Interleukin-1α Level among Iraqi patients with Acute Leukemia

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ABSTRACT

Leukemia is a malignant disease (cancer) of the bone marrow and blood. It is characterized by the uncontrolled accumulation of blood cells. Leukemia is divided into four categories: Myelogenous or Lymphocytic, each of which can be acute or chronic.

Forty Iraqi Acute Leukemic patients’ samples included 22 Acute Myelogenous Leukemia (AML) and 18 Acute Lymphoblastic Leukemia (ALL) have been estimated for IL-1α using ELISA technique in comparison with 25 apparently healthy controls.

This study reveals that there is a highly significant elevation in the level of this cytokine among ALL patients’ samples in comparison with control group (P< 0.001) for both AML and ALL group. Moreover there is no significant difference in IL-1α level before and after treatment (P> 0.05). In conclusion there is an effect for acute leukemia on IL-1α level particularly among AML cases in which it began to decline after treatment though it is non-significantly.
INTRODUCTION

The first solid description of a case of leukemia in a medical literature dated 1827, [1]. In 1845, a series of patients who died with enlarged spleens and changes in the “colors and consistencies of their blood”. It was reported that “Leucocythemia” described this pathological condition [2].

Acute myelogenous leukemia (AML) is a fast-growing cancer of the blood and bone marrow. In AML, the bone marrow makes many unformed cells called blasts. Blasts normally develop into white blood cells that fight infection. However, the blasts are abnormal in AML. They do not develop and cannot fight infections. The bone marrow may also make abnormal red blood cells and platelets [1]. It was noticed that the incidence rates for all types of leukemia are higher among males than among females. Acute Myelocytic Leukemia is the most common AL affecting adults, and its incidence increases within age [2].

It was declared that (ALL) is a malignant disorder resulting from the clonal proliferation of lymphoid precursors with arrested maturation [3]. It was denoted that ALL is the most common cancer of childhood. The incidence of ALL among (1-4) year old children is more than 10 times greater than the rate for young adults ages 20-24 [3].

The incidence of AML increases with aging [4]. The median age at diagnosis of ALL is 12 years [5]. Furthermore, it was observed that in all ages, the incidence is higher among males than females [6,7].

Although the cause of AL in human is unknown, several studies have tried to identify leukemia etiology for its development, but definite conclusions cannot be drawn [8].

The main symptoms of leukemia are anemia which results in short breathing and looking pale; bleeding due to low number of platelets and bone with joints pain [7].

Acute Leukemia is diagnosed when blood and bone marrow samples show a large number of leukemia cells [7, 8]. Interleukin-1 (IL-1) is a cytokine with diverse immunologic, physiologic and hematopoietic effects, produced mainly by macrophages and monocytes. There are two existed forms of IL-1 (α and β). They bind to the same receptors and have similar biologic activities [9]. Interleukin-1 appears to be primarily involved in the inflammation, having direct effects on endothelial cells as well as on both B and T cells [10]. It was observed to have a number of effects on the
hematopoietic system, inducing the stimulation of bone marrow stromal cells to produce IL-6 in addition to a range of colony stimulating factors [11].

This study is a trail to estimate the level of IL-1 α in the sera of leukemic patients in comparison with healthy control group since it is myelo-protective and accelerate Neutrophils and Platelets recovery after chemotherapy [12].

MATERIALS AND METHODS

This study was carried out in Baghdad Medical Hospital. It was conducted during the period from September /2006 to January /2007. Forty Iraqi patients with Acute Leukemia involved in this study. Their ages ranged between (10-70) years. They were sequentially selected from cases admitted to the hospital at first presentation. They were diagnosed under the supervision of consultant committee based upon the patient’s medical history, physical examination and laboratory tests which include some Hematological and serological parameters. These samples have been undergone complete blood picture (CBP), IL-1α estimation and the results were compared with those for 25 apparently healthy individuals with age ranged from (10-60) years as healthy control group. This group includes 15 males and 10 females [13, 14].

Statistical Analysis:

All results have been analyzed statistically using Bionomial test, Kruskal Wallis test and ANOVA test (F-test) for multivariate comparison (LSD) [15].

RESULTS AND DISCUSSION

I. Demographical Picture for Acute Leukemic Patients:

Some of demographical parameters had been listed in Table 1. This table also showed the distribution of AL according to the age groups. It is clear that the majority of patients are with ages ranged between 10-30 years (55%) while those at the age above 51 years form the minority among patients (15%) with very highly significant differences between age groups (P< 0.001). Furthermore, it is obviously that the frequency of AL decreases by aging as clearly shown in Table 1.
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Table-1: Demographical picture of Acute Leukemia patients

<table>
<thead>
<tr>
<th>Studied Groups</th>
<th>Subtypes of AL</th>
<th>Number</th>
<th>Frequency</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Leukemia</td>
<td>AML</td>
<td>22</td>
<td>55</td>
<td>0.527</td>
</tr>
<tr>
<td></td>
<td>ALL</td>
<td>18</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Age Groups (Years)</td>
<td>10-30</td>
<td>22</td>
<td>55</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>31-50</td>
<td>12</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>51-70</td>
<td>6</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>17</td>
<td>42.5</td>
<td>0.343</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>23</td>
<td>57.5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>40</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

The distribution of patients according to gender reveals that there is no significant difference between both sexes (P =0.343), though the frequency of females is higher (57.5%), with a female: male ratio of 1.4:1.

