

Study of Biochemical Markers in Breast Cancer Patients in Vidarbha Region

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ABSTRACT

According to the World Cancer Research Fund, reduce alcohol consumption, increasing physical activity, and maintaining a healthy weight will prevent 38 percent of breast cancer cases in the United States. Breast cancer screening is the process of monitoring otherwise healthy people for breast cancer in the hopes of catching it early. This research could help develop blood-based biochemical markers for breast cancer diagnosis and monitoring. To assess biochemical parameters in breast cancer patients. The findings were compared to those of stable controls. A clinical-based case control research was carried out between February 2020 and December 2020. A control group of 50 seemingly safe people was contrasted to a study group of 50 breast cancer patients from the Shalinitai Meghe Hospital in Nagpur. Kidney function tests, Liver function tests, Oxidative Stress Biomarkers, and Serum Antioxidant Levels in patients with breast cancer were studied using blood samples collected from the groups. The results suggest that the increased mean values of serum alkaline phosphatase and serum glutamate oxaloacetate transaminase, as well as lower serum protein levels in breast cancer patients, are caused by the patients' malignant stage. Increased TBARS (MDA) levels indicate increased lipid peroxidation/oxidative stress, which can lead to tissue damage and a breakdown of the antioxidant protection mechanism to prevent excessive free radical formation. The function of the renal profile in breast cancer patients will gain new dimensions as a result of these findings of elevated mean level. The majority of the patients diagnosed with breast cancer in the cases examined were from rural areas. The illness progressed due to a lack of knowledge of the diagnosed disorder in comparison to the surrounding areas. Breast cancer self-screening is a successful major if it is advertised to the interiors and peripheries to reduce the increased number of breast cancer patients.

KEY WORDS: VITAMIN A, TBARS, MDA, SGOT, ROMS, SOD, GPX.

INTRODUCTION

Breast cancer arises in the breast tissue, most usually in the inner lining of milk ducts or the lobules that supply milk to the ducts. Cancers that start in the ducts are

called ductal carcinomas, while cancers that develop in the lobules are called lobular carcinomas. Humans and other mammals are both affected by breast cancer; though women account for the great majority of instances in humans, men can also develop breast cancer.

In 2008, breast cancer was the most often diagnosed cancer in women and the main cause of cancer mortality in women, accounting for 23% (1.38 million) of all new cancer diagnoses and 14% (4,58,400) of all cancer fatalities. About half of breast cancer cases and 60% of deaths are projected to occur in economically developed countries. Western and Northern Europe, Australia, New

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Zealand, and North America, in general, have high incidence rates; South America, the Caribbean, and Northern Africa, in general, have intermediate rates; while Sub-Saharan Africa and Asia, in general, have low rates.² Female breast cancer is rarely found before the age of 25, save in rare familial situations. The incidence grows with age, from 1 in 232 in the fourth decade to 1 in 29 in the seventh.

Maintaining a healthy body weight, increasing physical exercise, and limiting alcohol use are the greatest ways to reduce the risk of breast cancer. ⁴ Early diagnosis of breast cancer with mammography increases treatment options and saves lives. Early detection techniques in these nations include promoting early recognition of signs and symptoms, as well as screening by clinical breast examination. Invasive breast cancer is the most frequent malignancy in women all over the world. ⁶ (The most prevalent type of cancer is non-invasive non-melanoma skin cancer; non-invasive tumors are generally easy to treat, have a lower mortality rate, and are frequently left out of cancer statistics.) Breast cancer is responsible for 22.9 percent of invasive female malignancies and 16 percent of all female malignancies. (13.7 percent of all cancer deaths in women, and 6.0 percent of all cancer deaths in men and women combined).⁷ Lung cancer took the lives of 12.8 percent of women, making it the second largest cause of cancer-related death among women (18.2 percent of all cancer deaths for men and women together). This research could help develop blood-based biochemical markers for breast cancer diagnosis and monitoring.

MATERIAL AND METHODS

A case-control analysis was used in this research. Datta Meghe Medical College and SMHRC Hospital in Nagpur conducted the study. The study took place between February and June 2020. The SMHRC Hospital Nagpur provided a pilot group of 50 breast cancer patients. A control group of 50 volunteers who tended to be in good health was related to the study group. The study participants gave their informed consent after being informed about the procedure. The research focuses on biochemical estimations of a variety of parameters, including kidney function tests; liver function tests, serum antioxidant levels, and oxidative stress indicators.

