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Study the Activity of Acetylcholinesterase Enzyme and Some Biochemical Parameters in Patients of Leukemic

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Abstract

leukemia causes significant biochemical changes, serum biochemistry was studied to investigate the correlation of these fa5ctors to leukemia. Total 112 subjects were studied, 36 healthy individuals and 76 leukemia patients . Blood samples were collected in a gel and anticoagulant tubes from Tumors and blood diseases center in Kirkuk, Iraq. In this study Low level of acetylcholinesterase activity (P≤0.01) were observed in leukemia patients. And a number of biochemical parameters were measured, a Significantly increased at a level of probability (p≤ 0.01) in kidney function and liver functions the ,(Urea**,** Creatinine ,Uric acid) and (Glutamate oxaloacetate transaminase GOT, Glutamate pyruvate GPT, Alkaline phosphatase (ALP) for patients with leukemia as compared with the control group.

Keywords: leukemia ; acetylcholinesterase activity; Urea; Creatinine ; Uric acid;GOT ; GPT; ALP.

1. Introduction

Leukemia is some of non-integrative changes that characterize the accumulation of malignant white blood cells in the bone marrow and blood. These malignant cells accumulate as a result of either the proliferation and infiltration of malignant cells in the spleen, liver, lymph gland, brain, meninges, skin or bone marrow deficits that give signs of anemia Low thrombocytopenia and low immune cells [1]. Leukemia is classified as acute and chronic, depending on the origin of lymphocytes or septicemia into four types **:** Acute Lymphocytic Leukemia(ALL) , Acute MyeIogenous Leukemia(AML), Chronic Lymphocytic Leukemia(CLL) and Chronic MyeIogenous Leukemia(CML)[2] .

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The general symptoms of leukemia include: general and stress, anemia and dizziness, recurrent fever and inflammation, loss of weight and loss of appetite, pain in the bones and joints, dyspnea, enlarged lymph nodes, liver and spleen, swelling of the feet and bruising small and small lesions that appear throughout the patient's body due to lack of blood vessels [3].

The acetylcholinesterase enzyme is found in the confluence of neuromuscular, musculoskeletal and neural networks. It is produced in the endoplasmic network, which is released to the surface of the cell, called acetylcholine hydrolysis (EC 3.1.1.7) [4] . Other cells (such as the cells that make up the fibers, the kidney cells ,spleen,Luna and whiteblood cell [5]. It is also found in many tissues for example (connective tissue, central nervous system, limbs, muscles, red blood cell walles, sensory nerves, motor nerves) and the efficacy of acetylcholinesters in sensory nerves less than motor nerves [6]. The function of the coenzyme acetylcholine enzyme is a neurotransmitter analysis and has a role in the regulation of cell death and the development and division of cells, which in turn indicates the role of enzymatic in the formation and development of cancer tumors [7].

2. Materials and methods

2.1 Selection of patients

This study was conducted in the Department of Biochemistry lab in Kirkuk university, Iraq. It included **76** patients diagnosed with Leukemia and 36 controls were also involved in the study.

2.2 Serological Technique

All were informed regarding the study and written consent was obtained. General information such as name, age, gender, acute illness, height, weight, and drugs usage etc was recorded in case of history performa. Blood samples were collected in a gel and anticoagulant tubes from normal and Leukemia infected patients. The biochemical test included each of AChE activity was manually measured While Creatinine ,Uric acid , ALP were measured using the standard kits from Biolabo and GOT , GPT was performed by commercially available kit (RANDOX / UK). and Urea was performed by commercially available kit (Linear Chemicals / Spain).

Table 1: Methods used to estimate the biochemical parameters

Biochemical parameters	The method
AChE	S-Acetylthiocholine Iodide method [8].
Creatinine	Jaffe reaction [9].
Uric acid	Fossati P, Prencipe L, Berti G [10].
ALP	Belfield and Goldberg [11].
GOT and GPT	Ghosh [12].
Urea	Enzymatic colorimetric method [13].

