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RESEARCH ARTICLE

Hematological and Biochemical Parameters in Pakistani Chronic Lymphoblastic Leukemia Patients

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ABSTRACT

Leukemia, blood cancer is the third most fatal disease in developing countries. Hematological variations are seen in all types of patients including leukemia. To see the effect of disease on hematological and biochemical parameters, fifty CLL leukemic patients were recruited including 25 female and 25 male subjects. Mean age for CLL patients was 41.5±20.86. Some Hematological parameters studied were: hemoglobin 7.4±1.6 g/dL, RBCs 2.84±0.32 Millions/mm^3, ESR 96.5±26.8 mm/1st hour, Platelets 46.0±70.2 $\chi 10^3/\mu L$ and WBCs 56.1±26.8 $\chi 10^3/\mu L$. Values of creatinin, total bilirubin, urea and ALT were elevated while level of alkaline phosphatase was decreased significantly as compared to normal local population. WBCs count and ESR value were increased while platelets, RBCs and Hb found to be lower in CLL patients as compared to healthy population ($P \leq 0.05$). Study of alteration of hematological and biochemical parameters in chronic lymphoblastic leukemia patients are important to develop many life saving strategies.

INTRODUCTION

Chronic lymphoblastic leukemia (CLL) is considered as the second most widespread leukemia in adults. There are almost 7,000 new cases of CLL per year. It was believed to occur only in western countries but later it was diagnosed in Chinese and Indian population (Pokharel, 2012). CLL remains incurable due to its heterogeneous nature with survival ranges from months to decades and therapy is flexible for different patient groups (Lu and Wang, 2012). Understanding of biology of CLL improves the drug therapy (Zenz et al., 2010) Changes of biochemical and some hematological parameters in newly diagnosed CLL patients are important for life saving purposes. This study was conducted to see differences between biochemistry and hematology of CLL patients and normal individuals in Pakistani population.

MATERIALS AND METHODS

To study the variation of hematological and biochemical parameters in chronic lymphoblastic leukemia (CLL) fifty CLL patients (25 female and 25 male) were selected. Mean age of the female and male patients was 39±17.57 and 44.85±24.15, respectively.

Hundred healthy individuals (50 male and 50 female) of local population were also selected for this study. All subjects were non alcoholics, non-smokers on normal diet and no one was on any medication. Mean ages of female and male healthy individuals were 31.21±13.63 and 30±10.98 respectively.

The biochemical parameters of all volunteers were determined in blank serum samples by using commercial diagnostic kits. The urea, creatinin, total bilirubin, aminotransferase (ALT), alkaline phosphatase (ALP) were measured on Roche Hitachi 912 automated closed system clinical chemistry analyzer Japan.

The blank blood sample collected from each volunteer was also used to determine hematological parameters such as hemoglobin (Hb), platelets, red blood cells (RBCs), erythrocyte sedimentation rate (ESR) and total white blood cells (WBCs).

The CLL patient's parameters were compared with those of healthy volunteers and patients were also compared for gender difference.

RESULTS AND DISCUSSION

Hematological parameters including Hb, RBCs, ESR, Platelets and WBCs were measured selected male and female CLL patients (Table 1) and compared with healthy population.

Table 1: Hematological parameters of Chronic Lymphoblastic Leukemia (CLL)

Volunteers	Hemoglobin (g/dL)	RBCs (Millions/mm^3)	ESR ($mm/1^{st}$ hour)	Platelets ($10^3/\mu L$)	WBCs ($10^3/\mu L$)
Healthy (n=100)	14.1±1.4	5.29±0.55	8.32±3.6	317.2±67.5	8.9±1.5
HealthyFemale (n=50)	13.7±1.4	5.2±0.47	8.44±3.5	313±58.8	8.97±1.51
Healthy male (n=50)	14.5±1.4	5.4±0.64	8.29±4.1	320.4±35.3	11.1±17.2
CLL (n= 50)	7.4±1.6	2.84±0.32	96.5±26.8	46.0±70.2	56.1±26.8
CLL Female (n=25)	7.0±1.6	2.9±0.46	102.5±0.30	30.5±21.3	54.2±16.8
CLL male (n=25)	7.2±1.8	2.8±0.29	103.9±0.36	17.2±11.7	58.4±18.7

