Journal of Medical and Biological Science Research
Vol. 4 (2), pp. 72-75, June, 2018
ISSN: 2449-1810
Full Length Research Paper
http://pearlresearchjournals.org/journals/jmbsr/index.html



# Liver Enzymes, Urea and Creatinine among Acute Lymphocytic Leukemia in Sudanese Patients

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Accepted 26 June 2018

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## ABSTRACT

The aim of this study was to assess the level of AST, ALT, urea and creatinine among Sudanese patients with acute lymphocytic leukemia (ALL). Liver and renal complications occur due to several factors including leukemic cells infiltration of the liver and kidneys, therapy-related side effects such as tumor lysis syndrome, nephrotoxic drugs, and septicemia. case-control study was conducted during the period from November 2017 to February 2018, 100 participants (50 cases and 50 controls). All cases admitted to national center for radiotherapy and nuclear medicine in Khartoum State and the sample was collected by simple random sampling technique through a self-administering questionnaire, the analysis of data by SPSS version 21 using T-test for comparing mean and simple correlation for correlation of continuous numerical data. There was a significant increased in the levels of AST, ALT, urea and creatinine in patients with Acute Lymphocytic Leukemia (ALL) with p-value = 0.005, 0.003, 0.029 and 0.027, respectively when compared to healthy individuals. The Mean±SD was 73.0±42.2 U/L, 85.1±34.8), 40.9±22.8 and 1.4±0.88mg/dl in ALL patients, respectively and was 32.5±8.5U/L, 25.2±7.6, 29.2±9.1 and 0.92±0.39mg/dl in healthy individuals, respectively, Also there was significant increased in the levels of AST and ALT in male with ALL when compared with female with ALL, the p-value was 0.028 and 0.025 respectively, also there was a positive correlation between level of AST and age in (ALL) patients with (R= 0.307, p-value= 0.030). But there was no correlation between the levels of ALT, urea and creatinine with age. The levels of AST, ALT, Urea and creatinine was increased in patients with ALL when compared to healthy individuals, and also there was positive correlation between AST level and age.

**Keywords:** Acute lymphocytic leukemia (ALL), liver enzymes, Khartoum State.
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## Introduction

Acute lymphoblastic leukemia (ALL) is a cancer of the lymphoid line of blood cells characterized by the development of large numbers of immature lymphocytes. Symptoms may include feeling tired, pale skin color, fever, easy bleeding or bruising, enlarged lymph nodes, or bone pain. As acute leukemia, ALL progresses rapidly and is typically fatal within weeks or months if left untreated, and it is the most common type of leukemia in young children (Ondreyco et al.,1981). Acute myeloid leukemia (AML): which affect myeloid cells and grows quickly, hepatic involvement in acute leukemia's is usually mild and silent at the time of diagnosis (Bruguera and Miguel, 2007). Some study showed liver infiltration in 95% of ALL and 75% of AML patients (Thiele, 2002). In ALL, infiltration was confined to the portal tract, whereas in AML, infiltration was observed in both portal tract and sinusoids, massive leukemic cells infiltration of the liver may present as a fulminant hepatic failure (Litten et al., 2006). The aminotransferases are normally present in the serum in low concentration; these enzymes are released into the blood in greater amounts when there is damage to the liver cell membrane resulting in increased permeability (Eugene, 2001; Anderson et al.,2001). The activation of ALP and GGT are elevated in hepatic infiltration by leukemic cells (Shimizu et al.,2006).

In acute lymphocytic leukemia, renal complications occur due to several factors, including leukemic infiltration of the kidneys, therapy-related side effects such as tumor

**Table 1:** Comparison The level of AST, ALT, urea and creatinine in case versus control: (n=100).

| Parameters | Case (Mean±SD) | Control (Mean±SD) | *P-value* |
|---|---|---|---|
| **AST** | 73.0±42.2 | 32.5±8.5 | 0.005 |
| **ALT** | 85.1±34.8 | 25.2±7.6 | 0.003 |
| **Urea** | 40.9±22.8 | 29.2±9.1 | 0.029 |
| **Creatinine** | 1.4±0.88 | 0.92±0.39 | 0.027 |

