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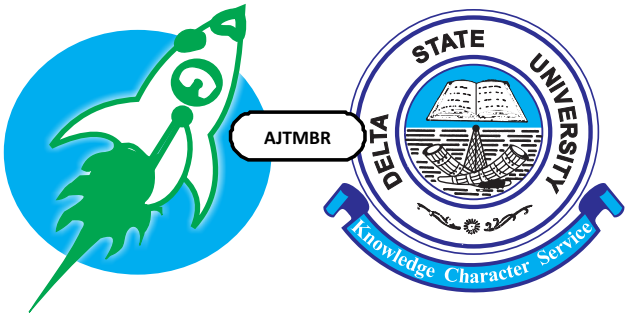

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The African Journal of Tropical Medicine and Biomedical Research is a multidisciplinary and international journal published by the College of Health Sciences, Delta State University of Abraka, Nigeria. It provides a forum for Authors working in Africa to share their research findings on all aspects of Tropical Medicine and Biomedical Sciences and to disseminate innovative, relevant and useful information on tropical medicine and biomedical sciences throughout the continent. The journal will publish original research articles, reviews, editorials, commentaries, short reports, case reports and letters to the editor. Articles are welcome in all branches of medicine and dentistry including basic sciences (Anatomy, Biochemistry, Physiology, Pharmacology, Psychology, Nursing etc) and clinical sciences (Internal Medicine, Surgery, Obstetrics and Gynaecology, Dental surgery, Child Health, Laboratory Sciences, Radiology, Community Medicine, etc). Articles are also welcome from social science researchers that document the intermediating and background social factors influencing health in countries of Africa. Priority will be given to publication of articles that describe the application of the principles of primary health care in the prevention and treatment of diseases.

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Original Articles

Platelet Count Variability in Breast Cancer Patients Undergoing Chemotherapy: Implication for Haematopoietic System Health

[1]*Echonwere-Uwikor BE,* [1]*Chukwu PH,* [1]*Ken-Ezihuo SU*

Abstract

Introduction: Platelet count variability and indices are critical markers in assessing haematopoietic system health during chemotherapy in breast cancer patients. Chemotherapy-induced thrombocytopenia (CIT) poses a risk of bleeding and delays treatment. This study evaluated platelet count changes during chemotherapy and their implications for haematopoietic health.

To analyze platelet count variability in breast cancer patients undergoing chemotherapy and identify factors influencing haematopoietic system health.

Materials and Methods: This prospective study recruited 100 female breast cancer patients aged 21–60 years undergoing chemotherapy at RSUTH. Participant's demographics were recorded. Platelet parameters, including platelet counts (PLT), mean platelet volume (MPV), platelet distribution width (PDW), and plateletcrit (PCT), were measured pre-chemotherapy (control and baseline) and after the 1st, 2nd, and 3rd chemotherapy cycles. Statistical significance was set at $p < 0.05$

Results: Most participants (48%) were aged 31-40 years, and 69% were at stage III cancer. Chemotherapy significantly altered platelet indices. PLT increased from the control (179 ± 75.58 x 10^9/L) to baseline (264 ± 103.4 x 10^9/L) and showed variability across cycles (1st: 272.0 ± 142.6 x 10^9/L, 2nd: 247 ± 142.6 x10^9/L, 3rd:259.1 ± 109.3 x 10^9/L; p = 0.001). MPV declined steadily (control: 9.5 ± 1.0 fL to 8.1 ± 0.6 fL by the 3rd cycle; p=0.032). PDW increased significantly (control: 16.3 ± 2.0% to 19.4 ± 3.5% by the 3rd cycle; p=0.022). PCT showed a consistent decline (control: 0.30 ± 0.05% to 0.20 ± 0.03% by the 3rd cycle; p=0.034).

Conclusion: Chemotherapy significantly affects platelet parameters in breast cancer patients, potentially indicating altered haematopoietic function. Monitoring these indices is vital for optimizing patient care and mitigating risks associated with treatment.

Keywords: *Platelet count, Breast cancer, Chemotherapy, Haematopoiesis*

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INTRODUCTION

Platelets are essential components of the circulatory system, derived from megakaryocytes in the bone marrow, and are critical for haemostasis, thrombosis, and immune regulation. Their levels and functional activity are tightly regulated under normal physiological conditions. In the context of malignancies such as breast cancer, platelet dynamics can be significantly altered, reflecting the interplay between tumor biology, systemic inflammation, and therapeutic interventions (1).

