The present study aimed to evaluate the changes of haematological parameters in Kala-azar patients of Bangladesh and compare with control group (healthy person).* ***Methods:*** *This cross-sectional study was conducted in 'Surjokanto Kala-azar Research Centre' under supervision of Mymensingh Medical College Hospital in Mymensingh during the period of July 2015 to June 2016, enrolling 56 Kala-azar patients and 30 healthy persons. All findings were recorded in a predesigned proforma.* ***Results:*** *The haematological assessment revealed that Haemoglobin level, Erythrocyte Sedimentation Rate, total White Blood Cell count and Platelets counts were significantly ($p<0.001$) changed in Kala-azar patients.* ***Conclusion:*** *This study concluded that the changes of haematological parameters are helpful for the diagnosis and therapeutic purpose of Kala-azar patients. We suggest that routine haematological investigation should be done in suspected Kala-azar patients.*

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INTRODUCTION

Leishmaniasis is an infectious disease which is caused by an intracellular parasite of the genus Leishmania and transmitted during blood-feeding by the infected female sand flies.[1]The word "Kala-azar" has been derived from two Indian words "Kala" and "Azar" meaning "Black sickness"- an illness in which the colour of the skin turns darker. On the basis of clinical syndromes, Leishmaniasis is of four types: A. Cutaneous Leishmaniasis; B. Muco-cutaneous Leishmaniasis; C. Visceral Leishmaniasis and D. Post Kala-azar Dermal Leishmaniasis (PKDL).[2] Visceral Leishmaniasis (VL) is also known as Kala-azar or black fever or Dumdum fever. This disease is vector- borne chronic febrile illness which is mainly caused by Leishmania donovani in our region (South Asia).[3] Kala-azar is a parasitic disease of the reticuloendothelial system (RES) characterized by fever, anaemia, splenomegaly, hepatos-

plenomegaly, leukopenia, progressive weakness and emaciation, which can result in death if left untreated. Children are at greater risk than adults in endemic areas.[4] Specifically six countries of the world are at greater risk of Kala-azar. Three of them are in South Asia, namely: Bangladesh, India and Nepal and the other three countries are Sudan, Ethiopia and Brazil. Statistics shows that more than 90% of cases occur in these countries. Out of 64 districts of Bangladesh, 45 are endemic for VL and 20 million people, around 18% of the total population, are considered to be at risk for VL. Migration, poor housing and sanitary conditions, malnutrition and HIV co-infection are the main factors those increase the frequency of Kala-azar.[5,6] An estimated 350 million populations are at risk and 10 million people are affected from this disease worldwide.[7]

Changes in some haematological parameters indicate the occurrence of Kala-azar. Some parameters are so significant that quickly represent the incidence of the disease. Alterations in these parameters occur due to pathophysiological changes of the patient. Haematological parameters such as the total White Blood Cell count, haemoglobin level (Hbgm/dl), erythrocytic sedimentation rate (ESR), platelet count and packed cell volume (PCV) are significant for Kala-azar patients.[8] In Kala-azar patients haematological findings include progressive leucopenia, anaemia, thrombocytopenia and increased ESR. Some biochemical and immunological parameters such as serum bilirubin, serum creatinine, alkaline phosphatase(ALP), alanine aminotransferase (ALT), aspartate aminotransferase (AST), serum total protein, albumin, globulin, albumin-globulin ratio and IgG are also important.[9,10]

The aims of this study were to determine the haematological parameters of Kala-azar patients and compare them with the healthy persons to know which parameters are significant to the disease.

