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Evaluation of galectin-3 and ferritin with liver enzymes in women with breast cancer

Ali Nassrullah Hussein Aljurany

Department of Chemistry, College of Education, University of Samarra, Samarra - Iraq

Corresponding author email: alialjuranyali@gmail.com

Othman Rashid Al Samarra

Department of Chemistry, College of Education, University of Samarra, Samarra – Iraq

Abstract---Cancer, as we know it, refers to more than a hundred different types of malignant tumors that can be found in various tissues throughout the body, including breast cancer. Breast cancer is a life-threatening condition that can have a negative impact on women's self-esteem. The most frequent cancer is breast cancer non-skin malignant tumor and is a type of cancerous tumor that occurs in breast tissue. The current study involved evaluation the level of Galectin-3 and ferritin with liver enzymes in breast cancer women. The study contained the collection of 90 blood samples for women, and the samples were divided into 50 samples for women with breast cancer, their ages ranged from 40-70 years, the samples were collected from the Breast Cancer Center in Baquba General Hospital, and 40 blood samples for healthy women as a control group, and their same ages, during the period from the beginning of October 2021 until the end of December 2021. The findings revealed a considerable rise in the level of Galectin-3 in breast cancer women compared to healthy women. The results also revealed a considerable increase in the activity of liver enzymes (ALT, AST, ALP) and ferritin level in the breast cancer women compared to the healthy women.

Keywords---breast cancer, calectin-3, liver enzymes, ferritin, malignant tumors.

Introduction

Breast cancer is the most frequent cancer in women, and it is also one of the main causes of cancer death, Despite the fact that the majority of factors linked to breast cancer risk have been identified, research has shown a reduced risk of

breast cancer among more physically active women, and Breast cancer risk is raised. Among females who drink alcohol or smoke cigarettes (1,2). The primary signs of breast cancer are the appearance of a compact mass in the breast, More than 80% of instances are diagnosed when a woman detects lumps or tumors on her skin, these lumps that are located in the lymph nodes and that are located in the armpit level indicate breast cancer (3).

The most common symptoms are (4-8): a palpable painless lump (node), swelling and redness in the armpit, arm swelling due to a tumor in the armpit, sagging nipple, an alteration in the breast's form or breast deformation, sagging nipple, and the breast skin becomes similar to "orange peel" Nipple secretion (which may be serous, nodular, milky, or bloody), usually spontaneous, bloody, spontaneous, and associated with a mass and localized to one duct in one breast. Purple, along with red, scaly patches of skin, fatigue, insomnia, cognitive impairment, reproductive symptoms, menopause, lymphedema and depression, the symptoms of depression and anxiety in breast cancer patients not only affect the overall quality of life by limiting social function and social adjustment, but also affect the development and prognosis of the cancer itself (9). Breast cancer is sometimes a metastatic disease, meaning the disease moves to other parts and sites of the body, and its symptoms vary according to the site to which the tumor has moved. Signs of metastatic breast cancer are Weight loss that isn't explained, joint and bone discomfort, a high temperature, jaundice, and other neurological signs and symptoms (11).

Galectin-3 is a multifunctional glycoprotein of the galectin family that is bound to lectin by a β -galactose bond, It is encoded by a single gene, LGALS3, on chromosome 14 and has a molecular weight of 35 kDa (12-14). Galectin-3 regulates various biological pathways inside and outside the cell including cell growth, differentiation, adhesion, inflammation and apoptosis (15). Galectin-3 is mostly found in the cytoplasm, but it also translocates to the nucleus and is released at the cell surface as well as in biological fluids such as serum and urine, where its many sites contribute to its various roles (16). The current study aimed to evaluate the Galectin-3 and other biochemical parameters in women with breast cancer.