Breast cancer remains a leading cause of cancer-related morbidity and mortality among women globally, and chemotherapy is a cornerstone of its management (2). However, chemotherapy, while effective against tumor cells, often induces

profound haematopoietic suppression, leading to thrombocytopenia or, in some cases, thrombocytosis (3). Chemotherapy-induced thrombocytopenia (CIT) is a common and serious complication in breast cancer treatment, increasing the risk of bleeding and necessitating dose reductions or delays in treatment, potentially compromising therapeutic outcomes (4). Conversely, thrombocytosis has been linked to tumor progression, angiogenesis, and metastasis, driven by tumor-derived cytokines and systemic inflammation (5).

These alterations in platelet count and function underscore the importance of platelets as both biomarkers and mediators of disease progression and treatment response in breast cancer patients. Emerging evidence highlights the prognostic and predictive value of platelet variability in cancer management. Elevated platelet counts have been associated with poor overall survival in breast cancer patients, while chemotherapy-induced thrombocytopenia serves as a marker of hematopoietic stress and bone marrow suppression (6; 7). Despite these findings, data on platelet dynamics in breast cancer patients undergoing chemotherapy remain limited, particularly in sub-Saharan Africa. The unique genetic, environmental, and healthcare factors in this region may influence hematological outcomes, necessitating localized studies to inform clinical practice.

This study aimed to evaluate platelet count variability in breast cancer patients undergoing chemotherapy and its implications for Haematopoietic system health. By analyzing patterns of platelet count changes and their clinical significance, this research seeks to contribute to improved patient management strategies, minimize treatment-related complications, and optimize therapeutic outcomes.

MATERIALS AND METHODS

This was a longitudinal, prospective observational study carried out on 100 female breast cancer patients, undergoing chemotherapy at the Rivers State University Teaching Hospital (RSUTH).

The study was conducted at the Oncology department of RSUTH, Port Harcourt with a focus on breast cancer management, leveraging oncology wards and haematology laboratories for patient recruitment and data collection.

The study recruited female breast cancer patients undergoing chemotherapy at RSUTH

Adult female patients aged 18–60 years, diagnosed with histologically confirmed breast cancer, who were scheduled to receive chemotherapy (either neoadjuvant, adjuvant, or palliative). Patients with baseline platelet counts within the normal range (150,000–450,000/μL) were included.

Female Cancer patients with pre-existing haematological disorders (thrombocytopenia or thrombocytosis), those on concurrent use of anticoagulant therapy or antiplatelet medications, with metastatic bone marrow involvement, and those pregnant or breastfeeding women were excluded.

Comprehensive patient history and clinical examination, blood sample collection for baseline haematological parameters, including platelet count, hemoglobin, and white blood cell count, demographic and clinical data (age, cancer stage, chemotherapy regimen) were all recorded.

3mL of venous blood was aseptically collected at baseline and during chemotherapy cycles using standard venipuncture procedures to ensure accuracy and prevent contamination. Samples

were stored in K2EDTA bottles to maintain stability and prevent clotting. The analysis of platelet parameters, platelet count, mean platelet volume, platelet width distribution, and plateletcrit was performed using a Sysmex XN-330 analyzer, ensuring high precision in results.

Data was analyzed using SPSS software Version 13. Descriptive statistics was used to summarize the patient demographics and One-Way ANOVA test was applied to demonstrate the effect of chemotherapy on platelet indices.

Ethical approval was obtained from the Ethics and Research Committee of the Rivers State University Teaching Hospital. A written informed consent was obtained from all participants and confidentiality was maintained through anonymized data handling.

RESULTS

Table 1.Demography of the Study Population

Variable	Frequency	Percentage (%)
Age		
21-30	2	2
31-40	48	48
41-50	27	27
51-60	13	13
Total	**100**	**100**
Sex		
Male	0	0
Female	100	100
Total	**100**	**100**
Marital Status		
Single	13	13
Married	86	86
Divorced	3	3
Total	**100**	**100**
Cancer Stage		
Stage I	10	10
Stage II	13	13
Stage III	69	69
Stage IV	8	8
Total	**100**	**100**

Table 2 Mean ± Standard Deviation on the effect of chemotherapy on platelet indices of the study population