**Table 2:** Comparison the levels of AST, ALT, urea and creatinine in case group according to gender. (n =50).

| Parameters | Male (Mean±SD) | Female (Mean±SD) | *P-value* |
|---|---|---|---|
| **AST** | 89.00±60.89 | 55.67±60.05 | 0.028 |
| **ALT** | 94.00±54.09 | 75.33±56.30 | 0.025 |
| **Urea** | 41.81±17.76 | 40.08±27.58 | 0.792 |
| **Creatinine** | 1.43±0.83 | 1.32±0.95 | 0.677 |

lysis syndrome, nephrotoxic drugs, and septicemias (Munker et al.,1998). Hyperuricemia, as a manifestation of tumor lysis syndrome, is a well-recognized complication (Lommatzsch et al., 2006) and in most cases, it occurs after the initiation of chemotherapy. Renal failure as the primary manifestation of ALL is rare. Here, we report three children who are presented with acute renal failure and hyperuricemia and were subsequently diagnosed to have ALL despite initial normal white cell counts and normal peripheral smear in one of them. There is limited information on the effect of leukemia on the liver and renal functions. Some studies showed that elevation of the liver enzymes such as AST and ALT, in leukemic patients due to infiltration of the leukemic cell that leads to liver damage, while other studies demonstrated limited effect of ALL in liver and renal functions. Therefore the present study was undertaken to assess the level of AST, ALT, urea and creatinine in ALL.

## MATERIALS AND METHODS

This study was a case-control study and conducted during the period from November 2017 to February 2018, 100 participants (50 patients with ALL as cases and 50 healthy individual as controls), gender and age was matched (case and control aged from 3 to 12 years, 26 (52%) and 24 (48%) were males and females). Blood samples were collected from the national center for radiotherapy and nuclear medicine (case study), Khartoum state.

All patients with ALL were included in this study, while patients with others like leukemia, liver and renal disease were excluded. This study was approved by the ethical committee of Medical Laboratory Sciences, Clinical Chemistry Department –Alneelain University. Subjects involved in this study were informed by the aims of the study and its importance, and verbal informed consent was obtained from each participant. Blood samples were collected and serum was separated. The levels of serum AST, ALT, urea and creatinine, were measured by using Mind ray BS-120, Pathological and Normal control sera to assure accuracy and precision of results.

Data were analyzed using SPSS version 21.The results were expressed as percentage, Mean and SD. Independent T-test was performed to compare the study parameters in case versus control groups. Correlation was done to study the relationship between study parameters and study variables. The p-value less than 0.05 were considered significant.

## RESULTS

Statistical analysis showed that there was a significant increase in the levels of AST, ALT, urea, and creatinine among patients with ALL, when compared to healthy individuals (Table 1). Also statistical analysis showed a significant increased in the levels of AST and ALT in male with ALL when compared to female with ALL (Table 2), and also there was insignificant variation in the level of urea and creatinine among ALL patients when compared according to gender (Table 2). The statistical analysis showed a positive correlation between the activity of AST and ages in ALL patients (Figure 1), while there was no correlation between the level of ALT, urea and creatinine with age among patients with ALL (Figures 2-4) respectively.

## DISCUSSION

In the current study, the levels of AST, ALT, urea and creatinine, showed a significant increased in patients with ALL when compared to healthy individuals with p-value (0.005), (0.003), (0.029) and 0.027 respectively, that might occur due to several factors including leukemic cells infiltration of the liver and kidneys, therapy-related side effects such as tumor lysis syndrome, nephrotoxic drugs and septicemia (Munker et al.,1998). This finding was in agreement with results of previous study done by Al- Hammami (2015), which reported that patients with ALL showed elevated AST, ALT, urea and creatinine due to infiltration of leukemic cells. It also agreed with Segal et al. (2010) who reported that elevated transaminases are common at initial presentation of ALL and are likely

