

Estimation of ALP, GPT and GOT Activities in Iraqi Patients Female With Breast Cancer

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Abstract

To investigate the activity and role of certain enzyme markers in 30 patients female with breast cancer (non-treated, treated, and treatment with recovered). The serum activity of enzyme tumor markers (ALP, GPT and GOT) of (30) patients with breast cancer, and (7) healthy control subjects by using statistical analysis: There is significant difference higher in activity of serum enzyme tumor markers (ALP, GPT, and GOT) in all patients as compared with healthy control.

Key word: Breast Cancer, Enzyme tumor markers.

Introduction

Breast Cancer:

Cancer is a disease in which cells become abnormal and form more cells in an uncontrolled way[1]. With breast cancer, the cancer begins in cells that make up the breast (usually in the tubes that carry milk to nipple or the glands that make milk). The cancerous cells form a mass of tissue called a malignant tumor that starts from cells in the breast. Sometimes, the cancer spreads to other parts of the body[1,2]. The disease occurs mostly in women, but men can get breast cancer as well. Breast cancer is the most common cancer among women, other than skin cancer. It is the second leading cause of cancer death in women, after lung cancer[1-4]. About one in eight women will be diagnosed with breast cancer during their lifetime. Breast cancer also strikes men but in much lower numbers (1 in 100)[4]. There are several types of breast cancer, although some of them are quite rare. In some cases a single breast tumor can have a combination of these types or have a mixture of invasive and in situ cancer which are[5]:

- 1- Ductal carcinoma in situ. (DCIS).
- 2- Lobular carcinoma in situ. (LCIS).
- 3- Invasive (or infiltrating) ductal carcinoma. (IDC).
- 4- Invasive (or infiltrating) lobular carcinoma. (ILC).

Alkaline phosphatase (ALP) (Ec: 3.1.3.1):

Alkaline phosphatase (ALP) is a hydrolase enzyme responsible for removing phosphate group from many types of molecules, including nucleotides, proteins, and alkaloids. The process of removing the phosphate group is called dephosphorylation[6].

As the name suggests, alkaline phosphatases are most effective in an alkaline environment. It is sometimes used synonymously as basic phosphatase[7].

In humans, alkaline phosphatase (ALP) is found in many tissues, including bone, liver, intestine, kidney, and placenta [8]. High (ALP) usually means that the bone or liver been damaged[9]. The normal range is 20 to 140 IU/L[10].

Alanine Transaminase (ALT) or (GPT) (Ec: 2.6.1.2):

Alanine transaminase or ALT is a transaminase enzyme. It is also called serum glutamic pyruvic transaminase (SGPT) or alanine aminotransferase (ALAT).

ALT is found in serum and in various bodily tissues, but is most commonly associated with the liver. It catalyzes the two parts of the alanine cycle[11].

Significantly elevated levels of ALT often suggest the existence of other medical problems such as viral hepatitis, congestive heart failure, liver damage, bile duct problems, infectious mononucleosis, or myopathy[11]. Reference range of ALT : 6-37 U/L[10].

Aspartate Transaminase (AST) or (GOT) (Ec: 2.6.1.1):

Aspartate transaminase (AST) also called serum glutamic oxaloacetic transaminase (SGOT) or aspartate aminotransferase (ASAT/AAT/AspAT) is similar to alanine transaminase (ALT) in that it is another enzyme associated with liver parenchymal cells[12].

ALT is found predominately in the liver, with lesser quantities found in the kidneys, heart, and skeletal muscle. As a result the ALT is a more specific indicator of liver inflammation than the AST, as the AST may also be elevated in diseases affecting other organs, such as the heart or muscles in myocardial infarction, also in acute pancreatitis, acute hemolytic anemia, severe burns, acute renal disease, musculoskeletal diseases, and trauma[13]. AST (SGOT) is commonly measured clinically as a part of diagnostic liver function tests, to determine liver health.

Reference ranges of AST:6-34 IU/L[14].

The aim of our study is to evaluate some biochemical parameters like enzymes as tumor biomarker (i.e. ALP, GPT, GOT). In Iraqi patients suffering from breast cancer and compared that with the same parameters in normal healthy Iraqi control.