Materials and Methods

Samples and Blood Collection

A total of 90 blood samples were collected from patients with breast cancer and healthy women, and they were distributed into two groups, within the first group included (50) women diagnosed with breast cancer infected, while the second group included (40) uninfected women, whose ages ranged between (70-40) years. Samples were collected from the Cancer Tumor Center at Baquba General Hospital in Diyala Governorate for the period from 10/31/2021 to 11/30/2021. The samples were collected by withdrawing 5 ml of venous blood from both patients and healthy ones, where 5 ml of blood was taken and placed in test tubes and left for ten minutes to coagulate, and then the serum was separated from it using a centrifuge at a speed of 4000 g for 10 minutes. Then the separated serum was kept under freezing until used in serological tests.

Estimation the concentration of Galectin-3

The concentration of Galectin-3 was estimated by using ELISA technology to measure its concentration of it according to the ELISA Sandwich dual antibody technique. the ELISA kit provided by (MyBioSource, China), bearing the catalog No. MBS722196.

Determination the concentration of ferritin

The concentration of ferritin was estimated by using ELISA technology to measure its concentration of it according to the ELISA Sandwich dual antibody technique.

Estimation of liver enzyme activity

Liver enzyme activity (AST, ALT and ALP) were measured based on the colorimetric method and absorbance measurements at specific wavelengths for each test according to the instructions attached with the kit providing by (Sigma-Aldrich, USA), bearing the catalog No. MAK055.

Statistical analysis

The results of the current study data were statistically analyzed using the statistical program (SPSS) version (23) through the mean and standard deviation (SD), and using the T-test to determine the difference between the two groups at the level of probability ≤ 0.05 .

Results and Discussion

The results showed a significant increase in the concentration of Galectin-3 in women with breast cancer compared with the control group, While the data revealed a drop in ferritin levels, and an increase in the activity of liver enzymes, respectively, in women with breast cancer compared to healthy women, as shown in Table (1).

Table 1
The concentration of galectin-3, Ferritin and the activity of liver enzymes in women with breast cancer compared with healthy women

Parameters	Control Mean $\pm$ SD	Patients Mean $\pm$ SD
Galectin-3 (ng/ml)	3.77 $\pm$ 0.90	14.09 $\pm$ 7.66 *
Ferritin (ng/ml)	79.78 $\pm$ 37.43	31.31 $\pm$ 16.14 *
AST (mU/ml)	21.25 $\pm$ 8.88	53.38 $\pm$ 16.07 *
ALT (mU/ml)	52.32 $\pm$ 27.83	136.23 $\pm$ 53.24 *
ALP (mU/ml)	101.23 $\pm$ 21.17	157.05 $\pm$ 18.71 *

* This sign means different significant at $P \leq 0.05$.

The amount of galectin-3 in the blood serum of breast cancer patients was found to be significantly higher than in the control group (healthy women), as in Figure (1).

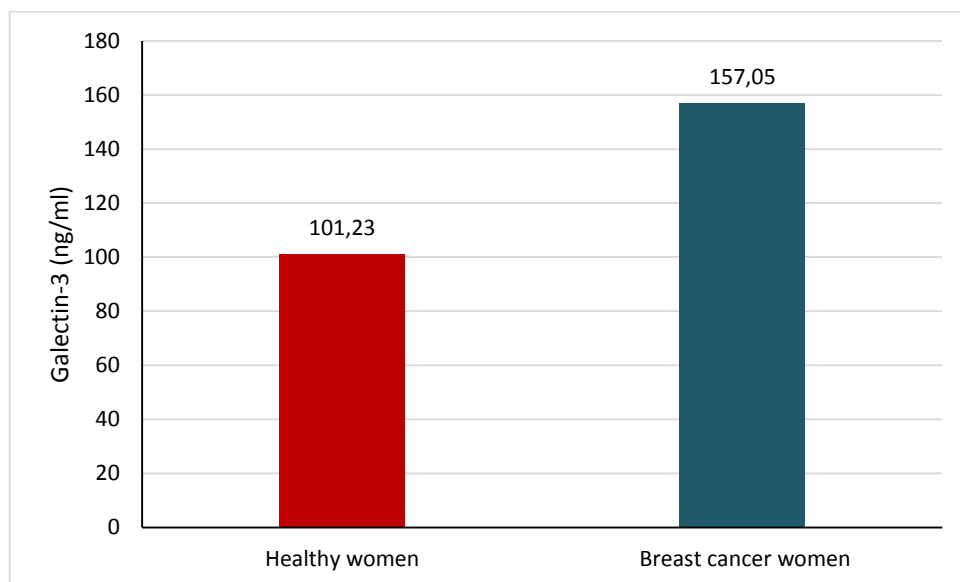


Figure 1. Concentration of Galectin-3 in the blood serum of the two groups of patients and control