PARAMETER	CONTROL (N=100)	BASELINE (N=100)	1ST CYCLE (N=100)	2ND CYCLE (N=100)	3RD CYCLE (N=100)	P-VALUE	REMARK
PLT(10^9/L)	.....	264 ± 103.4	272.0±142.6	247±142.6	259.1±109.3	0.001	Significant
	9.5 ± 1.0	9.0 ± 0.9	8.7 ± 0.8	8.4 ± 0.7	8.1 ± 0.6	0.032	Significant
MPV (fL)							
PDW (%)	16.3 ± 2.0	17.0 ± 2.5	18.1 ± 3.0	18.7 ± 3.2	19.4 ± 3.5	0.022	Significant
PCT (%)	0.30 ± 0.05	0.28 ± 0.04	0.25 ± 0.04	0.22 ± 0.03	0.20 ± 0.03	0.034	Significant

DISCUSSION

The majority of participants in this study were aged 31–40 years (48%), aligning with the peak age range for breast cancer incidence globally. This trend corroborates findings by (8), which reported that breast cancer is most prevalent in women aged 30–50 years. The relatively low representation of younger (2%) and older age groups (13%) may reflect both the population demographics and the increased breast cancer screening awareness in middle-aged women. The study's 100% female population aligns with the well-established fact that breast cancer predominantly affects women. While male breast cancer constitutes less than 1% of all cases, its absence in this study emphasizes the rarity of male breast cancer (9). The predominance of married participants (86%) is consistent with studies suggesting that marital status influences health-seeking behavior and outcomes in breast cancer patients. For instance, Study by (10) highlighted that married individuals often have better support systems, which can enhance treatment adherence and prognosis. The data reveal that the majority of participants were diagnosed at Stage III (69%), indicating delayed presentation, a common issue in resource-limited settings like Nigeria. This finding is supported by (11), who reported late-stage diagnoses in 70% of breast cancer cases in sub-Saharan Africa. This delay underscores the need for improved cancer awareness and early screening programs. Table 4.2 highlights significant changes in platelet indices, reflecting the haematopoietic impacts of chemotherapy on breast cancer patients. A marked increase in PLT count was observed from the control (179 ± 75.58 × 10/L) to baseline (264 ± 103.4 × 10/L). The elevation at baseline may be attributed to systemic inflammation triggered by the malignancy itself, as noted by (12). During chemotherapy, PLT count showed fluctuations, with a significant rise during the 1st cycle (272.0 ± 142.6 × 10/L) followed by declines in subsequent cycles. This biphasic pattern likely reflects the interplay between chemotherapy-induced bone marrow suppression and reactive thrombocytosis due to inflammatory cytokines (13). MPV declined significantly from 9.5 ± 1.0 fL in the control to 8.1 ± 0.6 fL by the 3rd cycle ($p = 0.032$). A lower MPV suggests suppressed megakaryocyte activity, consistent with chemotherapy-induced bone marrow suppression. This observation aligns with findings by (14), who reported a similar decline in MPV among breast cancer patients receiving anthracycline-based chemotherapy. PDW showed a significant increase, rising from 16.3 ± 2.0% in the control group to 19.4 ± 3.5% by the 3rd cycle ($p = 0.022$). An elevated PDW reflects heightened platelet anisocytosis, possibly due to the release of immature platelets during bone

marrow recovery phases (15). PCT consistently declined from 0.30 ± 0.05% in the control to 0.20 ± 0.03% in the 3rd cycle ($p = 0.034$). This reduction highlights the combined effects of chemotherapy-induced thrombocytopenia and reduced platelet production, findings supported by (16). The significant alterations in platelet indices observed in this study underscore the haematological toxicity associated with chemotherapy. The variability in PLT count, MPV, PDW, and PCT suggests that platelet indices could serve as valuable biomarkers for monitoring chemotherapy-induced myelosuppression. Regular assessment of these indices could aid in early identification of haematological complications, facilitating timely interventions to minimize treatment interruptions and enhance patient outcomes.

Limitations and Future Directions

The study's limitations include its relatively small sample size and its focus on a single-center cohort, which may limit the generalizability of the findings. Additionally, the absence of male participants precludes analysis of gender-specific differences in chemotherapy-induced platelet variability. Future studies should include larger, multi-center cohorts and explore the prognostic significance of platelet indices in predicting chemotherapy outcomes.

CONCLUSION

This study highlights significant platelet variability in breast cancer patients undergoing chemotherapy, reflecting the impact of the treatment on haematopoietic health. These findings underscore the need for routine monitoring of platelet indices to mitigate treatment-related complications and improve clinical outcomes.

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