Material and Methods

Patients:

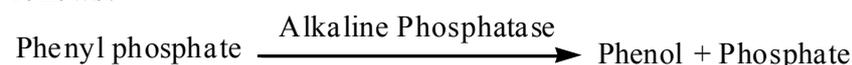
Blood samples were collected from a thirty breast cancer (females) (Non- treated (8) female, treated (12) female, treated and recovered (10) female), their age was range (19-60) years at the Medical City Hospital in Baghdad. Seven apparently healthy individuals (females) were selected with age range (20-43) years.

Ten milliliters (ml) of venous blood were collected into plain tubes from each patient and healthy individuals after 12 hours fast. The blood samples were allowed to stand for 15 minutes (min) then centrifuged at 3500 rpm for 10 min. Serum was frozen at -20°C till used for the estimation of ALP, GPT, GOT.

Determination of Some Enzyme Markers:

Determination of Alkaline Phosphatase (ALP Activity):

Colorimetric determination[15,16] of the ALP activity which reaction scheme is as follows:



Free phenol librated by hydrolysis of the substrate reacts then with 4-amino-antipyrene in the presence of alkaline potassium ferricyanide to form a red-coloured complex which absorbance measured at 510nm is directly proportional to the ALP activity in the specimen.

Sodium arsenate in corporated in the reagent abolishes further enzyme activity and prevents the dilution of the colour inherent in earlier methods.

Calculation

$$ALP \text{ activity} = \frac{Abs. Assay - Abs. specimen blank}{Abs. standard} \times 20$$

(kind and king units/100ml)

Determination of Aminotransferases (ALT) or (GPT) Activity:

Colorimetric determination[17-19] for GPT activity according to the following reactions:



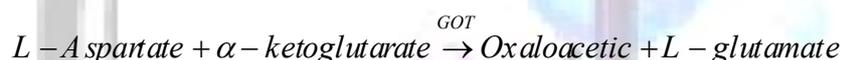
The pyruvate formed is measured in its derivated form, 2,4-dinitrophenylhydrazone at 505nm.

Calculation

number of GPT units/ml in serum were calculated using the standard curve.

Determination of Aminotransferases (AST) or (GOT) Activity:

Colorimetric determination[17-19] of GOT activity according to the following reactions:



The oxaloacetate formed is measured in its derivated form, 2,4-dinitrophenylhydrazone at 505nm.

Calculation

The number for GOT units/ml in serum were calculated using the standard curve.

Results and Discussion

Results

Serum Enzyme Markers Levels:

Serum Alkaline Phosphatase (ALP) Activity:

Data in Table (1) and Fig. (1) show that, the mean \pm SD of ALP activity in serum of control was (16.6565 \pm 5.7695 IU/L). While the mean \pm SD of ALP activity in serum of patient with breast cancer (No treatment) was (38.4583 \pm 27.4304IU/L) and for (treatment and treatment & recancer) were (56.8010 \pm 23.6085IU/L) and (47.6151 \pm 29.0696IU/L) respectively.

The results showed no significant difference ($P \geq 0.05$) in serum of ALP activity of Breast Cancer patient's no treatment, treatment and treatment & recancer as compared with healthy control.

Fig(1) of our results shows that no treatment breast cancer patients female was two times high in ALP activity, while treatment patients high four times and treatment with recancer was three times high activity than healthy control.

Serum Alanine Transaminase (ALT) or (GPT) Activity:

Table (2) and Fig. (2) shows that, the Alanine transaminase (ALT) or (GPT) activity in serum of control is $(19.2500 \pm 2.4749 \text{ units/ml})$. While the (ALT) activity in serum of breast cancer patient no treatment is $(24.7000 \pm 13.9803 \text{ units/ml})$ and treatment and treatment & recancer patient's breast cancer were $(28.9143 \pm 22.0185 \text{ units/ml})$ and $(21.8200 \pm 12.4333 \text{ units/ml})$ respectively.

The results showed that there is no significant difference ($P \geq 0.05$) in serum ALT activity of Breast Cancer patient compared with that of healthy control.

Our results from the Fig(2) show that no treatment was high one time in ALT activity, while treatment female Breast cancer patients was two times higher in activity, and treatment with recancer half time higher than healthy control.

