

Study of Liver Function Tests in Breast Carcinoma Patients before and After Chemotherapy

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Abstract

Breast cancer is the most common cancer worldwide. The incidence and mortality rate is increasing in developing countries as compare to developed countries. The aim of this study was to evaluate the effect of different courses of chemotherapy treatment on liver and renal function tests of breast cancer patients. In the present study, two hundred breast cancer patients were selected to study variations in serum biochemical level of breast cancer patients. The mean values of aspartate aminotransferase (SGOT), alanine aminotransferase (SGPT) and alkaline phosphatase was found to be 27.3 ± 4.02 U/L, 27.9 ± 10.24 U/L and 111 ± 24.04 U/L before the start of chemotherapy courses. The mean values of total and direct bilirubin, total serum protein, albumin was 0.30 ± 1.3 mg/dl, 0.13 ± 0.11 mg/dl, 8.11 ± 0.5 g/dl, 3.5 ± 0.07 g/dl before the start of chemotherapy treatment. The level of alkaline phosphatase, bilirubin was found to be more than normal reference range; while the level of aspartate aminotransferase (AST or SGOT), alanine aminotransferase (ALT or SGPT), total serum protein, albumin was reported to be within normal reference range

during the different courses of chemotherapy. In conclusion, present results suggest liver function tests as an important diagnostic tool in the disease monitoring and metastasis.

Keywords: Breast cancer, Liver function tests, chemotherapy, prognostic significance

INTRODUCTION

Breast carcinoma is the most common malignancy and leading cause of death in women worldwide ¹. It affects women more than any other cancer both in developed and developing countries. Approximately in 2008 breast carcinoma represented 23% of all new cases². In 2013, Brazil was estimated with incidence of 52 cases per 100,000 women³.

Complete blood count is a prerequisite investigation for breast cancer patients before the use of any treatment ⁴. The cancer treatments like chemotherapy and radiation therapy generally destroy the cancerous cells in the body. However, some of the normal cells are also sensitive to these treatments and get damage in the process. Some cancer treatments interfere with blood cells production of the body. Complete blood counts are routinely performed during chemotherapy and other breast cancer treatments to check the number of each type of blood cell circulating in the body. The complete blood count also helps to check for different side effects of chemotherapy.

Blood chemistry panel (BCP) is a common tests used to evaluate a variety of chemical components released from body tissues or produced during the breakdown or metabolism of certain substances. The blood chemistry panel (BCP) measures the levels of chemicals, enzymes, and organic waste products found in the blood. It determines the healthiness and proper functioning of various organs during chemotherapy treatment. The abnormal blood chemistry results also suggest the spread of breast cancer to the bone, kidney or liver. Only a few studies have investigated the associations of liver function tests (LFTs) and kidney function tests (KFTs) with mortality in breast cancer ^{5,6}.

In the present study, the liver functioning (LFT) were assessed to check the level of different components. The liver function tests measured the levels of important chemicals including liver transaminase (SGOT, SGPT), alkaline phosphatase, albumin; bilirubin, serum proteins⁷.

MATERIALS AND METHODS

The present study was conducted on the two hundred breast cancer patients being treated at Viswabharathi Cancer Hospital and Medical college, Kurnool. Blood analysis of two hundred female breast cancer patients undergoing chemotherapy was performed. All samples were taken after institutional ethical committee permissions and personal consent of the patients or guardians.

The blood samples were collected from the patients; in heparinized tubes. The collected samples were analysed for biochemical profile of blood. The biochemical parameters SGOT, SGPT, Alkaline Phosphatase, bilirubin (direct & total), albumin, total serum protein were included in this study. The statistical analyses were done by Microsoft Excel Windows 10.

RESULTS

In the present study, two hundred breast cancer patients were studied for prognostic significance of peripheral blood. The mean age of breast cancer patients was 47.49 ± 10.43 . Maximum patients were from rural background (66%) with no education (76%).