The results of the current study agreed with the findings of Hao Zhang et al (17), Arooj Shafiq et al (18) and Ioannis et al (19), Galectin-3 is a protein connected with soluble carbohydrate and has involvement in various cellular processes, according to the researchers, who found a higher amount of Galectin-3 in patients with breast cancer in their study. (20,21). Depending on the cell type and the stimulus, galectin-3 levels might rise or fall during apoptosis. Galectin-3 overexpression in breast cancer cells makes them resistant to chemotherapy treatments (22,23). Galectin-3 expression varies between tumor areas and is downregulated in many malignancies. Galectin-3 protein expression is induced in breast cancer by stress circumstances such as hypoxia and food restriction, and Galectin-3 accumulation in the cytoplasm promotes cell survival (24).

The nucleus, cytoplasm, cell surface, and extracellular environment are all where galectin-3 is made. Galectin-3 is significant in breast cancer tumors because it improves connections between cell-cell components and the extracellular matrix, which increases tumor survival and metastasis. The method by which Gal-3 inhibits tumor cell migration and metastasis, on the other hand, is complex and unknown (25). The ferritin concentration was measured when comparing breast cancer patients to healthy ladies, as shown in Table (1). the mean $\pm$ standard deviation of ferritin level was (31.31 ± 16.14) ng/ml in women who have breast cancer, while it was (79.78 ± 37.43) ng/ml in the control group. The results showed a significant decrease in the level of ferritin in patients with breast cancer compared with the control group (healthy women), as in Figure (2).

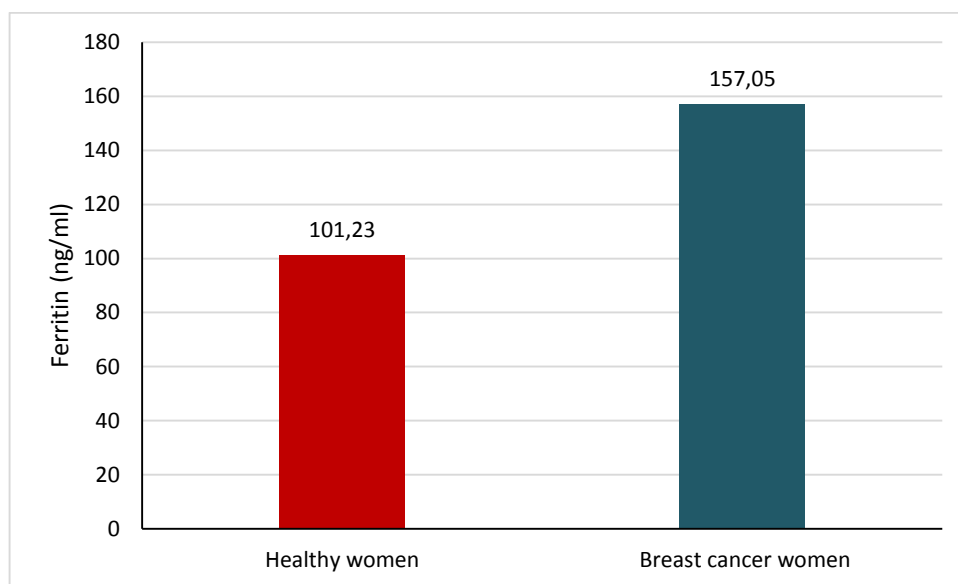


Figure 2. Concentration of serum ferritin of the two groups of patients and control