Serum Aspartate Transaminase (AST) or (GOT) Activity

Data in Table (3) and Fig. (3) show that the mean \pm SD of aspartate transaminase (AST) or (GOT) activity in serum of control was $(28.75 \pm 3.8891 \text{ units/ml})$.

While the mean \pm SD of AST activity in serum of patient with breast cancer (No treatment, treatment, and treatment & recancer) were $(38.3667 \pm 17.5342 \text{ units/ml})$, $(30.0750 \pm 5.6076 \text{ units/ml})$, and $(50.6167 \pm 25.6691 \text{ units/ml})$ respectively.

The results showed no significant difference ($P \geq 0.05$) in serum of AST activity of all breast cancer patients as compared with healthy control.

Our study from the Fig(3) shows that the no treatment patients of breast cancer was higher AST activity one time than the control and high in treatment, while in treatment with recancer is higher two times compared with healthy control.

Discussions

Alkaline phosphatase (ALP) Activity:

Our results demonstrate that none of our patients with total-ALP activities lower than the control presented metastases. On the contrary, patients with bone metastases show a significantly increased total-ALP activity. This finding is in agreement with data from other authors[20]. It has been demonstrated that total-ALP is highly sensitive to detect hepatic metastases[20]. Our patients with hepatic or bone metastases show the highest total-ALP activity and there are no significant differences of total-ALP activity between them. According to our results, total-ALP could not differentiate between hepatic and bone metastases and it is necessary to take into account bone-ALP values that, in bone metastases[21].

Alanine transaminase (ALT) or (GPT) Activity:

Alanine transaminase was significantly high in patients with lymph node metastasis at disease presentation as compared to control. This suggests the role of alanine aminotransferase in relation to axillary lymph node metastasis and disease prognosis. The pathogenesis of drug induced liver disease usually involve the participation of the parent drug or its metabolites that either directly effect the cell biochemistry or elicit an immune response. Susceptibility to drug induced hepatotoxicity is also influenced by genetic and environmental risk factors. Unpredictable, low frequency, idiosyncratic reactions often occur on a background of a higher rate of mild asymptomatic liver injury, it is very difficult to detect them but they may be detected by monitoring serum aminotransferase levels[22].

Some trials suggest biochemical evaluation as the better tool for the screening of metastatic disease at the time of diagnosis of breast cancer[23,24]. In these trials ALT is suggested as first-line examination to detect liver or bone metastases.

Aspartate Transaminase (AST) or (GOT) Activity:

Aspartate transaminase (AST) is familiar markers of liver function and to ascertain the non-involvement of systemic toxicity, the activities of marker enzyme like Aspartate transaminase (AST) was assayed. In our study, the AST levels is higher in cancer when compared to normal control[24]. As a marker for liver metastases in breast cancer patients and also as a marker for hepatotoxicity, aspartate transaminase was found to be increased. It was concluded that the elevations in the activities could be due to the decreased synthesis of degradative products which could have resulted in the elevation in the circulation.

Elevations in liver transaminases following tamoxifen administration have been observed. Tissue damage is the sensitive feature in the cancerous conditions so any deterioration or destruction of the membrane can lead to the leakage of these enzymes from the tissues. Hence elevation of these liver specific enzymes observed in breast cancer condition may be due to the progression of tumor growth[25].

Conclusion

Our results suggest that ALP, GPT, and GOT may play an important role in breast cancer. A significant elevation in the activity of ALP, GPT, and GOT in female breast cancer.

Recommendation

Although, some of our data were statistically no significant, our interpretation from these results indicate that the chemotherapy are unusefull in treatment of breast cancer.

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Table(1): Alkaline phosphatase (ALP) Activity (IU/L) in serum of Patients with Breast Cancer (no treatment, treatment, and treatment & recancer) and healthy control.

| t-test | SD | Mean | N | Groups |
|----------|---------|---------|----|----------------------|
| P ≥ 0.05 | 27.4304 | 38.4583 | 8 | No treatment |
| P ≥ 0.05 | 23.6085 | 56.8010 | 12 | Treatment |
| P ≥ 0.05 | 29.0696 | 47.6151 | 10 | Treatment & recancer |
| P < 0.05 | 5.7695 | 16.6565 | 7 | Control |