Biochemical tests were also performed during chemotherapy treatment (from course 1 to course 5)

The level of enzymes (aspartate aminotransferase, alanine aminotransferase, and alkaline phosphatase) and proteins (total serum protein and albumin) were analyzed for the proper functioning of liver. Liver function test was used to screen liver infection, to monitor disease progression and possible side effects of medication used in chemotherapy. The mean value of Aspartate aminotransferase (AST or SGOT) level before the start of chemotherapy treatment was noted to be 27.3 ± 4.02 U/L. The mean value of SGOT level was observed to be within normal reference range (540 U/L) from the first course of chemotherapy to the third course of chemotherapy. However, SGOT level increases as the courses of chemotherapy further proceeds (Figure 2).

The mean value of alanine aminotransferase (ALT or SGPT) level was reported to be within normal reference range (7-56 U/L) during the five courses of chemotherapy treatment. The mean value was noted to be 27.9 ± 10.24 U/L before the start of treatment. An increasing level of SGPT enzyme was reported during the treatment courses (Figure 2). Increased SGPT level indicate the improper liver functioning.

The mean value of alkaline phosphatase in pre chemotherapy state was 111 ± 24.04 U/L. The level of alkaline phosphatase from chemotherapy course 1 to course 4 was observed to be within in normal range (44-147 IU/L), but slightly increased at the level of fifth cycle of chemotherapy (Figure 2). Increased value provides the evidences of liver and bone damage.

The two forms of bilirubin were measured to determine the conditions such as liver disease, hemolytic anemia, and blockage of the bile ducts during the different courses of chemotherapy. The total bilirubin level was observed to be increased as treatment proceeded from first course to fifth course chemotherapy (Figure 3). The mean value of total bilirubin was 0.30 ± 1.3 mg/dl before the starting of the treatment. Elevated bilirubin level may be a result of hemolytic or pernicious anemia, transfusion reaction, viral hepatitis or drug reaction. The mean value of direct bilirubin was 0.13 ± 0.11 mg/dl before the starting of the treatment. Direct bilirubin level was found to be increased after the fourth cycle of chemotherapy (Figure 3).

In serum protein profile, the level of albumin and total proteins was measured to determine the proper liver functioning. In the present study, a decreased level of albumin was observed in breast cancer patients undergoing chemotherapy treatment (Figure 4). This decline may be due to increased generation of reactive oxygen species and free radicals.

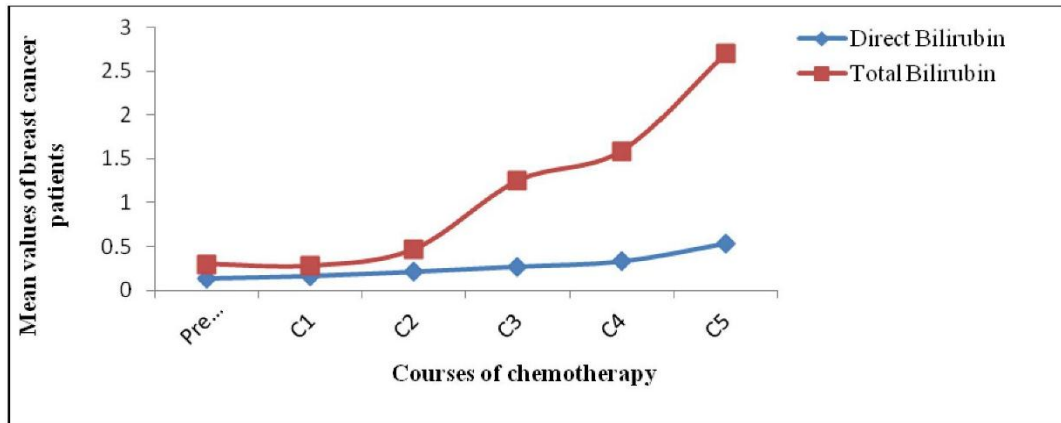


Figure 1: Variations of SGOT, SGPT and alkaline phosphatase of breast cancer patients during five courses of chemotherapy