2.3 Statistical analysis

In this study the results include mean ±S.D and significant differences (P.Value) between groups that examined a available statical SPSS 17.0 significant differences was estimated as the p.value equal or less than 0.01

3. Results and Discussion

3.1 Acetylcholinesterase (AChE)

The results shown in Table (2) show that the efficacy of acetylcholinesterase metabolism was significantly reduced at a probability level of ($p \leq 0.001$)for all age groups in the serum people with leukemia and both genders compared to the healthy group. The highest rate of decline was in the fourth age group (60-64) years. This decrease in enzyme activity is due to its large use, especially with age. Enzyme has many important physiological functions and biochemical needed by the body, in addition to the primary role of the neurotransmitter analysis This enzyme is an important role in regulating cell proliferation and death and is an indicator of the diagnosis and exacerbation of cancer in patients. These results are consistent with previous research suggesting that serum vascular leukemia, liver cancer, and lung cancer [14][15] .Many patients with leukemia suffer from damage to liver tissue. It is therefore important to note that the cause of reduced efficacy of acetylcholinesterase is due to this damage, noting that the levels of AChE are correlated with the severity of the disease and the nutritional status of the patient [16] .

Table 2: mean ± S.D of AChE activity for patients Leukemia and control group

Age	**Activity of ASChE (µmol/L/min)** **S.D ± Mean)(**	
>15	**Control (8)**	(0.24± 8.97)
	Patients (20)	(**0.62±5.311)
16-30	**Control (10)**	(0.33±8.81)
	Patients (11)	(**0.45±4.6)
31-45	**Control (7)**	(0.36±8.86)
	Patients (14)	(**0.37±4.57)
46-60	**Control (11)**	(0.81±36.16)
	Patients (31)	(**9.2±28.05)

3.2 The kidney function tests (Creatinin , Urea , Uric acid)

The results in Table 3 showed a significant increase at ($p \leq 0.001$) in serum creatinine ,Urea and uric acid in the serum group of patients compared to healthy patients. These results are consistent with previous research results,

indicating that levels of creatinine urea and uric acid in the serum were high in both leukemia and both genders And for all age groups. As noted, there is a rise in levels of creatinine urea and uric acid with age and that the reason for the rise in the level of creatinine is due to kidney function, which leads to high levels of creatinine because the creatinine is one of the most important indicators Which causes an idea of renal function and any abnormalities in renal function leads to elevated levels in the serum due to the lack of speed of glomerular filtration[17] . And the cause of urea increases and this rise in urea level occurs due to imbalance in the (brain blood) and its loss of function due to high oxidative stress, the urethra can cross the barrier to the serum, causing it to increase its concentration[18]. And the chemical treatment received by the leukemia patient contributes to an imbalance in the whole of the urethra, Kidney function associated with leukemia patients causes its accumulation in the body and therefore increases the levels of serum urea [19]. The reason for the rise of uric acid is due to the increased incidence of oxidative stress in the bodies of patients with leukemia, or due to the fact that it is an internal antioxidant that consists of oxidation of xanthine and hypoxanthine by the enzyme (xanthine oxidase), which contributes to the removal of free radicals from the body and is very effective suppression Superoxide oxide, hydroxyl root, organic peroxylate and peroxy nitrite [20].It was also observed that there was an increase in the levels of uric acid with age and this is identical to previous research due to increasing the severity of the disease with age[21].