Table(2): Alanine transaminase (ALT) or (GPT) Activity (units/ml) in serum of Patients with Breast Cancer (no treatment, treatment, and treatment & recancer) and healthy control.

| t-test | SD | Mean | N | Groups |
|----------|---------|---------|----|----------------------|
| P ≥ 0.05 | 13.9803 | 24.7000 | 8 | No treatment |
| P ≥ 0.05 | 22.0185 | 28.9143 | 12 | Treatment |
| P ≥ 0.05 | 12.4333 | 21.8200 | 10 | Treatment & recancer |
| P<0.05 | 2.4749 | 19.2500 | 7 | Control |

Table(3): Aspartate transaminase (AST) or (GOT) Activity (units/ml) in serum of Patients with Breast Cancer (no treatment, treatment, and treatment & recancer) and healthy control.

| t-test | SD | Mean | N | Groups |
|----------|---------|---------|----|----------------------|
| P ≥ 0.05 | 17.5342 | 38.3667 | 8 | No treatment |
| P ≥ 0.05 | 5.6076 | 30.0750 | 12 | Treatment |
| P ≥ 0.05 | 25.6691 | 50.6167 | 10 | Treatment & recancer |
| P<0.05 | 3.8891 | 28.7500 | 7 | Control |

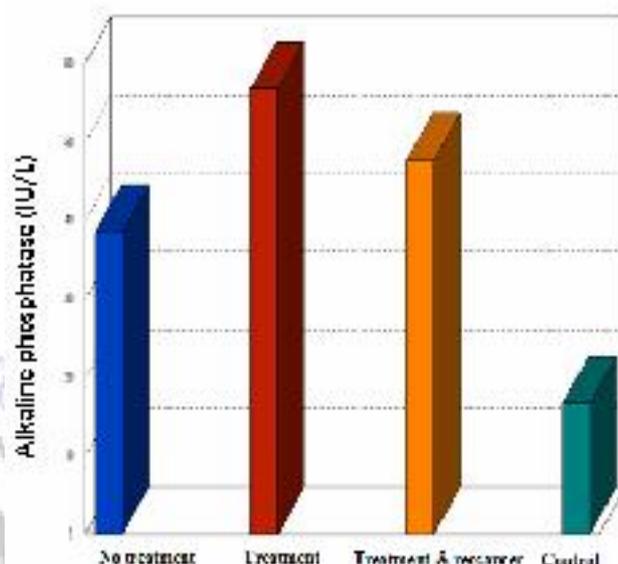


Fig. (1): Alkaline phosphatase (ALP) Activity (IU/L) in serum of Patients with Breast Cancer (no treatment, treatment, and treatment & recancer) and healthy control.

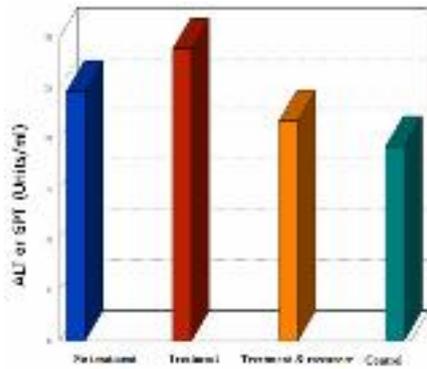


Fig.(2):Alanine transaminase (ALT) or (GPT) Activity (units/ml) in serum of Patients with Breast Cancer (no treatment, treatment, and treatment & recancer) and healthy control.