CLL: Chronic Lymphoblastic Leukemia, RBCs: Red blood cells, ESR: Erythrocyte sedimentation rate, WBCs: White blood cells, n: number of volunteers

Hemoglobin (Hb)

A reduced level (7.4±1.6 g/dL) of Hb was observed in CLL patients. It was 7.0±1.6 and 7.2±1.8 g/dL in female and male patients, respectively. These results are comparable with earlier studies and the values vary depending upon disease condition (Junglee, et al., 2012). No statistical gender difference was found in values of hemoglobin in patients as well as in healthy volunteers. Healthy volunteers showed HB levels within range mentioned in literature (12-16 g/dL) (Esfahani et al., 2011).Red Blood Cells (RBCs)RBCs were found less in number in CLL patients (2.84±0.32 Millions/mm^3). It is due to less production of RBCs in red bone marrow or their higher degradation in spleen. These results are consistent with previous studies (Al-abdallah, 2012). RBCs were less in number in female and male patients 2.9±0.46 and 2.8±0.29 Millions/mm^3 compared to female and male of healthy individuals 5.2±0.47 and 5.4±0.64 Millions/ mm^3, respectively. No difference was seen in female and male of patients and that of healthy individuals when compared statistically.

Erythrocyte Sedimentation Rate (ESR)

ESR was found much higher (96.5±26.8 $mm/1^{st}$ hour) in patients as compared to healthy population (8.32±3.6 $mm/1^{st}$ hour). It was 102.5±0.30 and 103.9±0.36 $mm/1^{st}$ hour in female and male patients, respectively. Higher level of ESR is usually used as prognostic factor indicating short survival in patients (Hannisdal et al., 1986). Patients had no gender difference. ESR was found within range (0-18 $mm/1^{st}$ hour) in healthy population as set previously. Both female and males had almost similar values 8.44±3.5 and 8.29±4.1 $mm/1^{st}$ hour, respectively.

Platelets

Plateletes or thrombocytes count was low (46.0±70.2 $10^3/\mu L$) in CLL patients compared to healthy volunteers (317.2±67.5 $10^3/\mu L$) coincide with previous studies (Mukiibi et al., 2001; Sengul et al., 2008). In female and male patients platelet count was 30.5±21.3 and 17.2± 11.7 $10^3/\mu L$, respectively. Female of CLL have greater platelets count as compared to their male counterpart.

White blood cells (WBCs)

White blood cells of CLL patients have higher WBC count (56.0±23.0 $10^3/\mu L$) as compared to healthy volunteers (8.9±1.5 $10^3/\mu L$) according to present study. This is comparable to the earlier studies (Mukiibi et al., 2001; Sengul et al., 2008). Although in normal population gender difference was seen but no significant difference found in CLL when genders were compared in present study.

Biochemical parameters

Biochemical parameters including total bilirubin, creatinine, urea, aminotransferase (ALT) and alkaline phosphatase (ALP) were determined in healthy and chronic lymphoblastic leukemia patients (Table 2). Values of Patient population were also compared with healthy local population.

Total bilirubin

Bilirubin is metabolic product of hemoglobin and its concentration is higher in CLL patients because of overall disease condition. Replacement of normal myeloid lineage with abnormal leukemic cells and higher degradation of RBCs in spleen may be the reason (Mehmood, 2007). Bilirubin was higher in CLL patients 2.84±0.29 mg/dL as compared to healthy volunteers (0.89±0.23 mg/dL). Total bilirubin in patients with CLL was found 2.86±0.28 and 2.82±0.31 mg/dL in females and males, respectively. Moreover, females and males of CLL patients showed higher levels of bilirubin when compared with their healthy counterpart (Table 1). Bilirubin is mostly elevated in patients with CLL reported previously (Esfahani, et al., 2011) however no difference was found in female and male of CLL patients.

