



Study of Liver and Kidney Biochemical Variations in Patients with Various Morphological Types of Leukemia at a Tertiary Healthcare Hospital

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Abstract

Leukemias are malignant neoplasm of the haematopoietic stem cells, arising in the bone marrow that flood the circulating blood or other organs. The objective of this study was to find out the effect of leukemia on liver and renal function of the patients at our institute. Present study is a prospective study which includes the findings and observations of 25 patients diagnosed with leukemia of various types such as acute lymphoblastic leukemia, acute myeloid leukemia, chronic myeloid leukemia and chronic lymphocytic leukemia. Diagnosis of the patients were made by their peripheral smear examination and various parameters counted by automated haematology analyzer and their confirmation was made by using special stains and bone marrow examination. Liver and renal function tests were performed in the patients and results were observed. In acute myeloid leukemia liver function tests were found altered with mainly rise in serum alkaline and alanine transferase, in acute lymphoblastic leukemia, there was marked increase in alkaline phosphatase with normal or decreased SGOT and SGPT value, in chronic myeloid leukemia increase in uric acid was observed with slight fluctuating values in SGOT/SGPT but no significant changes were seen in patients with chronic lymphocytic leukemia.

Keywords: Leukemia, Acute Myeloid Leukemia, Acute Lymphoblastic Leukemia, Chronic Myeloid Leukemia, Chronic Lymphocytic Leukemia.

Introduction

Leukemia is white blood cells cancer, which is characterized with production of immature blood cells. Overcrowding of bone marrow with this abnormal immature cells, which interference with normal blood cells production, this may be lead to hyperleukocytosis, cytopenias, liver and kidney

failure they are classified on the basis of the cell type involved (myeloid vs lymphoid) and the state of maturity of leukemia cells. Acute leukemias are characterized by the presence of immature cells called blasts and by rapidly fatal course in untreated patients; chronic leukemias are associated at least initially, with well

differentiated (mature) leukocytes and a relative indolent course.

It is common to find malignant infiltration of the liver in hematogenous malignancies such as acute leukemia. Hepatic involvement is usually mild and clinically silent at the time of diagnosis. Acute leukemia patients, Acute Lymphoblastic Leukemia (ALL) and Acute Myeloid Leukemia (AML), the clinical features are very vague and variable. However, certain patients with acute leukemia present with hyperleukocytosis and cytopenias^[1]. B-Cell chronic lymphocytic leukemia (CLL) is a usually indolent disease that may infiltrate the liver, but based on a review of the literature, has never been reported to induce acute liver failure.

Most of acute leukemia patients have organs enlargement as splenomegaly and hepatomegaly, this might be caused by infiltration of leukemic cells, which are seen in some cases of leukemia^[2]. Acute liver failure considers as the initial manifestation of acute leukemia, also it is extremely rare, it is difficult to diagnose due to the rapid progression^[3]. It has been described in acute lymphoblastic leukemia far more than in acute myeloid leukemia because of blasts infiltration in ALL more than in AML^[4].

In addition, acute renal failure has been reported as complicated feature in many of leukemia cases^[5]. Multiplication and overgrowth of malignant cells increase rate of turn over nucleic acid and this can cause acute renal failure due to the release of urate salts, which may deposited in renal tubule and cause blocking it^[6]. Also, high

cell turnover may be causes elevated lactate dehydrogenase. However, leukemia patients characterized with infection and inflammation this may be reason for elevated the rate of erythrocyte sedimentation^[1].

Aim And Objective

To study the effect of leukemia on liver and renal function of different leukemic patients in central India.

Type of study- Prospective

Materials and Methods

Sample size- 25 cases diagnosed with leukemia. In the present study patients diagnosed with leukemia were selected to perform liver and renal function tests and then observed for results. Diagnosis of the patients were made by their peripheral smear examination, special stains and bone marrow examination were required and various parameters counted by automated haematology analyser. On admission, patients were subjected to physical examination for fever, cervical lymphadenopathy, hepatomegaly, splenomegaly and cachexia. Consent, complete clinical and past history was taken from the patients for evaluation.

Results

The results were recorded and tabulated for further analysis. Table no. 1, 2, 3 and 4 shows the various observed parameters in the patients.

Table No. 1 Different Parameters (LFT & RFT) In Patients

S.NO	AGE/SEX	DIAGNOSIS	SGOT	SGPT	URIC ACID	ALK PHOSPHATASE
1	45/M	AML	247	71	10.4	215
2	25/F	AML	115	61	12	88
3	25/M	AML	90	70	6.2	60
4	28/F	AML	64	45	4.8	67
5	50Y/M	CML	52	62	8.7	84
6	18Y/M	AML	34	58	2.8	50
7	7/M	ALL	26	12	6.2	82
8	60/M	AML	25	16	4.1	92
9	40/F	AML	23	21	3.5	128
10	3/M	ALL	18	16	5.4	111