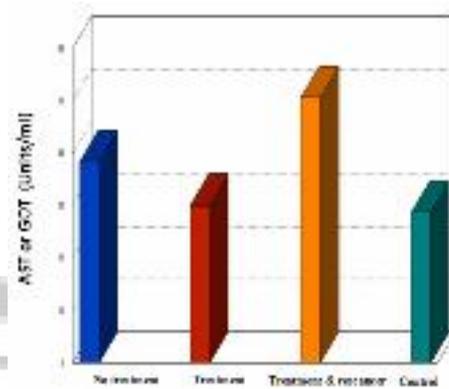
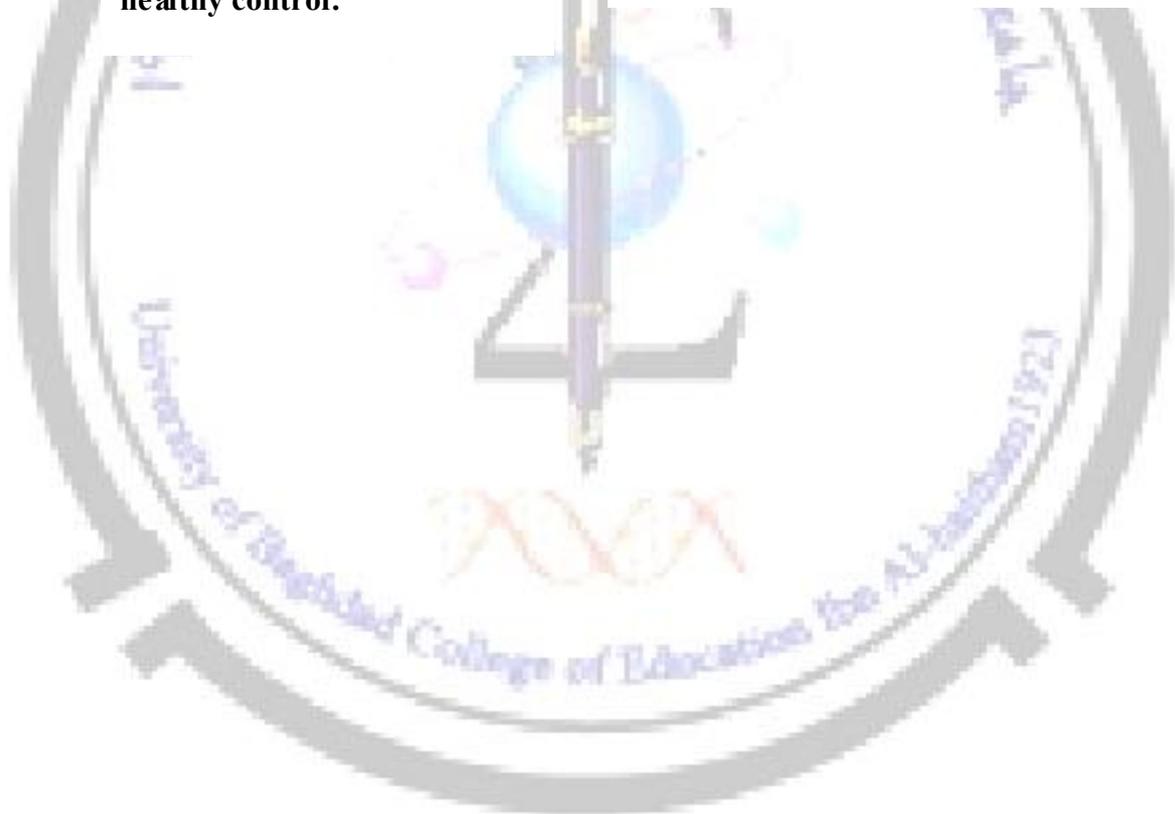


Fig.(3):Aspartate transaminase (AST) or (GOT) Activity (units/ml) in serum of Patients with Breast Cancer (no treatment, treatment, and treatment & recancer) and healthy control.



تقييم الفوسفات القاعدي ALP والامينوترانسفيرز GPT و GOT في المريضات العراقيات المصابات بمرض سرطان الثدي

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الخلاصة

لغرض بيان دور الفعالية وبعض الأنزيمات الواسمة في المرضى المصابين بسرطان الثدي. اخذت عينات تتألف من (30) مصابة بالمرض (بدون علاج ، بعلاج ، بعلاج مع رجوع المرض). وقيست فعالية الأنزيمات الواسمة (الفوسفات القاعدي ALP والامينو ترانسفيرز GPT و GOT) في مصل (30) مريضة و (7) نساء تطوعن بوصفهن مجموعة سيطرة خالية من أي مرض. كانت نتائج البحث للمجاميع المذكورة باستخدام التحليل الإحصائي كما يأتي: حدوث ارتفاع معنوي في فعالية الأنزيمات الواسمة (ALP, GPT, GOT) في جميع المرضى مقارنة بالأصحاء.

الكلمات المفتاحية: سرطان الثدي ، أنزيمات واسمة ورمية .