METHODS

This cross-sectional type of descriptive study was conducted in Mymensingh district due to higher prevalence of Kala-azar in this region. Patients were selected from 'Surjokanto Kala-azar Research Center' (SKRC) which is under supervision of Mymensingh Medical College Hospital, Mymensingh. A total number of 56 Kala-azar patients (35 males and 21 females) aged up to 60 years were selected for this study. All Kala-azar patients were free from comorbidity such as malaria, enteric fever, chronic liver disease, thalassemia, lymphoma, leukemia, diabetes mellitus and hypertension etc. Thirty (30) healthy persons (18 males and 12 females) were also included as control group from same socio-demographic background. The patients were diagnosed by clinically and serum rK39 immunochromatographic test. To conduct this study, ethical permission was taken from the authority of SKRC and informed written consent was taken from the study subjects. Data were collected by using structured questionnaire as well as from interviews and observations. After confirmed diagnosis, patients were investigated for haematological profile, especially Hb level, ESR, total WBC count, platelet count. Patient's age, sex, education, occupation, living status, family history of the disease, knowledge about Kala-azar and sand fly vector were also recorded.

Specimen collection: Every subject spontaneously gave two milliliters of venous blood that were collected by disposable syringe. Then the blood specimens were immediately transferred to the labeled test tube containing anticoagulant e.g. Ethylenediaminetetraacitic acid (EDTA).

Haematological study: Haemoglobin level, ESR, total WBC count, platelet count were measured according to different recommended methods.

Statistical analysis: The data obtained from this study was analyzed with SPSS program (version-20). Results were expressed as Mean±Standard error of the Mean (SEM). Statistical significance was assessed by independent student's '*t*' test. A *p* value ‹0.05 was considered statistically significant.

RESULTS

Among 56 Kala-azar patients, majorities 25, (44.60%) were in the 18-40 years age group, whereas 21 (37.50%)were more than 40 years and 10 (17.90%) were below 18 years (Table I).

Table I: Age distribution of the study patients (n-56)

Age groups (in year)	No. of patients	Percentage (%)
<18	10	17.90
18-40	25	44.60
40-60	21	37.50

Within the control group majority 17 (56.66%) in the 18-40 years, whereas 6 (20.00%) were more than 40 years and 7 (23.34%) were below 18 years (Table II).

Table II: Image distribution of control group (n-30)

Age groups (in year)	No. of healthy Person	Percentage (%)
<18	7	23.34
18-40	17	56.66
40-60	6	20.00

Out of 56 Kala-azar patients, majority were male 35 (62.5%) and female 21 (37.5%). Among the control group male were 18 (60%) and female were 12 (40%). The male and female ratio was 1.67:1 in patient group and 1.5:1 in control group (Figure 1).

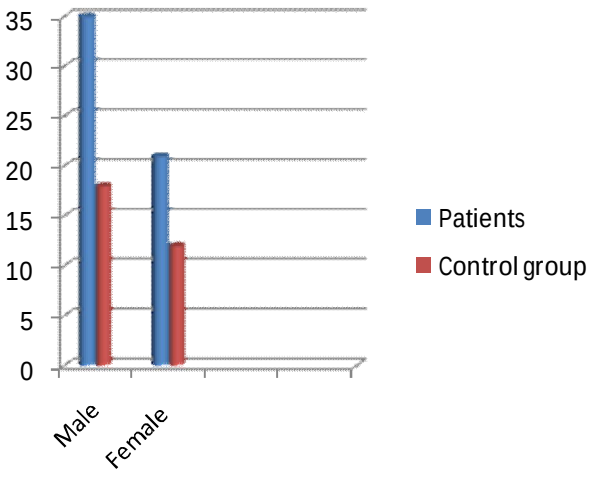

Figure 1: Sex distribution in Kala-azar patients and control group

In this study, all the patients 36 (100%) patients suffered with fever, 43 (76.8%) showed weight loss. Darkening of the skin and bleeding occurred in 34 (60.7%) and 21 (37.5%) of patients, respectively. Regarding clinical signs, anemia 23 (50%) and splenomegaly 42 (75%) were more frequent in a large number of patients. But hepatomegaly, hepatosplenomegaly and lymphadenopathy were less common (Table III).