Table3: mean ± S.D of kidney function tests(Uric acid, Urea, Creatinin) activity for patients Leukemia and control group

Age		**Uric acid (mg/dl)**	**Urea (mg/dl)**	**Creatinin (mg/dl)**
		(S.D ± Mean)		
>15	**Control (8)**	(0.12 ±3.94)	(1.4±18.4)	(0.08±0.54)
	Patients (20)	(**0.45 ±7.1)	(**2.2±49.2)	(**0.06±1.19)
16-30	**Control (10)**	(0.16±3.91)	(2.5±26.1)	(0.15±0.61)
	Patients (11)	(**0.34±8.23)	(**2.4±56.3)	(**0.08±1.38)
31-45	**Control(7)**	(0.53±4.5)	(6.02±33.94)	(0.18±0.76)
	Patients (14)	(** 0.40±9.1)	(**2.15±59.09)	(**0.16±1.53)
46-60	**Control(11)**	(0.50±5.47)	6.75 ±37.72)	(0.08 ±1.04)
	Patients (31)	(**0.53 ±9.69)	(** 1.60±60.3)	(**0.15±1.63)

3.3 Liver function tests(AST, ALT, ALP)

The results in Table 4 showed a significant increase at ($p \leq 0.001$) in the efficacy of enzymes (ALP, ALT, AST) in serum group of patients compared to healthy patients. These results were consistent with previous research results(AST, ALT, ALP) in the serum leukemia patients, both genders and for all age groups. It was also observed that there was an increase in the levels of the three enzymes with age. The reason for the increase in the effectiveness of the AST enzyme was due to the increased damage of liver, heart and kidney cells resulting from iron deposition. Red blood cell deficiency due to increased leukocytes at the expense of increased

N To Recurrent blood or obstruction of hepatic channels [22,23] .It is also indicated that the increase in the efficacy of this AST enzyme may result in an increase in the number of cancer cells[24]. The cause of ALT elevation is due to hepatic infiltration, because leachate disorders cause an imbalance in the mitochondrial walls of the cell or increase the enzyme's effectiveness to liver damage due to chemotherapy [23]. It may also be due to an increase in the number of cancer cells [25]. The reason for the rise in the level of ALP, especially among children, is the growth of children during this age period before reaching puberty [26]. These results are consistent with earlier research suggesting that ovarian cancer, prostate, lung, breast and pharynx [27] . And acute lymphocytic cancer [28] . And colon cancer [29]. are more effective Hepatitis and liver cirrhosis [30]. The increase in the efficacy of ALP may be due to increased effectiveness of the real pathogenesis pathway [31].

Table 4: mean ± S.D of Liver function tests(GOT, GPT ,ALP) activity for patients Leukemia and control group

Age		**GOT(U/L)**	**GPT(U/L)**	**(U/L) ALP**
		(S.D ± Mean)		
>15	**Control (8)**	(1.48 ± 13.5)	(2.02±15.4)	(0.481±39.9)
	Patients (20)	(**2.1 ±48.05)	(**2.2±47.4)	(**33.2±220.2)
16-30	**Control (10)**	(0.62±15.7)	(1.12±17.21)	(0.35±40.53)
	Patients (11)	(**10.5±68.3)	(**1.1±69.4)	(**33.5±164.9)
31-45	**Control(7)**	(**0.70±15.5)	(1.51±18.7)	(0.28±41.3)
	Patients (14)	(**8.9± 69.8)	(** 11.3±68.4)	(**35.6±169.3)
46-60	**Control(11)**	(0.39 ±15.9)	(3.11±20.3)	(0.46 ±41.2)
	Patients (31)	(**7.6 ±67.1)	(**11 ±63)	(**41.5±183.5)

4. Concleusion

An investigated of Leukemia case was successfully performed, studying it's effect on the acetylcholinesterase activity. The main concluded points from this research were summarized as follow : the decrease of acetylcholinesterase enzyme activity level ; increasing the level of ALT ,AST,ALP ,Urea, Uric acide and Creatinin .

5. Recommendations

The present study recommends the following

1. Isolation of other enzymes related to Leukemia **.**

2. The possibility of using the enzymes AChE as biochemical parameters

to follow the severity of the disease.

3.Study the effect of drugs on the biochemical variables in people with Leukemia .

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