Creatinine

Weight loss mostly seen in patients due to muscle degradation or kidney failure Moreover leukaemic infiltration of the kidneys that may cause increased creatinine is mostly seen late in the course of disease (Sengul, et al., 2008, Al-abdallah, 2012). Creatinine was more in CLL patients (4.76±1.48 mg/dL) than healthy volunteers (0.63±0.25 mg/dL). Creatinine was 4.44±1.69 and 4.23±1.70 mg/dL in female and male respectively. Concentration was also found higher when female and male of patients were compared with healthy ones (Table 2). Results are consistent with previous findings. Creatinine concentration found to be progressively increased with course of disease in patients as some patients ends with renal failure (Rifkin, 2008). The difference in blood creatinine was

Table 2: Biochemical parameters of Chronic Lymphoblastic Leukemia (CLL)

Volunteers	Total Bilirubin (mg/dL)	Creatinine (mg/dL)	Urea (mg/dL)	ALT (U/L)	Alkaline Phosphatase (U/L)
Healthy (n=100)	0.89±0.23	0.63±0.25	36.5±5.36	29.4±7.5	350.6±21.8
Healthy female (n=50)	0.86±0.23	0.57±0.23	34.4±6.27	30.0±8.7	345±25.4
Healthy male (n=50)	0.98±0.18	0.70±0.26	38.5±3.94	28.5±7.16	355±19.9
CLL (n= 50)	2.84±0.29	4.76±1.48	101.0±28.2	47.3±8.0	204.7±45.7
CLL female (n= 25)	2.86±0.28	4.44±1.69	97.64±28.2	45.6±7.93	207.2±46.4
CLL male (n= 25)	2.82±0.31	4.23±1.70	104.40±28.3	49.1±7.98	202.3±45.7

CLL: Chronic Lymphoblastic Leukemia, ALT: Alanine Aminotransferase, n: Number of volunteers.

not found significant when the genders were compared for CLL patients in present study.

Urea

Blood urea is degradation product of proteins. Proteins may come from the muscles of the patients because of many lytic enzymes released due to imbalance of antioxidant status (Rai and Phadke, 2006). Blood urea concentration found higher in CLL patients compared to healthy volunteers. Urea was 101.0±28.2 mg/dL in all CLL patients is higher in patients compared to healthy volunteers (36.5±5.36 mg/dL) respectively in female and male patients. Male and female of patients also showed elevated levels (97.64±28.2 and 104.40±28.3 mg/dL) as compared to male and female of healthy local population (30.0±8.7 and 28.5±7.16), respectively. These results are consistent with previous studies as urea concentration increased in patients depending on disease condition (Junglee et al., 2012). No statistical difference was seen when the gender were compared with their counterpart.

Alanine aminotransferase (ALT)

ALT was significantly higher in CLL patients 47.3±8.0 U/L as compared to healthy volunteers (29.4±7.5 U/L). ALT was found 45.6±7.93 and 49.1±7.98 U/L for female and male patients respectively. Higher ALT level was seen in both female and male CLL patients as compared to female and male of healthy local population. Source of ALT is liver. In hepatocellular diseases serum concentration of ALT increases as compared to healthy individuals. Elevated level of ALT is found in CLL patients previously and the value depends on disease condition. Upto 225 U/L was found in CLL patient with renal failure (Esfahani et al., 2011). In patients no difference was seen when the genders were compared for ALT.

Alkaline phosphatase (ALP)

Alkaline phosphatase is significantly lower in patients with CLL as compared to healthy individuals in Pakistani population. We found elevated serum ALP value in Pakistani healthy population (350.6±21.8) compared to other populations where normal range is usually mentioned as 53-141 U/L. Serum alkaline phosphatase value may vary upto 615 U/L (Esfahani et al., 2011). Alkaline phosphatase was lower 204.7±45.7 U/L in CLL patients as compared to healthy population. It was also found lower in female and male patients (207.2±46.4 and 202.3±45.7 U/L) as compared to healthy (345.2±25.4 and 355.3±19.9 U/L) female and male volunteers, respectively. Serum ALP comes from erythrocyte, liver and bone marrow. Serum level of ALP is usually low due to malnutrition and anemia (Khan and Tayyab, 2004). .No significant difference was found when male and female subjects of CLL were compared statistically.

Conclusions

Biochemical parameters like creatinin, total bilirubin, urea and ALT increased in CLL patients while alkaline phosphatase decreased significantly from normal population. WBCs and ESR were higher; whereas, platelets, RBCs and Hb were found significantly lower in CLL patients as compared to healthy population.

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