It is worth noting that this result indicates that the ferritin level can be adopted as an indicator of the progression and severity of breast cancer, and an indicator for classifying diseased cases based on the ferritin value, which helps infer in the decision to treat the diseased case. The results of the current study did not agree with the findings of Eman S (26), Snežana and (27), who showed in their study the high level of ferritin in patients with breast cancer because ferritin helps us in assessing breast severity and monitoring it in breast cancer patients. Ferritin, an iron-storage protein, is increased in the serum of several malignancies, such as breast and pancreatic tumors. Through angiogenesis, immunological modulation, and iron delivery, it also plays a role in tumor formation, cancer cell growth, and survival. Ferritin can also be used as a biomarker to assess the prognosis of patients with pancreatic and breast cancer. (28).

Ferritin is a multifunctional protein that may have a role in cell proliferation, angiogenesis, immunosuppression, and iron transport. Many cancer patients, notably those with breast cancer, have elevated serum ferritin levels, which are linked to aggressive illness and poor clinical outcomes. Ferritin is also extensively expressed in tumor-associated macrophages, and it has just recently been discovered to play a role in tumor growth and treatment resistance. Down-regulating ferritin can disturb the tumor-supporting microenvironment, anti-cancer cells, and boost chemotherapy sensitivity (29). Table (1) shows that the mean $\pm$ standard deviation of the AST activity was (53.38 ± 16.07) mU/ml in breast cancer patients, while it was (21.25 ± 8.88) mU/ml in the control group. The findings revealed a considerable rise in the activity of AST in patients with breast cancer when compared to a control group (healthy women), as in Figure (3).

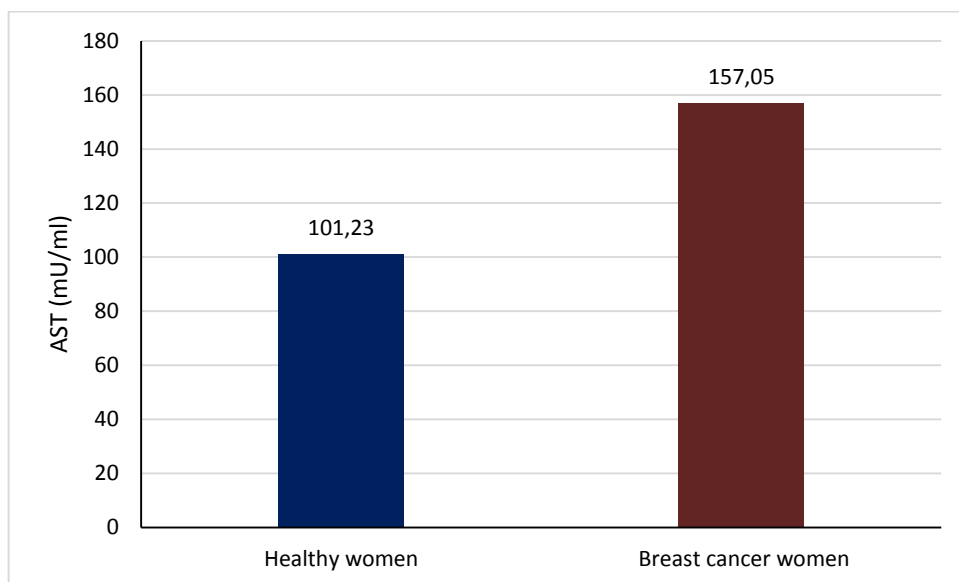


Figure 3. Activity of AST in the two groups of patients and control

The present study's findings match those of Ashtee et al (30) and Mshemish et al (31) who found an increase in AST activity in the blood serum of women with breast cancer compared to the control group in their investigation. While AL-Mashhadani (32) showed no significant differences in the AST activity in the blood serum of women with breast cancer compared with the control group. The cause of elevated AST is due to decreased synthesis of decomposing products that can lead to elevation in blood circulation, because tissue damage is a sensitive trait in malignant instances, any degradation or breakdown of the membrane might result in the leakage of these strange tissues from the cells. As a result, elevated liver-specific enzymes in breast cancer may be linked to tumor progression or growth. (33). Elevated liver enzymes can sometimes reveal serious conditions, and possible causes of elevated AST include viral hepatitis, cirrhosis and hepatitis caused by steatocystosis (34).