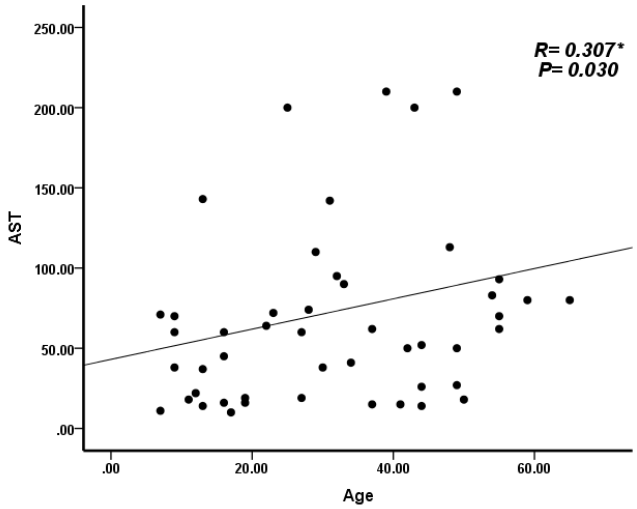


**Figure 1:** Correlation between the level of AST and age.

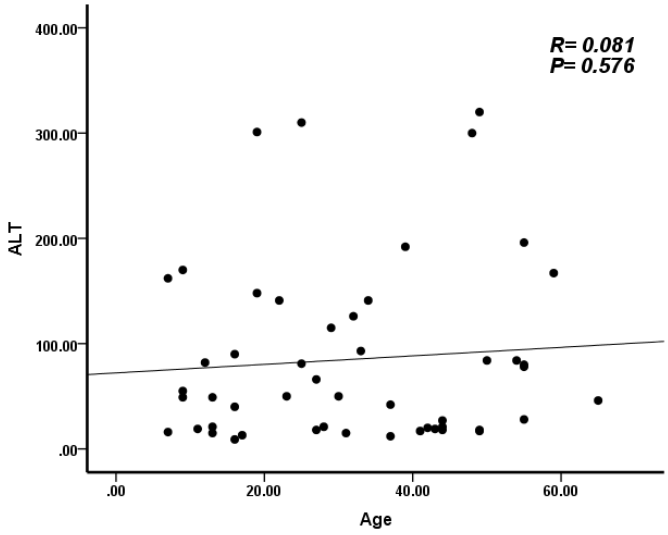


**Figure 2:** Correlation between ALT level and age.

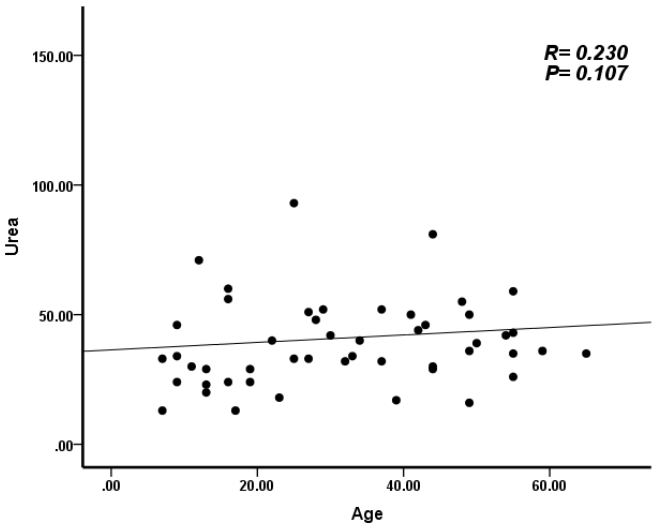


**Figure 3:** Correlation between urea level and age.

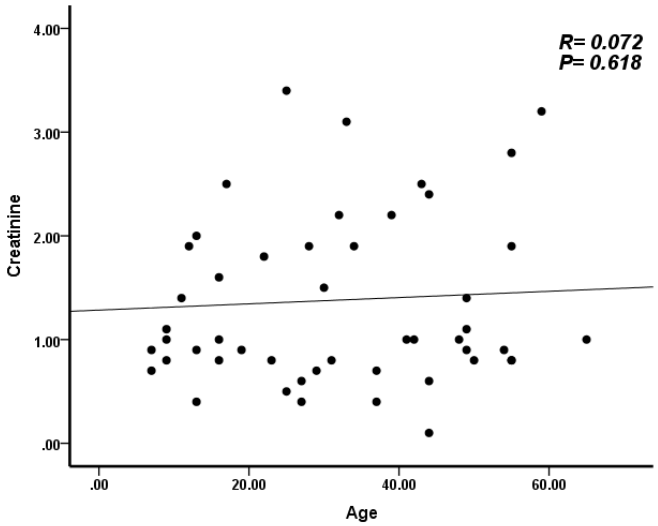


**Figure 4**: Correlation between creatinine level and age.

due to hepatic injury from leukemic infiltrates (Segal et al., 2010). There was a significant increase in the levels of AST and ALT in male with ALL when compared to female with ALL, the p-values were 0.028 and 0.025 respectively, and also there was a positive correlation between the level of AST and age in ALL patients with (R= 0.307, p-value= 0.030). But there was no correlation between the level of ALT, urea and creatinine with age. Kopecna (2001) reported that improved chance for cure and prolonged survival, especially in childhood leukemia, implies the necessity for long-term follow-up of body systems. Effects of therapeutic approaches and different complications are most directly related to the kidney (Kopecna, 2001).

Sevgi et al.(2004) demonstrate that this study brought to our attention the following points: (i) Children cured of ALL may have renal damage. (ii) Kidney damage may occur in ALL patients with renal infiltration, hypertension, or age <2 years, which is associated with a higher risk for kidney damage per se, and in patients subjected to loaded, long-term methotrexate treatment at frequent intervals. (iii) Frequency of renal damage may be underestimated because the blood biochemistry, urinalysis, and renal ultrasonography could not determine renal lesions. (iv) Because the children have a higher probability of long-term survival, they should be reevaluated with renal tests (GFR, U-Ca/Cr, TPR, urinary b 2-microglobulin, renal function, and USG) at least once after they have completed therapy (Sevgi et al., 2004).

## Conclusions

The levels of AST, ALT, Urea and creatinine were increased in patients with ALL when compared to healthy individuals, and also there was a positive correlation between AST level and ages.

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