11	40/M	CLL	15	10	6.4	167
12	42/M	AML	237	74	11.2	238
13	23/F	AML	118	64	14	90
14	26/M	AML	85	65	6.8	53
15	24/F	AML	74	55	3.6	78
16	65/M	AML	22	15	4.7	67
17	45/F	AML	28	26	3.6	136
18	3/M	ALL	21	18	7.6	87
19	2/M	ALL	18	15	4.8	124
20	5/M	ALL	25	14	5.6	78
21	6/M	ALL	19	15	4.5	116
22	58Y/M	CML	60	56	9.2	88
23	52Y/M	CML	67	63	7.8	82
24	57Y/M	CML	55	53	8.4	76
25	41/M	CLL	18	13	6.6	176

Table No.2 Characterization of Leukemia in the Study

S.No	Diagnosis	No. Of Cases	Percentage
1	AML	13	52
2	ALL	06	24
3	CML	04	16
4	CLL	02	08

Table No.3- Clinical Symptoms Observed

S.No	Symptoms	No. Of Cases	Percentage
1	Fever	22	88
2	Cachexia	08	32
3	Splenomegaly	10	40
4	Hepatomegaly	13	52
5	Lymphadenopathy	19	76

Table No.4- Male and Female Preponderance

S.No	Sex	No. Of Cases	Percentage
1	Male	19	76
2	Female	06	24

Discussion

Acute leukemia is a heterogeneous disease with distinct manifestations and disturbance in different metabolic processes occurring in acute leukemia patients^[7]. At the cellular level, acute leukemia's are rapidly progressing diseases, which characterized with over growth of immature malignant cell and this lead to decrease synthesis of mature normal blood cell due to suppression of hematopoiesis and this lead to anemia, thrombocytopenia, and hyperleukocytosis, all of this lead to fever, fatigue, infection, and bleeding^[8]. Continuously divided and overproduced of immature cells in the bone marrow caused damage in some organs due to spreading (infiltrating) of blasts cells to other organs^[9].

In the present study, all cases were subjected to hematological and clinical studies. Increase in leucocyte count was observed in all leukemias. In AML, most of studies have found that hyperleukocytosis is unfavourable prognostic factor^[1]. AML patients with hyperleukocytosis have demonstrated low rate of complete remission, low disease free survival and overall survival as well as high rates of early mortality. In ALL, there are consistent data regarding the poor prognosis of hyperleukocytosis, so hyperleukocytosis correlated with high rate of death as compare to patients with low or normal white blood count.

In acute myeloid leukemia liver function tests were found altered with rise in serum aspartate and alanine aminotransferase. The maximum

value of SGOT was found to be 247 IU and minimum was 23 IU, while the value of SGPT was recorded maximum as 71 IU and 16 IU as lowest, comparing the uric acid levels maximum was 14 mg/dl and minimum 3.5 mg/dl showing defective renal function. In acute lymphoblastic leukemia, there was marked increase in alkaline phosphatase with normal or decrease SGOT and SGPT value, in chronic myeloid leukemia increase in uric acid was observed with maximum value being 9.2 mg/dl and minimum 7.8 mg/dl along with slight fluctuating values in SGOT/SGPT but the values were no more than 70 IU in the patients. No significant changes were seen in patients with chronic lymphocytic leukemia due to small sample size (02).

Out of the total number of 25 cases 52% were diagnosed as acute myeloid leukemia, 24% acute lymphoblastic leukemia, 16% chronic myeloid leukemia and 08% chronic lymphocytic leukemia, with male preponderance.

Based on the general and clinical examination of the patients 88% presented with fever, 76% with lymphadenopathy, 52% with hepatomegaly, 40% with splenomegaly and 32% suffered from cachexia.

Various authors have reported that acute leukemia associated with abnormal liver function^[10,11].

Some cases have been shown disturbance in renal function as increase in uric acid levels and creatinine levels. Increase of uric acid in acute leukemia may be due to the increase Tumor Lysis Syndrome (TLS), which is an oncologic emergency that is caused by massive tumor cell lysis with the release of large amounts of potassium, phosphate, and nucleic acids into the systemic circulation^[12]. Catabolism of the nucleic acids to uric acid leads to hyperuricemia; the marked increase in uric acid excretion can result in the precipitation of uric acid in the renal tubules and renal vasoconstriction, impaired autoregulation decreased renal flow, oxidation, and inflammation, resulting in acute kidney injury^[13].

Liver failure caused by infiltration of leukemia is uncommon and usually associated with a poor prognosis^[14-16]. acute leukemias, and transformation of chronic leukemias to acute stages have all been associated with sporadic cases of acute liver failure^[17-35].

Based on a review of the current literature, only three cases of liver failure have so far been associated with CLL. Greer *et al.*^[17] described a case of acute liver failure attributable to organ infiltration by a T-cell CLL.

Conclusion

In conclusion, leukemia is heterogeneous malignant disease in which different clinical manifestation are shown. Complete blood count and peripheral smear examinations along with bone marrow examination flow cytometry are helpful in arriving at diagnosis of acute and chronic leukemia. Any disturbance in liver function tests or kidney function test may act as prognostic alarm for the presence of organ damage and repetitive analysis is important to observe the course of the disease at various age groups.

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