Hematological parameters in pre chemotherapy breast cancer patients in a tertiary care centre

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Abstract

Introduction: This study aimed to highlight the degree of derangements of various blood parameters preoperatively in carcinoma breast patients as compared with controls who presented with benign breast disease.

Materials and Methods: This was a descriptive study done among clinically diagnosed breast cancer patients attending the central laboratory, at Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore.

Results: A total number of 51 cases of prechemotherapy carcinoma breast patients along with controls were subjected to hematological investigations. Anemia was noted in 60% of the cases. The overall mean MCV, MCH, MCHC (79.01± 5.75fl, 26.54± 2.0 pg, 32.70 ± 1.6 g/l respectively) were lower than the controls. Mean TLC (7.73±1.84), RDW (15.18±2.05) and MPV (7.9±0.83), platelet count (3.1±0.8) were seen to be higher than the controls.

Conclusion: Breast cancer patients showed deranged hematological parameters as a consequence to the disease.

Keywords: Carcinoma, Prechemotherapy, Prognosis.

Introduction

Breast cancer (ca) incidence has increased and in India it is around 70-90 per 1, 00,000 population and its prevalence is estimated to be around 2.5 million with over 8, 00,000 new cases. Around 5,50,000 deaths occur every year. Routine investigations such as complete blood count (CBC) test are a prerequisite investigation requested for all cancer patients before any surgery, chemotherapy or radiotherapy.

Various blood parameters and systemic inflammatory markers have been correlated with their prognosis in various malignancies.[1] Prognostic value of cells like neutrophils, platelets, Mean platelet volume (MPV), platelet-lymphocyte ratio and neutrophil to lymphocyte ratio in patients with advanced and local gastric cancer were found to influence the overall survival of patients.[2] Prognosis and survival was better in patients with higher lymphocyte count. Similar studies were also done to study the lymphocytes in the peripheral blood of patients with breast cancer in the past.[3] Therefore novel predictive markers are required to identify high risk cancer patients who may develop metastasis during postoperative surveillance which may permit oncologists to utilize more efficient patient treatment strategies.[4]

The present study is carried out to investigate the degree of derangements of hematological parameters and provide mean values in prechemotherapy breast cancer patients when compared with control subjects.

Materials and Methods

This was a descriptive study carried among the cytologically diagnosed, consenting, pre chemotherapy patients of carcinoma breasts attending central laboratory of Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore, from the period January 2015 to January 2017. It was one year retrospective and one year prospective study.

All females with benign breast diseases were taken as controls.

Inclusion Criteria: Patients aged >20 years diagnosed on cytology with breast cancer.

Patients with breast lumps who are diagnosed as carcinoma breast on FNAC.

Exclusion Criteria: Breast carcinoma patients who have undergone chemotherapy or radiotherapy.

Collection of Samples: A total of 4.5ml of blood was collected from each patient and control subjects in EDTA bottle for full blood count test and analysis was done on the same day of collection.

Procedure: Full blood count was done by sysmex XN 550 five part analyzer.

Statistical Analysis

The results of 51 cases and 51 controls were analyzed. Data were analyzed using SPSS version 20.0. The descriptive data were given as means ± SD, Min and Max. The t-test is used to compare Mean difference between case and control group and p –value is calculated. Interpretation of p-value: If $p < 0.05$, is considered to be statistically significant.

Results

We noticed significant changes in hematological parameters of breast cancer patients when compared with controls.

The present study reported 100% female prevalence of breast carcinoma. No cases of male ca breast were noted. All age group ranged from 29 years

to 82 years, the mean being 53.6±11.5 which shows the commonest age of presentation in our locality.

Table 1

Parameters	Tests	Controls	p-value
Hb (Mean ± SD)	11.3±1.6	12.8±1.2	0.3111
Minimum	7.4	10.4	
Maximum	14.6	16	
PCV(Mean ± SD)	31.9±3.6	35±3.8	0.3100
Minimum	28	32	
Maximum	34	38	
MCV(Mean ± SD)	79.0±5.7	82.0±4.0	0.0027
Minimum	64	72	
Maximum	84	88	
MCH(Mean ± SD)	26.5±2.0	29.5±2.1	0.0001
Minimum	23	26.8	
Maximum	30	34	
MCHC(Mean ± SD)	32.7±1.6	34.4±1.1	0.0001
Minimum	30	32.6	
Maximum	36.2	36.8	
RDW(Mean ± SD)	15.2±2.1	12.9±0.8	0.0001
Minimum	12	11	
Maximum	21.7	14.2	

Table 2

Parameters	Tests	Controls	p-value
TLC (Mean±SD)	7737.3±1845	7135±1419.8	0.0678
Minimum	4500	4500	
Maximum	14000	9800	
Neutrophil% (Mean±SD)	65.2±8.5	61.5±6.8	0.0170
Minimum	48	45	
Maximum	86	74	
Lymphocyte% (Mean±SD)	31.8±7.1	36.4±6.7	0.0011
Minimum	14	25	
Maximum	46	50	