The mean value of albumin was noted to be 3.5 ± 0.07 g/dl. During the treatment courses of chemotherapy; albumin level was within normal range (3.5-5.5 g/dl). The total serum protein was found with non-significant decreased level during the different courses of chemotherapy (Figure 4). The mean value of total serum protein was observed to be 8.11 ± 0.5 g/dl before chemotherapy. The level was found within normal range (6-8.3 g/d

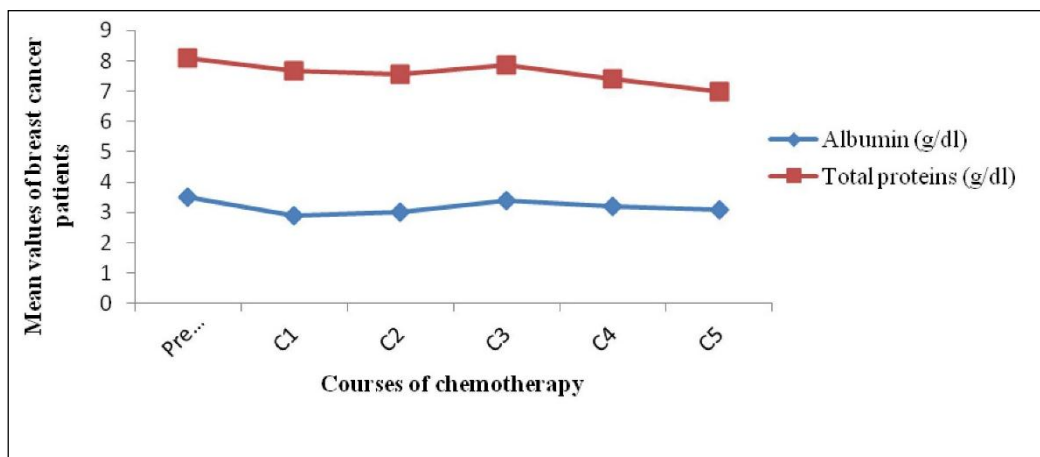


Figure 2: Variations of blood total and direct bilirubin count of breast cancer patients during five courses of chemotherapy

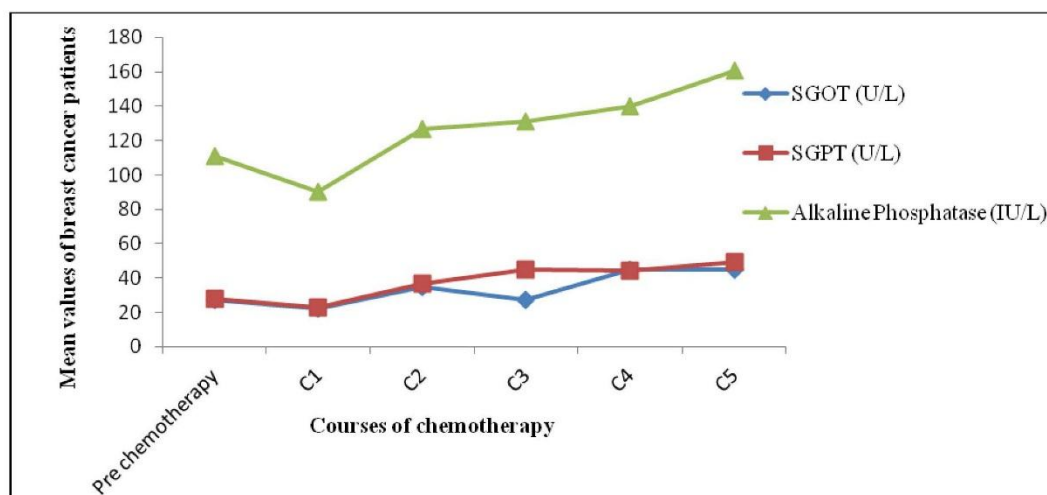


Figure 3: Variations of serum proteins of breast cancer patients during five courses of chemotherapy

DISCUSSION

Biochemistry profiles of blood measures the chemical substances released from body tissues or are produced during the breakdown (metabolism) of certain substances. The analysis of blood chemistry provides important information about the function of the kidneys, liver and other organs. In the present study, the liver functioning (LFT) were assessed to check the level of different components.