Patients’ distribution according to the age groups and regarding the subtype of Leukemia either ALL or AML are listed in table 2. It is clear from this table that there is no effect of age on the frequency of ALL or AML (P = 0.797).

Table- 2: Distribution of Acute Leukemia subtypes according to age groups.

<table>
<thead>
<tr>
<th>Acute Leukemia</th>
<th>Age Groups (Years)</th>
<th>Total</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10-30</td>
<td>31-50</td>
<td>51-70</td>
</tr>
<tr>
<td>AML</td>
<td>12 (54.5)*</td>
<td>6 (27.3)</td>
<td>4 (18.2)</td>
</tr>
<tr>
<td>ALL</td>
<td>10 (55.6)</td>
<td>6 (33.3)</td>
<td>2 (11.1)</td>
</tr>
<tr>
<td>Total</td>
<td>22 (55)</td>
<td>12 (30)</td>
<td>6 (15)</td>
</tr>
</tbody>
</table>

* = No. between brackets represents the frequency

II. Interleukin-1α Level among Patients’ Sera:
Interleukin-1α has been estimated in the sera of patients in comparison with apparent healthy control, table 3 shows highly significant arising in IL-1α level among the patients’ sera in comparison with control group (P = 0.001); and there is no significant variation between IL-1α titer before and after treatment (P> 0.05) for both patients studied groups (AML & ALL).
Table- 3 : Interleukin-1 α (IL-1 α) pg /ml Level among the studied groups

<table>
<thead>
<tr>
<th>Studied Groups</th>
<th>Number</th>
<th>Mean ± SD</th>
<th>ANOVA P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent Healthy Control</td>
<td>25</td>
<td>7.52 ± 1.19</td>
<td></td>
</tr>
<tr>
<td>AML- Before treatment</td>
<td>8</td>
<td>18.50 ± 5.88</td>
<td>0.001</td>
</tr>
<tr>
<td>AML- After treatment</td>
<td>14</td>
<td>17.00 ± 5.32</td>
<td></td>
</tr>
<tr>
<td>ALL-Before treatment</td>
<td>4</td>
<td>14.75 ± 1.26</td>
<td></td>
</tr>
<tr>
<td>ALL-After treatment</td>
<td>14</td>
<td>18.43 ± 6.68</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>65</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LSD Multicomparison P values’ results are:

All the studied groups Vs Apparent Healthy control: (P =0.001 for each comparison)
All the studied groups Before & After treatment comparisons: (P > 0.05)

Regarding the incidence of leukemia among the children; the explanation for this result may be associated with high incidence of infections among the children and young youth rather than adults which enhance the possibility for Leukemia development. Moreover the likelihood exposure to so many agents [such as the mutagens] which facilitate the disease development; occurs at this age [10-30] group more than old ages.

Although there is no significant difference between AML and ALL frequency with the different age groups, young ages [i.e. below 30 years] are still representing the majority for both subtypes (P = 0.797). On the contrary, studies mentioned that 75% of ALL cases occur in children under age of 16 years [16]. This variation is due to racial, geographical and environmental conditions.

Regarding the age effect, on the contrary of the current study’s result, the high frequencies of new cases of AML occur in the United States each year, mostly in older adults. The average age of a person with AML is 65 years. Less than 10% of people with AML are children [17]. While about 3,970 new cases of (ALL) are diagnosed each year in the United States, under the age of 19 years. Children are most likely to develop the disease, but it can occur at any age [18].

These results conflict with the fact that most AML Iraqi patients are less than 30 years. This variation may be related to high exposure of Iraqis to mutagenic factors during the last wars such as the radiated bombs besides the infectious agents and psychological stress which increase the chance for disease development [19]. On the other hand, the above result is regarding ALL to some extent, agreed with this study. However, frequency of ALL among Iraqi children (55.6%) is higher than those observed in other countries as reported in USA that 30% of ALL are children who are < 19 years old [20, 21].
No significant effect for gender on the frequency of ALL or AML as shown in table 1 (P = 0.343). While other studies’ conclusions were clashed with this criterion; for some denoted that the majority of patients were the men, while the others observed that nearly frequency of infection was among both males and females [22]. The interpretation for this result is due to the hormonal and physiological variations and perhaps women nowadays take more responsibilities than the men which enhance their exposure to so many carcinogenic agents. In addition, the security circumstances may prohibit most men to go out even to visit hospitals which reduce their samples’ collections.

Interleukin-1 (IL-1) is a proinflammatory cytokine that plays a pivotal role in driving the in vitro proliferation of leukemic cells through autocrine or paracrine pathways [23]. This is true since arising level of IL-1α in the sera of leukemic patients has been demonstrated as shown in Table 3 in comparison with apparent healthy control group. Furthermore, it was proposed that this cytokine has potent direct and indirect effects on normal and malignant hematopoiesis, and its widespread constitutive expression by neoplastic blood cells may play a fundamental role in driving the leukemic process [2, 24]. This fact also explains the low level of IL-1α among the apparent healthy control group’s sera samples [25].

REFERENCES


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