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ASSOCIATION OF OXIDATIVE STRESS AND BLOOD COUNT IN PATIENTS WITH BREAST CARCINOMA

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ABSTRACT

BACKGROUND: Breast carcinoma is the most frequent carcinoma in women, and the incidence and mortality rate in poor countries is higher than in industrialised countries. Breast carcinoma patients experience elevated oxidative stress as a result of abnormal blood counts caused by excessive proliferation.

AIMS & OBJECTIVES: In order to track the progression of breast carcinoma patients' condition during therapy, blood counts are estimated.

METHODS: This is a case-control research that looked at the relationship between serum MDA levels and blood counts in breast carcinoma patients and healthy controls. This research comprised 300 people, including 100 breast carcinoma patients before chemotherapy, 100 breast carcinoma patients after chemotherapy, and 100 healthy controls, all of whom had blood drawn. The serum MDA levels were determined using commercially available kits based on the TBARS Method, and the total blood count was determined using a CBC Analyzer.

RESULTS: The current research compares the serum levels of MDA in breast carcinoma patients to those in healthy controls. MDA levels were significantly higher in two groups of breast carcinoma patients as compared to healthy controls (5.44 1.30, P 0.001). The blood counts of patients with breast carcinoma and healthy controls are also compared in this research. When patients with two types of breast carcinoma were compared to controls, there was a statistically significant difference in serum oxidative stress and total blood count levels.

CONCLUSIONS: This research suggests that serum oxidative stress levels, specifically MDA levels, affect total blood count in breast carcinoma patients as compared to other groups of people, resulting in anaemia. Monitoring serum oxidative stress levels and total blood count on a regular basis may be beneficial for continued progression, especially in those receiving chemotherapy.

KEY WORDS: Breast carcinoma, MDA, Hemoglobin, TBARS.

INTRODUCTION

Breast carcinoma (BC) is the second largest cause of death among women. Breast carcinoma patients experience a variety of metabolic problems. Young people with a good family history are more likely to develop this type of carcinoma[1,2]. Breast carcinoma is caused by ionising radiation, oxidative stress, genetic abnormalities, and changes in inflammatory state. Oxidative stress is defined as an imbalance of reactive oxygen and nitrogen molecules, as well as a reduction in antioxidant activity. When gamma rays are used to treat breast carcinoma, they impact some of the biological effects on red blood cell membranes[3]. Irradiation produces reactive oxygen species, which can cause membrane alterations such as lipid peroxidation. The cytoskeleton of red blood cells is damaged by free radicals, resulting in haemolysis and haemoglobin leakage[4]. Malondialdehyde (MDA) was utilised as a marker for evaluating lipid peroxidation levels. In most situations, monitoring the total blood count is a pre-therapy investigation for breast carcinoma patients since therapies like chemotherapy and radiation therapy often destroy tumour cells, but normal cells are also particularly sensitive to these therapys and are damaged in the process[5,6]. Red blood cells, white blood cells, haemoglobin, and platelets are all measured in the total blood count (TBC). Because carcinoma therapys influence the bone marrow's ability to generate blood cells, blood counts are checked periodically before each cycle of therapy in breast carcinoma patients[7,8]. The progression of illness is influenced by changes in haematological markers. In breast carcinoma patients, total blood counts are linked to heart failure.

AIMS & OBJECTIVES: The current research examines the relationship between oxidative stress levels and total count in breast carcinoma patients before and after therapy.

MATERIALS AND METHODS

Over the course of three years, a case-control research was undertaken in a tertiary healthcare centre in central India. In the current research, there were 300 participants: 200 breast carcinoma patients (100 before chemotherapy and 100 after chemotherapy) and 100 healthy controls. After receiving informed consent and ethical clearance from the institute, all of the subjects were enrolled in the research. The current research included patients with breast carcinoma who were over 30 years old. All of the patients were given the same chemotherapy regimen, which included Taxotere (docetaxel), Adriamycin (doxorubicin), and cyclophosphamide. After a 12-hour overnight fast, 6 mL of venous blood was taken and transferred from all patients, 3 mL into an anticoagulant (EDTA) tube and 3 mL into a plain tube. The total count was processed right away, and plain serum was isolated and stored by centrifugation at 4000 rpm for 3 minutes before biochemical analysis. Sysmex KN-21N (made by Sysmex Corporation Kobe, Japan) was used to analyse the total count, including Hemoblobin, RBCs, WBCs, and Platelets, and the serum MDA levels were determined using the TBARS Method.

Statistical Analysis: The Kolmogorov Smirnov test is used to determine whether data has a normal distribution. All of the personalities have been described in detail. The arithmetic mean's mean and standard deviation were employed. Student's T-Tests were used to examine variations in serum MDA and Total Count (2 Tailed). The analysis of variance (ANOVO) was used, followed by a posthoc analysis of the differences between the groups. Pearson Correlation analysis was used to determine the relationship between serum MDA and Total Count. The data was compiled in Microsoft Excel spreadsheets and analysed with SPSS 16.0 for Windows. Statistical significance was defined as a p value of less than 0.05.