Liver dysfunction associated with an overload of hepatotoxins or hepatotoxicants is known as hepatotoxicity⁸. Hepatotoxicity enhances necrosis, steatosis, fibrosis, cholestasis, and vascular injury⁹. Liver functioning test (LFT) is mainly based on enzymatic level of SGOT, SGPT and alkaline phosphatase.

Serum glutamate oxaloacetate transaminase (SGOT) and serum glutamate pyruvate transaminase (SGPT) catalyze the aspartate into oxaloacetate and alanine into pyruvate, respectively. Some studies have established that malignant breast cancer patients have increased activities of these transaminases than in benign breast cancer patients^{10,11}. The elevation in SGOT and SGPT suggests impairment in liver and kidney function which could be caused by tumor invasion¹¹. In the present study, the level of alkaline phosphatase was higher than the normal range while the levels SGOT, SGPT were within the normal range. The mean value of SGOT and SGPT was found to be increased significantly similar to other studies^{11,12}.

The progressive increase in the serum alkaline phosphatase (ALP) activity in breast cancer patients is an indication of metastasis^{13,14}. In the present study, the increased ALP level was noticed during different chemotherapy courses. This indicates the metastasis of breast cancer either to bone or liver. Some studies didn't find any significant difference in ALP levels in non-metastatic breast cancer^{15,16}.

The relationship of serum bilirubin level with survival has been evaluated in metastatic breast cancer patients and the results showed that hyperbilirubinemia was associated with worse survival^{5,17}. However, some study revealed that non-metastatic breast cancer patients with higher total bilirubin levels had better overall survival compared with those with lower bilirubin levels¹⁸. This may be due to the differences in patient population. Serum bilirubin level may have different predictive effect in metastatic and non-metastatic breast cancer patients¹⁸

In the present study, increased level of bilirubin was observed during chemotherapy treatment process, consistent with other studies¹². Serum bilirubin level in breast carcinoma women were found to be within normal range. The level of bilirubin in normal range may be due to bilirubin scavenge during oxidative load or oxidative stress in breast cancer. Some studies have found non-significant correlation between bilirubin level and different chemotherapy courses⁸.

Total human serum protein profile is made up of albumin and globulins¹⁹. In this study, the total protein level was found to be non-significantly reduced during the treatment process, consistent with other studies^{11,20}.

Many studies have found marked variation in level of different proteins. That's why the level of different proteins should be considered instead of the amount of total proteins¹⁹. This fact is supported by decrease in one type through catabolism (albumin) and increase in the other (globulins) through synthesis, in response to breast cancer to compensate the first which consequently contributes to the serum levels of total proteins²¹. This could be the possible mechanism that supports a non-significant change in serum levels of total proteins in this study.

Serum albumin is the most abundant protein, comprising more than half of the blood serum proteins²². Reduced serum albumin (SA) level is used as an independent prognostic indicator in breast cancer^{21,23,24}. In this study a marked reduction of serum albumin level was observed during the chemotherapy treatment within normal reference range. This decline of serum albumin is associated with poor survival and increased mortality of the patients regardless of the stage of breast cancer^{20,25,26}.

CONCLUSION

The present study focused on evaluation of serum biochemical profile of breast cancer patients undergoing chemotherapy treatment. Chemotherapy treatment may results in increasing or decreasing level of biochemical components of blood and hence affecting organ system. Increased level of bilirubin alkaline phosphatase, directly affects the functioning of liver. The study of serum biochemical parameters may be a helpful diagnostic tool in the monitoring of disease, metastasis and different treatment strategies of breast cancer.

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