The high activity of the AST enzyme is not an indicator of liver disease. When a tumor occurs in the breast, it can cause an increase in the activity of the enzyme (35) AST. During follow-up, patients with breast cancer may experience an increase in the activity of liver enzymes; this consequence, known as nonalcoholic fatty liver disease, may be linked to the same malignancy produced by drugs or another established risk factor for fatty degeneration. Nonalcoholic fatty liver disease may be associated with patients Those with breast cancer a primary tumor that is the same or a known risk factor such as obesity, hyperlipidemia, or diabetes, The AST/ALT efficacy ratio was found to have no effect on the rate of hepatic steatosis, but it should be investigated further. AST may be a more readily normal variant in patients those with breast cancer (36). Table (1) shows that the mean $\pm$ standard deviation of the ALT activity was (136.23 ± 53.24) mU/ml in patients with breast cancer, while it was (52.32 ± 27.83) mU/ml in the control group. The results showed a significant increase in the activity of ALT in patients with breast cancer compared with the control group (the healthy women), as in Figure (4).

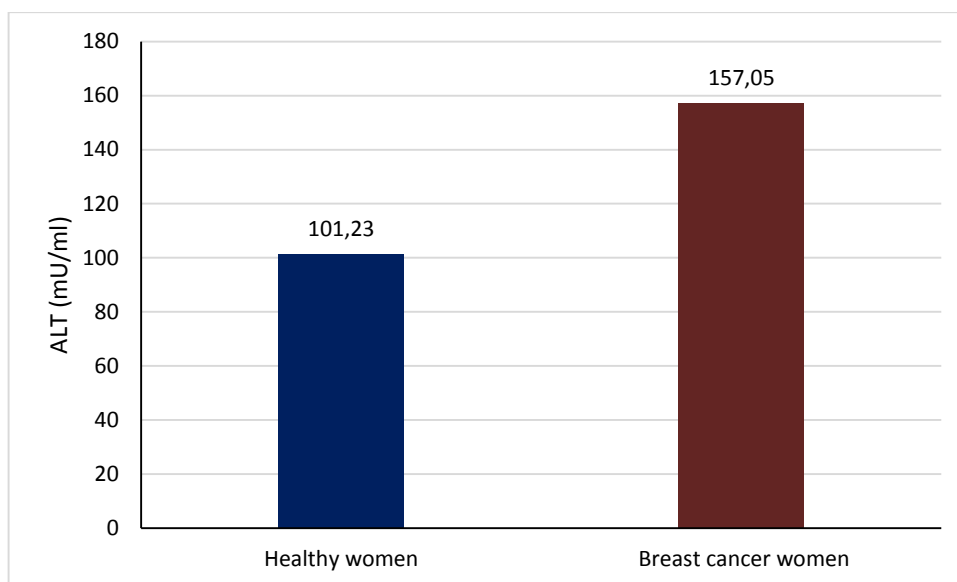


Figure 4. Activity of ALT in the two groups of patients and control

The results of the current study agree with the findings of Ashtee et al (30) and Mshemish et al (31) who showed in their study an increase in the activity of ALT in the blood serum of women with breast cancer compared with the control group. Many breast cancer cell lines have a high expression of potent ALT, both in mRNA and protein. Chemotherapy, on the other hand, was not found to be a significant risk factor for in our current study's multivariate analysis elevated serum ALT efficacy in affected women, but the current adjuvant chemotherapeutic agents doxorubicin, cyclophosphamide, and paclitaxel were found to be less hepatotoxic than a prior study's chemotherapy regimen, which included methotrexate (37). Serum ALT activity increases when liver tissue damage occurs (38).

