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### Short report

## Evaluation of alkaline phosphatase in pre and post operative breast cancer patients

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#### ABSTRACT

**Background:** Breast cancer is the commonest malignancy of women in India. Changes in serum level of some biochemical parameters before and after surgery could assess the effectiveness of surgical intervention in breast cancer patients. **Objective:** To assay the activity of serum Alkaline phosphatase (ALP) in patients with breast cancer before and after mastectomy. **Methods:** Serum Alkaline Phosphatase was assayed in 50 histopathologically proven breast cancer patients using spectrophotometric methods and compared with the age matched control. **Result:** The level of serum Alkaline phosphatase was significantly ( $p < 0.05$ ) increased in 11 patients before surgery and it was decreased in 3 breast cancer patients after surgery. **Conclusion:** The increase in the levels of ALP may be a diagnostic marker for disease recurrence and metastases.

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### 1. Introduction

Breast cancer is the most common cancer in the female population [1]. Although tremendous progress in the treatment of breast cancer has been achieved during past decades, it is still the principal cause of cancer death among women worldwide [1,2]. The majority of these patients die not because of the tumor in the primary site, but due to (metastasis) secondary sites. Metastasis is the process by which tumor cells travel from the primary site to a distant site via the circulatory system and establish a secondary tumor. The process of metastasis is a complex cascade of organized, sequential and interrelated steps, including angiogenesis, local invasion, intravasation and extravasation [3].

Alkaline phosphatase (ALP) comprises a group of isoenzymes that catalyse the hydrolysis of phosphate esters in an alkaline environment, generating an organic radical and inorganic phosphate [5]. Total serum Alkaline phosphatase activity reflects the combined activity of several isoenzymes found in the liver, bone, kidney, and intestinal lining. The skeletal isoenzyme originates in osteoblasts that release large amounts of the enzyme when bone

repair activity occurs, for example with bone metastases. In cancer patients, ALP is a sensitive indicator of mild biliary obstruction, thus being a very sensitive indicator of liver progression. Many authors have shown that the determination of alkaline phosphatase (ALP) (3.1.3.1) isoenzyme activity is useful for the diagnosis and clinical evaluation of patients with cancer. In a study conducted by the International Breast Cancer Study Group (IBCSG), ALP was examined for their sensitivity in detecting breast cancer recurrence. It was abnormally high in breast cancer patients with bone metastases and/or liver metastases, and was more effective in distinguishing patients with relapse from those without [4]. Therefore, we assessed the activity of serum alkaline phosphatase before and after surgery to predict breast cancer recurrence and metastases.

### 2. Materials and Methods:

Blood samples were collected from 50 Clinically and Histopathologically proven breast cancer patients who were admitted in Aringar Anna Cancer Institute, Kancheepuram for treatment. The patients included in our study were not on hormonal therapy, oral contraceptives and were non-smokers. None of them had secondary disorder. Age matched control was included and it consisted of members of the public with no previous history of breast cancer and other cancer related diseases. Informed consent was obtained from the participants. The human ethical committee of the Office of the Director, Govt.

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Arignar Anna Memorial cancer Hospital, Regional Cancer Center, Karapettai, Kancheepuram ( vide Ref.No.262/E1/08 ) has approved this study. Blood samples were collected, centrifuged for 15 minutes at 3000rpm and the serum was separated and stored at 4°C for analysis. The activity of Alkaline Phosphatase was assayed by using Diethanol amine (DEA) method [11].

### 3. Results and Discussion

**Table: 1 Age and Body weight (Mean  $\pm$  SD) of Control (n=50) & Patients (n=50) with breast cancer.**

Parameters	Control	Patient
Mean age (year)	46 $\pm$ 4.3	44 $\pm$ 2.5
Mean body weight (Kg)	61.8 $\pm$ 5.5	62.5 $\pm$ 5.7

Values are means  $\pm$  standard deviation of fifty breast cancer patients and healthy controls.

**Table: 2 Activity of Alkaline phosphatase in patients with breast cancer, before and after Surgery (mean  $\pm$  SD, n=50)**

Patient population	ALP (IU/L)
Control	123 $\pm$ 4.7
Before Surgery	289.9 $\pm$ 61.3
After surgery	192.5 $\pm$ 11.4

shows the level of ALP in Control and breast cancer patients before and after mastectomy.

ALP levels were significantly elevated in breast cancer patients before and after surgery irrespective of clinical stages as compared to control. ( $P < 0.05$ )

ALP has consistently been shown to predict bone metastases, and to some extent liver metastases, as expected on the basis of its biological activity. While some studies have reported fairly high sensitivity of ALP for bone and overall metastases detection, these studies included the use of specific isoenzymes in addition to total ALP [6]. The result of the present study showed higher serum ALP level in the breast cancer patient before surgery when compared to control and slightly decreased after surgery. The level of serum Alkaline phosphatase was found to be increased before surgery in 11 patients out of 50 patients. After surgery, the ALP level was found to be decreased in 3 patients out of 11 patients. Increase in ALP might be due to recurrence or metastases to bone or liver and the decrease might be due to recovery after treatment.

The study of Coombes et al [7] suggested that various biochemical parameters like plasma total alkaline phosphatase,  $\gamma$ -glutamyl transferase and carcino embryonic antigen are useful for detecting overt metastatic deposits. The increase in ALP noticed in our study also indicates that the disease had metastasized either to bone or liver. Keshaviah et al [8] reported that the median follow-up and percentage of patients with recurrence was less for the patients with no ALP elevation than for those who had ALP elevation. Our result is also in agreement with the report of

Keshaviah et al that the increased ALP activity noticed in 3 patients after surgery might be due to recurrence and the remaining 8 patients showed decreased ALP after surgery indicating recovery. The increase ALP activity seen in the subjects of the study may also be due to osteolytic bone metastases in breast cancer patients.

Mayne et al [9] studied the level of total ALP and High molecular weight (HMW) ALP in breast carcinoma and found that the sensitivity of HMW – ALP is less but the specificity is 85% for total ALP. The authors justified their findings by stating the early phase of the disease and more of false negative results. Wasif Saif M et al [10] in their study, found a significant difference in the level among patients with and without liver metastasis. Those with liver metastasis have a significantly worse prognosis compared to those without metastasis. Hence, the increase in ALP observed in our study may be due to liver or bone metastases and further study on liver and bone ALP is required to corroborate our findings. Measurement ALP activity though less sensitive than imaging procedure, may be useful for screening and early detection of a considerable proportion of metastases among breast cancer patients. Besides, ALP measurement may also be useful to monitor the therapeutic efficacy in breast cancer patients

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