Table III: Symptoms and signs in Kala-azar patients (n-56)

Traits	No. of patients	Percentage (%)
Symptoms		
Fever	56	100
Weight loss	43	76.8
Darkening of skin	34	60.7
Bleeding	21	37.5
Signs		
Anemia	23	50
Splenomegaly	42	75
Hepatomegaly	11	19.6
Hepatosplenomegaly	7	12.5
Lymphadenopathy	5	8.9

*Multiple responses

ESR (81.34 ± 5.29 mm/hour) level of Kala-azar patients were high and Hb level (10.56 ± 0.36 g/dL) were decreased significantly compared to controls. On the other hand, total count of WBC and platelet were decreased to its lower normal limit in all Kala-azar patients (Table IV).

Table IV: Comparison of the haematological parameters among patients and control

Parameters (unit)	Kala-azar patients	Controls	*p*-value	Post test result
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 (x10^9/L)	150.26 ± 11.5	313.5 ± 8.81	<0.0001	*
WBC (per µL)	4312.4 ± 263.6	7140 ± 281.5	<0.0001	*

* Significant

DISCUSSION

The present study was conducted to identify potential haematological changes in Kala-azar (Visceral Leishmaniasis,VL) patients in comparison with healthy group. These haematological changes are valuable for the diagnosis and treatment of the patients. The total subjects were of the same geographic region, minimizing differences in genetic background of the human population or diversity in parasite behaviour as well as reducing differences in clinical care observed in distinct regions.

In this study, prevalence of Kala-azar in male and female was 62.5% and 37.5% respectively. Boggiatto et al.[11] found that the number and percentage of male patients (40, 56.3%) were higher than female patients (31, 43.7%). In another study, conducted by Singh et al.[7]established that infection of VL had higher prevalence in males than females in India. The study of Bhowmick[12] revealed that the prevalence of Kala-azar was higher in males (51.22%) than females (36.96%). These findings were almost similar to our findings. Those were may be due to occupational variation.

The most marked symptoms in Kala-azar patients were fever and weight loss, which may be due to infection and anorexia. Bleeding and darkening of the skin were also present possibly caused by thrombocytopenia. Among the signs, anaemia was more prevalent in the patients. The presence of anaemia in Kala-azar patients would suggest intravascular volume contraction.[13] Splenomegaly (75%) was a vital feature of the clinical presentation in our study. In one study conducted by Islam et al.,[14] Splenomegaly was reported to be present in 100% of patients, but it may be absent in immunocompromised patients, such as those who are HIV positive, renal transplant recipients, those with haematological malignancies and those on long-term steroids therapy. Several studies[15,16] revealed that splenomegaly may be absent in acute cases, or in the early stages of the disease. Besides, hepatomegaly, hepatosplenomegaly and lymphadenopathy were less frequent in those patients.

Haemoglobin concentration in patients suffering from VL was lower than in healthy controls. This finding is consistent with the findings reported by Rahim et al.[17]and Collin et al.[18] Our study revealed thrombocytopenia in 32 out of 56 patients with mean platelet count of 150.26x10^9/L, whereas Dhingra et al.[19] reported thrombocytopenia in 11 out of 18 cases with a mean platelet count of 84 x 10^9/L. Raiet al.[20] found raised ESR in 88% cases but in this study, raised ESR in 81.34% cases. Early and striking manifestation of VL is leucopenia. About 75% patients with VL have been shown to have leucopenia in various studies.[21, 22] This study showed leucopenia in 54% patients and mean WBC count was 4312.4±263.6/µL which was possibly due to hypersplenism.

CONCLUSION

This study revealed haematological changes are linked to the diagnosis of Kala-azar. It also suggests to include fever, weight loss, darkening of skin, anaemia and splenomegaly as key signs and symptoms for diagnosis of Kala-azar, particularly in Bangladesh. Further studies are essential to investigate other haematological and biochemical changes related to Kala-azar in two more phases: during treatment and after treatment.

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Conflict of Interest: The authors declare no conflict of interest.

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