Place Of Study: The research was carried out in collaboration with SMHRC Hospital, Wardha, at the Department of Biochemistry, Datta Meghe Medical College and SMHRC Hospital, Deemed University, Nagpur.

Selection Of Control Subjects: Control subjects were stable control subjects who did not have any diseased conditions and were used to compare to the test group.

Subject Population: The participants were split into two classes. Specifically, fifty cases of normal healthy subjects served as the control group, while fifty cases of each form of cancer served as the test group.

Sample Collection And Analysis: Blood sample was collected in an oxalate bulb for the study of blood urea and reduced Glutathione, resulting in oxalated blood sample. A sample of erythrocytes was collected in an EDTA bulb to test their susceptibility to peroxide haemolysis. The sample was collected in a clean dry plain bulb to extract serum from the blood for the remaining parameters investigated, including liver function test, serum creatinine, serum uric acid, and antioxidants parameters. The patients had nearly 10 mL of venous blood drawn from them. The control group and test group subjects were obtained from Datta Meghe College and SMHRC Hospital, both in Nagpur.

METHODOLOGY

1. Estimation of Blood Urea by Diacetyl Monoxime (DAM) method.⁹
2. Estimation of Serum Creatinine by Jaffe's Method.¹⁰
3. Estimation of Serum Uric Acid by Caraway's method.¹¹
4. Estimation of Serum Alkaline Phosphatase by King and Armstrong method.¹²
5. Estimation of Serum AST and ALT Reitman and Frankel method.^{13, 14}
6. Estimation of Total Serum Proteins by Biuret Method.¹⁵
7. Estimation of Lipid Peroxidation (MDA) or (TBARS) by Satho, 1978 method.¹⁶
8. Estimation of Vitamin "A" Singh R A et al method.¹⁷
9. Estimation of Reduced Glutathione in blood by Satoh K. (1978) ; Patterson and Lazarow method.^{18, 19}

Statistical Analysis: The information gathered in this analysis was statistically analysed. The standard deviations and mean were determined. The significance and non-significance of each parameter is determined using students t' values to draw probabilities. The research subjects and healthy control subjects were compared statistically. The values in the tables and figures are mean + standard deviation. A probability value of $P < 0.05$ was considered important, while $P < 0.01$ was considered extremely significant.

RESULTS

Various Parameters In Breast Cancer

The findings of renal function tests, such as blood urea, serum creatinine, and serum uric acid, in breast cancer patients are shown in Table No. I. In comparison to the control group, the patients' blood urea level was substantially higher. This may be due to a lack of early detection; as the disease progresses, it leads to metastases. The levels of serum creatinine in breast cancer patients were also substantially higher than in control patients. The serum uric acid level, the third parameter of renal function tests, showed elevated values as compared to blood urea and serum creatinine. In cancer patients, serum uric acid levels were higher than in the control

group. The increased uric acid has been thought to be a side effect that is either harmless or even beneficial because uric acid is an antioxidant. There was a clear connection between disease progression and antioxidant intake.

The levels of serum alkaline phosphatase, serum glutamate oxaloacetate transaminase SGOT, and total proteins in the breast cancer and control groups are shown in Table II. The research and control groups had different levels of serum alkaline phosphatase. The levels are nearing the upper limits, indicating the possibility of metastasis and bone resorption. When compared to the control group, the SGOT levels were substantially higher. In comparison to the control group, serum protein levels were on the lower end of the normal range. The studied parameter values were linked to the malfunctioning of the liver as a result of disease-related metastases.

Table 1. Kidney Function Test in Breast Cancer

Parameters	Breast Cancer	Control
Blood Urea (mg/dl)	28.69±7.25	22.9±5.41
Serum Creatinine (mg/dl)	1.28±0.010	0.87±0.013
Serum Uric Acid (mg/dl)	8.37±0.48	3.87±0.73

Table 2. Liver Function Test in Breast Cancer

Parameters	Breast Cancer	Control
Alkaline Phosphatase (KAU)	9.64±3.23	8.41±0.095
SGOT (IU/L)	15.70±0.991	11.22±1.815
Serum Proteins (gm/dl)	4.65±0.075	8.08±0.174