Kim (39) has indicated that a higher ALT efficacy may be an important indicator of an individual's overall health. Many diseases, including viral hepatitis, acute hepatitis and toxic hepatitis, increase the activity of this enzyme in the blood serum (40), and the activity of the ALT enzyme is mainly present in the liver, where it is a specialized indicator of liver damage (41). ALP concentration was measured in patients with breast cancer compared to healthy women without breast cancer as a control group, as shown in Table (1). The table shows that the mean $\pm$ standard deviation of the ALP activity was (157.05 ± 18.71) mU/ml in patients with breast cancer, while it was (101.23 ± 21.17) mU/ml in the control group. The results revealed the importance of increase in the activity of ALP patients with breast cancer compared with the control group (the healthy women), as in Figure (5).

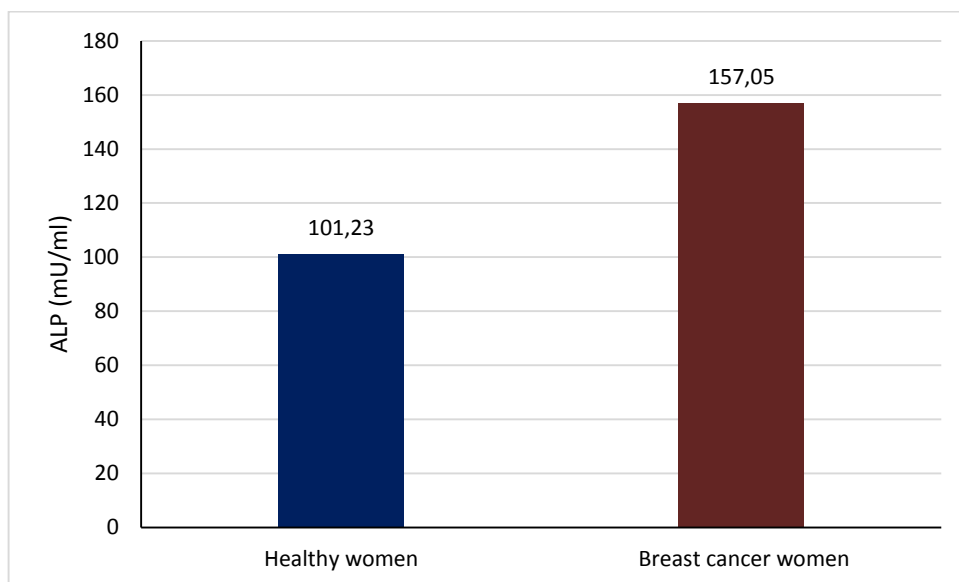


Figure 5. Activity of ALP in the two groups of patients and control

The results of the current study agree with the findings of Salih (42) and Ashtee et al (30) and Mshemish et al (31) who showed in their study the high activity of ALP compared to the control group in the blood serum of women with breast cancer. ALP levels in breast cancer patients are often greater than in healthy women. A steady increase in ALP in the serum of breast cancer patients is a sign of metastases (43). Galasko (44) blood ALP levels were found to be high in 66% of patients with bone metastases, according to the study. And Wright Evans (45) 70% of patients with abnormal bone scans and 63% of patients with abnormal liver scans had normal ALP levels, according to the study. White and his associates (46) In addition, 36% of individuals with abnormal bone scans had normal serum ALP levels, according to the study. They also discovered that all of the patients who had twice as high or higher ALP had an abnormal bone or liver scan. ALP activity has been linked to bile duct obstruction, bone disease, hepatitis, and malnutrition, and when ALP levels rise, jaundice usually follows (47). Previous research has found that assessing ALP activity is a difficult task. is associated with poor prognosis in esophageal cancer, colon cancer, rectal cancer and nasopharyngeal cancer (48).

Conclusions

Through what was obtained from this study, We have discovered that there has been a significant rise in the level of Galectin-3 in the blood serum of women with breast cancer compared to the control group. Also, there appears to be a decrease in the level of ferritin and this is associated with the severity of breast cancer. The study also showed a rise in the activity of liver enzymes, as measured by (AST, ALT, and ALP) in the blood serum of women with breast cancer compared to the control group.

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