Table 3

Parameters	Tests	Controls	p-value
Plt (Lakhs) Mean±SD	3.1±0.8	2.6±0.8	0.0021
Minimum	1.5	1.5	
Maximum	4.6	3.2	
MPV (Mean±SD)	7.9±0.8	7.3±0.7	0.0001
Minimum	6.2	6.0	
Maximum	9.2	8.7	

Discussion

At present it is estimated that breast cancer is responsible for >1,300,000 cases and 450,000 deaths annually worldwide.[5] With the recent advances in treatment modalities and early detection, breast cancer mortality was reduced by 34% from 1990 to 2010.[6] Hence there is a need for simple, reliable and non invasive prognostic biomarker to enable clinicians to perform risk evaluation in these patients before or during the treatment process.[7]

Routine blood tests such as CBC is used frequently by clinicians to support the work up of diagnosis of several diseases such as anemias, acute infection, allergic disorders, malignancies and immunological disorders, pre operative evaluations and health screening.[8] Breast carcinoma predominantly affects females as noticed in this study and many other previous studies.[9] It is estimated that 1% of breast cancer develops in males.[10] Olumole et al[11] reported 3.9% prevalence of breast cancer amongst males in Nigeria. The prognosis of breast cancer remains the same as that of females.[12]

A total of 51 cases of carcinoma breast were included in this study who presented to Sapthagiri

institute of medical sciences and research centre, Bangalore, India. Mean age of presentation was 53.6±11.5 in ca breast patients in our locality. None of the patients were younger than 20 years of age. Inekwaba[13] also showed that majority of the cases around 70% of breast cancers in Nigeria were between 26-50 years with a peak age range of 36-45 years.

The present study reported anemia in 60% of the cases when compared with that of the controls using Hemoglobin (Hb) and packed cell volume (PCV). This could be compared with the studies done by Akibami[9] and Kirshner[14] who reported anemia in prechemotherapy breast cancer patients using PCV. They also had divided the patients into different stages clinically and compared the degree of anemia in each stage. This categorization could not be made in our study as ours was both prospective and retrospective study.

The various red blood cell indices such as mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) of cases were lower than the controls while the mean red cell distribution width (RDW) i.e. the coefficient of variation of RBCs anisocytosis was higher in patients of ca breast as compared with the controls. This is in agreement with studies done by Daniel,[15] Amrit Pal,[16] Sa Ufelle[17] etc. Rabia Farooq[18] also reported abnormal hematological parameters in gastric cancer patients. The cause of low hemoglobin (Hb) could be associated to anemia of chronic disorder. Anemia could be due to hemorrhage or due to with iron deficiency anemia. If the mass is ulcerating, then it is evidenced by lower MCV, MCH, MCHC and a higher RDW when compared with the controls. Nutritional anemia can be associated with anorexia in these patients. Metastases to the bone marrow in these patients are generally the cause for suppression of erythropoesis. Infection in fungating malignancy may be associated with RBC hemolysis (anemia) and leucocytosis.

Many previous studies have also shown that the neutrophil lymphocyte ratio (NLR) could provide a prompt representation of the state of inflammation, which might plays an important role in tumor growth, progression, invasion and metastasis. Many inflammatory factors such as pre operative C-reactive protein, human epidermal growth factor receptor 2 (HER2), interleukin 6 are associated with breast carcinoma prognosis.[19]

Mean WBC counts, neutrophil % of cases were slightly higher than that of the controls because of the fact that all neoplasms of all types are associated with neutrophilia. There may be even a lymphovasular invasion leading to demargination of tumour cells which occupy the vascular spaces. The principle mechanism of tumour immunity is killing of tumour cells by CD8+ cytotoxic T-lymphocytes. The natural killer cells destroy the tumour cells without prior sensitization. Many tumours down regulate expression of class 1 major histocompatability complex (MHC) molecules as a way of evading immunity. Hence lymphocyte count may therefore be depressed or increased.[9] Present study showed the mean lymphocyte % was reduced when compared with the normal controls.

Previous literature showed that high platelet counts are associated with later stage, higher risk of recurrence and metastasis in many types of malignancies. Ovarian cancer, renal cell cancer, gastric cancer and colorectal malignancy which were associated with thrombocytosis had poorer prognosis.[20] Mean platelet count of the cases was also higher than that of control. The cause for this may be reactive thrombocytosis which is seen in malignancy patients as a result of cancer induced anemia. A negative feedback effect on erythropoietin production in patients of cancer breast as a result of anemia could be responsible for thrombocytosis. Thrombopoietin and erythropoietin has a similar structure while Thrombopoietin is considerably bigger than the former, has similarity at the N-terminal region.[21] Hence were recognized that thrombocytosis is associated with anemia of chronic diseases and several types of anemias. Bone marrow metastasis may also be associated with defective thrombopoesis leading to malignancy induced thrombocytopenia. So thrombocytopenia and thrombocytosis may therefore be associated with malignancy depending on the scenario.[21] However, Ufelle et al[17] study found that platelet levels were higher in control group than the pre and post chemotherapy breast cancer patients.

Conclusion

To conclude, our study showed increased inflammatory parameters (MPV, RDW, Neutrophil count etc) of complete blood counts in carcinoma breast patients as a consequent to the disease when compared with the controls which may be a useful guide for the oncologists for further treatment. However further studies with larger sample size are required to confirm the findings of the present study.

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