Table 2. Serum Antioxidants and Oxidative Stress Levels in Breast Cancer

Parameters	Breast Cancer	Control
Vitamin A (µg/dl)	8.741±21.65	41.09±4.52
Reduced Glutathione (mg/dl)	16.87±2.54	35.14±0.58
TBARS (nmol/ml)	28.68±20.4	7.802±9.41

All values are mean with ± standard deviation: The relationship between antioxidants and breast cancer is depicted in Table III. Vitamin A and reduced glutathione were the antioxidants investigated. The mean values of test against control (vitamin A) and test mean value against control (reduced glutathione levels) both showed substantial decreases (reduced glutathione). The antioxidant mechanism plays a role in carcinogenesis inhibition.²³ Glutathione works on a number of levels in the body's protection mechanism. Glutathione's thiol group protects against the harmful effects of reactive O₂ species that have formed during biological imbalances and cancerous conditions. Glutathione deficiency is

most likely the result of oxidative stress caused by carcinogens and free radical scavenging. The oxidative stress parameter TBARS was significantly higher in the experimental group than in the control group. This may be due to the advanced stage of the disease.

DISCUSSION

Breast cancer, also known as malignant breast neoplasm, originates in the breast tissue, most commonly in the inner lining of milk ducts or the lobules that supply milk to the ducts.²⁴ The current research looked at the kidney and liver function profiles, as well as oxidative stress indicators and antioxidant levels in breast cancer patients. A total of 50 patients were included in the report. Patients ranged in age from 35 to 65 years old. Many of the participants were tested for breast cancer and had not received any cancer treatment, such as radiotherapy or chemotherapy. Renal function tests, liver function tests, vitamin A, reduced glutathione, and Thiobarbituric Acid Reactive Substances were all performed on blood samples.

Tables I, II, and III summarise the findings of the statistical study of biochemical parameters in breast cancer. Biochemical markers such as bone specific alkaline phosphatase (B-ALP), creatinine, and complete alkaline phosphatase (T-ALP) were studied in patients with breast cancer by Kao Hsiung et al in 2003²². The findings revealed that in metastatic breast cancer patients, an increase in bone osteolytic activity occurred before an increase in bone osteoblastic activity. In various stages of breast cancer, Khanzode SS et al 2005²¹ looked at antioxidant enzymes and lipid peroxidation. They discovered that the MDA, which reflects membrane shifts, increased dramatically as the clinical stage of breast cancer progressed. Yedekar ME and Nargund MP 1994²⁵ conducted similar research on free radicals in human diseases and the role of antioxidants. The observations of Djuric Z, et al.1993²⁵, 26 As a result, increased oxidative stress plays a key role in breast cancer initiation, progression, and metastasis.

In different stages of breast cancer, Mahajan M et al 2011²⁷ investigated oxidative stress and its relationship with Adenosine Deaminase (ADA) function. Reactive oxygen species (ROS) damage DNA, resulting in mutations and tumour development, such as breast carcinoma. Before chemotherapy, there was a substantial rise in MDA levels and a decrease in antioxidant enzymes SOD and Catalase, according to Dey Sarkar P. et al 2011²⁸. A number of studies on breast carcinoma and biomarkers were reported²⁹⁻³². Laddha et. al. reported on histopathological types of benign proliferative lesions in peritumoural vicinity³³. Mishra et. al. reported about assessment of cytokeratin expression in carcinoma breast³⁴. Khatib et. al. reported on effectiveness of Ghrelin in cancer related cachexia. In breast cancer patients, the renal profile, liver profile, oxidative stress, and antioxidant status were all affected, according to the findings. There was a significant rise in alkaline

phosphatase, SGOT, and serum proteins in some patients, indicating that they had metastasized.

CONCLUSION

The aim of this study was to compare and contrast the results of organ function tests [related to the renal and liver profiles] with the status of serum antioxidant and oxidative stress markers in different cancer types. The study's main focus was on malignancies that generally affect women. Good subjects free of apparent systemic disease were used as age and sex matched control cases. The majority of the patients diagnosed with breast cancer in the cases examined were from rural areas. The illness progressed due to a lack of knowledge of the diagnosed disorder in comparison to the surrounding areas. Breast cancer self-screening is a successful major if it is advertised to the interiors and peripheries to reduce the increased number of breast cancer patients.

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