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Hematological and biochemical changes in acute leukemic patients after chemotherapy[1]

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KEY WORDS acute lymphocytic leukemia; acute myelocytic leukemia; combined antineoplastic agents, hematology; blood chemical analysis

AIM: To study hematological and biochemical profiles in acute leukemic patients before and after chemotherapy **METHODS**: Sera from 20 normal persons were compared with those from 40 patients of whom 20 patients were followed up after 6 - 8 months of treatment with cyclophosphamide, vincristine, and prednisolone. **RESULTS**: Hemoglobin, hematocrit and platelet count were decreased while reticulocyte count, blood sedimmentation, total leukocyte count, bleeding time, bilirubin, blood coagulation time, alanine aminotransferase, lactate dehydrogenase, creatinine, and urea were increased in acute myelocytic patients compared to normal A similar pattern was observed in acute lymphocytic patients except there was no significant increase in serum urea. **CONCLUSION**: In acute leukemic patients blood chemistry and hematology are useful during diagnosis and treatment. After 6 - 8 months of treatment 50 % remission occurred.

The objects of treatment in leukemia are eradication of the leukemic process and control complication, especially those due to inadequate production of normal blood cells such as in anemia, infection and hemorrhage.

Eradication of the leukemic process involves the use of antileukemic agents, usually in combination with supplementary measures.

This study was conducted to investigate hematological and biochemical profile in the patients of acute myelocytic and acute lymphocytic leukemia and to observe how chemotherapy improves them.

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MATERIALS AND METHODS

Twenty four patients of acute lymphocytic leukemia (ALL, M 16, F 8; age 4 - 20 a, av 16 ± 9 a) and 16 patients of acute myelocytic leukemia (AML, M 9, F 7; age 9 - 50 a, av 31 ± 13 a) were selected randomly from the Institute of Nuclear Medicine and Oncology Lahore (INMOL) and Oncology Department, King Edward Medical College, Mayo Hospital, Lahore, Pakistan.

All patients received the following drug combination: 1) vincristine 1.4 mg/m^2 body surface area iv for 6 - 8 wk; 2) prednisolone 25 mg · d^{-1} *po* for 6 - 8 wk; 3) cyclophosphamide 10 mg·kg^{-1} iv for 6 - 8 wk.

Out of 40 patients, 20 were followed up after 6 - 8 months. Control group was 20 normal persons. Blood 7 mL was collected for hematology and serum analysis.

Hemoglobin, total leukocyte count, hematocrit, and platelets count, were determined with Hematology Autoanalyser (Sysmex K-1000, Toa Electronics, Japan). Bleeding time, blood coagulation time[1] and reticulocyte count[2], blood sedimenta, serum bilirubin, creatinine and urea[3], alanine aminotransferase and lactate dehydrogenase[4]. All chemical reagents were of AR.

Statistical significance was measured by two-tailed *t*-test[5].

RESULTS

Hemoglobin, hematocrit, and platelet count were decreased while reticulocyte count, blood sedimentation, total leukocyte count, bleeding time, bilirubin, blood coagulation time, alanine aminotransferase, lactate dehydrogenase creatinine, and urea were incresed in AML patients compared to normal. A similar pattern was observed in ALL patients except there was no obvious increase in serum urea (Tab 1).

DISCUSSION

The 95 % patients were anemic. Reticulocytosis was due to secretion of unstable inhibitor of erythropoiesis by cancer cells. Low hemoglobin and hematocrit resulted from ineffective erythropoiesis[6].

Tab 1. Hematological and biochemical data in acute leukemic patients before and after chemotherapy. Group I indicated the leukemic patients before treatment and the same patients after 6 – 8 months of treatment were called Group II, just to facilitate comparison. $\bar{x} \pm s$. $^aP > 0.05$, $^bP < 0.05$, $^cP < 0.01$ *vs* **normal persons.**

	Before treatment		After 6 – 8 months		Normal persons
	AML	ALL	AML	ALL	
Patients	16	24	9	11	20
Reticulocyte count/%	1.4 ± 1.3^b	1.2 ± 0.7^c	0.95 ± 1.0^a	0.8 ± 0.6^a	0.7 ± 0.4
Hemoglobin/$g \cdot L^{-1}$	81 ± 16^c	76 ± 25^c	98 ± 13^b	96 ± 23^b	137 ± 0.7
Hematocrit/%	24 ± 5^c	24 ± 7^c	36 ± 6^c	32 ± 9^c	40 ± 2.2
Blood sedimentation/$mm \cdot h^{-1}$	83 ± 44^c	83 ± 37^c	68.3 ± 2.0^c	59 ± 16^c	6.7 ± 2.1
Platelet count/$10^9 \cdot L^{-1}$	106 ± 51^c	82 ± 68^c	137 ± 0.6^c	116 ± 27^b	203 ± 21
Leucocyte count/$10^9 \cdot L^{-1}$	35 ± 54^b	56 ± 72^c	30 ± 32^a	46 ± 59^a	7.5 ± 1.3
Blood coagulation time/min	8.7 ± 1.3^c	8.2 ± 1.2^c	7.8 ± 1.6^a	7.9 ± 2.4^a	5.8 ± 1.1
Bleeding time/min	5.6 ± 1.0^c	5.3 ± 1.1^c	4.8 ± 1.8^b	4.5 ± 2.1^a	3.2 ± 0.8
Bilirubin/$mg \cdot L^{-1}$	3.8 ± 1.0^c	3.1 ± 1.8^c	3.3 ± 1.2^a	2.01 ± 0.07^b	0.7 ± 0.3
Alanine aminotransferase/$IU \cdot L^{-1}$	25 ± 4^c	25.1 ± 1.5^c	21.3 ± 2.7^b	23.1 ± 1.2^c	16.6 ± 2.9
Lactage Dehydrogenase/$IU \cdot L^{-1}$	$1\,171 \pm 670^c$	$1\,495 \pm 781^c$	650 ± 110^c	$1\,040 \pm 119^c$	348 ± 47
Creatinine/$mg \cdot L^{-1}$	10.2 ± 0.9^c	9.6 ± 0.8^c	9.5 ± 1.0^a	9.1 ± 1.2^a	8.7 ± 1.6
Urea/$mg \cdot L^{-1}$	316 ± 51^c	303 ± 69^a	308 ± 65^a	296 ± 54^a	285 ± 69

Infections and neoplasm caused changes in plasma proteins which accelerated sedimentation. Radiation and cytotoxic drugs produced thrombocytopenia[7]. Leukocytosis was associated with lymphadenopathy, hepatosplenomegaly, and T-cell immunophenotype. Whole blood coagulation time was prolonged by deficiencies of various coagulation factors. Prolonged bleeding time was due to vascular defects, thrombocytopenia, and platelet dysfunction[8]. Bilirubin, alanine aminotransferase and lactate dehydrogenase were increased due to various hemolytic conditions[8]. The increase of creatinine indicated impaired formation or excretion of urine while the increased urea showed elevated cortisol and stress. Chemotherapy of 6 – 8 months produced marked improvement in above parameters (Tab 1).

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急性白血病病人化疗后的血液学及生化变化

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关键词 急性淋巴细胞性白血病; 急性髓细胞性白血病; 多剂联用抗肿瘤药; 血液学; 血液化学分析

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