RESULTS

The demographic and clinical features of healthy controls, as well as two groups of breast carcinoma patients before and after chemotherapy, are shown in Table 1. The average age of the research participants (mean SEM) was 52.04 ± 8.24, 53.34 ± 11.36, and 50 ± 9.44 years for Groups 1, 2, and 3. Using an independent sample (2 tailed) T-Test, the mean levels of haemoglobin, RBCS, WBCs, Platelets, and MDA were statistically significant differences between two groups of breast carcinoma patients before and after chemotherapy when compared to healthy controls (P- 0.0001).

Table 1: The Independent Samples Test was used to examine the demographic features and biochemical parameters of controls and two groups of breast carcinoma patients.

Parameter	Controls	Breast Carcinoma Patients	P – Value
AGE	52.04 ± 8.24	53.34 ± 11.36	0.086
HEMOGLOBIN	13.42 ± 1.48	10.48 ± 2.80	0.055
RBCS	4.31 ± 1.64	4.19 ± 0.25	0.0001
WBCs	5786.33 ± 1705.58	7035.42 ± 2104.4	0.0001
PLATELETS	215.68 ± 40.14	263.45 ± 37.68	0.0001
MDA	3.12 ± 0.31	6.19 ± 0.26	0.0001

The demographic and clinical characteristics of the various research groups are shown in Table 2. When compared to healthy controls, haemoglobin and RBC levels were significantly lower in two groups of breast carcinoma patients before and after chemotherapy (P- 0.0001 and 0.037). When compared to healthy controls, two groups of breast carcinoma patients had significantly higher levels of WBCs and Platelet Count before and after chemotherapy (P- 0.0001). By using analysis of variance (ANOVO) followed by post hoc analysis, the oxidative stress (MDA) levels are significantly higher in breast carcinoma with before chemotherapy when compared to the other two groups of research subjects, and significantly lower in breast carcinoma with after chemotherapy when compared to the other two groups of research subjects (P- 0.0001).

Table 2: Controls and three groups of type 2 diabetes mellitus patients with albuminuria were investigated for demographic and biochemical data.

Parameter	Group 1	Group 2	Group 3	p- Value
AGE	52.04 ± 8.24	53.34 ± 11.36	50 ± 9.44	0.177
HEMOGLOBIN	13.42 ± 1.48	10.48 ± 2.80	7.8 ± 0.33	0.0001
RBCS	4.31 ± 1.64	4.32 ± 0.30	4.74 ± 0.25	0.037
WBCs	5786.33 ± 1705.58	7035.42 ± 2104.4	11367.10 ± 3411.26	0.0001
PLATELETS	215.68 ± 40.14	243.45 ± 37.68	282.28 ± 42.54	0.0001
MDA	3.12 ± 0.31	7.74 ± 0.92	4.74 ± 0.26	0.0001

Table 3 depicts the positive connection between serum MDA and WBCs, Platelets, and haemoglobin and RBCs in patients with breast carcinoma before and after chemotherapy.

Table 3: Pearson Correlation in between serum MDA/Total Blood Count

Parameter	r value	P value
AGE	0.048	0.0001
HEMOGLOBIN	0.750	0.0001
RBCS	0.168	0.0001
WBCs	0.538	0.0001
PLATELETS	0.442	0.0001

DISCUSSION

Excessive cell proliferation of carcinoma tissues elevated oxidative stress levels in breast carcinoma patients, which can have a direct impact on their blood parameters[9,10]. The amount and types of cells in the blood, namely RBCs, WBCs, and platelets, are determined by the total blood count. Total blood count investigation is routinely monitored as part of the follow-up of breast carcinoma patients. It indicates the response of cellular immunity, and any change in haematological parameters influences disease development[11]. The current research compares the total blood count in breast carcinoma patients before and after chemotherapy, finding significantly lower levels of haemoglobin and red blood cells in patients with two groups of breast carcinoma when compared to healthy controls, and significantly higher levels of white blood cells and platelets count in patients with two groups of breast carcinoma when compared to healthy controls. Anticarcinoma medications have affected total blood count levels in breast carcinoma patients, according to prior studies. Anticarcinoma drugs are employed for a restricted therapeutic window, high toxicity profile, relevance of drug interaction, and lastly to prevent recurrence of unpleasant disease conditions. Anticarcinoma medications affect every tissue in the body because they are unable to target the tumor's location. They also have an effect on essential organs such as the brain, heart, kidney, and liver, and those who undergo rapid cell division suffer from anaemia and haematopoiesis. When compared to healthy controls, oxidative stress levels in breast carcinoma patients increase due to abnormal cell proliferation and lipid peroxidation of cell membranes, particularly red blood cells, resulting in increased MDA levels and a concurrent drop in total blood count[12-15]. When compared to healthy controls, increased oxidative stress levels lead to changes in haematological parameters such as haemoglobin, red blood cells decreased, and WBCs, Platelets levels are increased in patients with two groups of before and after chemotherapy breast carcinoma.

CONCLUSION

Increased oxidative stress (MDA) levels and continuous therapeutic agent exposure cause changes in total blood count, especially haemoglobin, red blood cell levels are lowered, and WBCs, Platelet levels are enhanced, resulting in various haematological abnormalities in breast carcinoma patients. This research suggests that measuring total blood count levels in breast carcinoma patients on a regular basis can help with ongoing monitoring, disease progression, and therapy effects. It is only for the sake of research, and the investigator will bear the entire expense of the research.

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