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**Prevalence and Severity of Anaemia in Breast Cancer Patients Undergoing Chemotherapy in Rivers State University Teaching Hospital: A Cross-Sectional Study**

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<https://dx.doi.org/10.4314/sokjmls.v9i4.9>**Abstract**

Breast cancer is the most prevalent type of cancer in women globally and the primary cause of cancer-related deaths, particularly in low- and middle-income countries with inadequate access to prompt early detection and medical care. In patients with breast cancer, chemotherapy-induced anaemia (CIA) is a common side effect that can cause treatment delays, dose reduction, and adverse patient outcomes. The aim of this study is to determine the prevalence and severity of anaemia in breast cancer patients undergoing chemotherapy at the Rivers State University Teaching Hospital in Port Harcourt, Nigeria, as well as the effect that anaemia has on the effectiveness of treatment and the quality of life for patients. In this cross-sectional study, women employees of the hospital who appeared healthy were used as controls, whereas the subjects were patients with breast cancer undergoing chemotherapy. Sysmex XN-330 automated haematology analyzer was used to analyze blood samples that were collected in K2EDTA bottles. The prevalence and severity of anaemia were determined by measuring haematological parameters, such as haemoglobin levels. GraphPad Prism 6.1 was used to analyze the data, and the results were presented as percentages and frequencies. Out of the 100 individuals with breast cancer under examination, 16% were anaemic and 84% were non-anaemic. Two percent (2%) of the anaemic patients had mild anaemia, 11% had moderate anaemia, and 3% had severe anaemia. The impacts of treatment on haemoglobin levels were demonstrated by the mean haemoglobin level for anaemic patients, which dropped from

11.12 g/dl at baseline to 10.34 g/dl following chemotherapy. Patients at Rivers State University Teaching Hospital with breast cancer who are receiving chemotherapy frequently suffer from anaemia, especially from moderate cases. The drop in haemoglobin levels after chemotherapy emphasizes how important it is to manage anaemia proactively to improve patient outcomes and quality of life. To lessen the impact of chemotherapy-induced anaemia, healthcare professionals ought to carry out routine haemoglobin monitoring and consider early therapies such nutritional supplementation or erythropoiesis-stimulating drugs.

**Keywords:** Anaemia management, Breast cancer, Chemotherapy-induced anaemia, Haemoglobin, Rivers State,

**Introduction**

Breast cancer remains the most prevalent cancer diagnosis among women worldwide and is a leading cause of cancer-related mortality. In 2022 alone, breast cancer resulted in approximately 670,000 deaths globally, marking it as a significant public health burden, particularly in low- and middle-income countries where access to timely diagnosis and treatment is often limited (World Health Organization, 2024). Despite advancements in early detection and therapeutic strategies, managing breast cancer remains challenging, especially when compounded by treatment-related complications such as anaemia.

Anaemia is a frequent complication in cancer patients and is especially prevalent in those

undergoing chemotherapy for breast cancer. Chemotherapy-induced anaemia (CIA) arises primarily due to the cytotoxic effects of chemotherapy on the bone marrow, which impairs red blood cell production (Badheeb *et al.*, 2023). The prevalence of anaemia in breast cancer patients is considerable, with estimates indicating a significant proportion of patients affected during their treatment course (Muthanna *et al.*, 2022). Moreover, anaemia in breast cancer patients is associated with reduced response to treatment, increased fatigue, and overall decreased quality of life (Pourali *et al.*, 2017). The clinical implications of anaemia are substantial, as it directly influences treatment outcomes and patient well-being. Anaemia can lead to dose reductions, treatment delays, and a higher likelihood of disease recurrence (Zhang *et al.*, 2024). Furthermore, severe anaemia has been linked to decreased survival rates among breast cancer patients, making its management critical to improving overall prognosis and quality of life (Mohammed *et al.*, 2022). The management of CIA typically involves the use of erythropoiesis-stimulating agents (ESAs), iron supplementation, and, in severe cases, blood transfusions. However, these interventions carry potential risks, such as increased thromboembolic events and potential impacts on tumor progression, necessitating careful clinical monitoring (Badheeb *et al.*, 2023).

Given the multifactorial nature of anaemia in breast cancer patients, including the effects of chronic inflammation, nutritional deficiencies, and direct bone marrow suppression by chemotherapeutic agents, a comprehensive approach to anaemia management is vital. Current guidelines recommend a combination of supportive therapies, including nutritional supplementation and careful monitoring of hemoglobin levels, to optimize patient outcomes. Recent studies have also highlighted the need for individualized treatment plans that address both the physiological and psychosocial impacts of anaemia in breast cancer patients (Muthanna *et al.*, 2022).

Anaemia places a significant burden on breast cancer patients, both physically and emotionally. While there is substantial literature on the

prevalence of anemia in cancer patients, there is a lack of focused research specifically addressing breast cancer patients undergoing chemotherapy in low- and middle-income countries, where resources for managing anaemia may be limited. This study seeks to fill this gap by providing valuable insights into how anaemia management can be improved, thereby enhancing both treatment outcomes and quality of life for breast cancer patients. Therefore, the primary objective of this study is to evaluate the prevalence of anaemia in breast cancer patients undergoing chemotherapy and to assess its impact on treatment efficacy and patient quality of life.

## Materials and Methods

### Study design

This study was a cross-sectional study; the sampling method was carried out among breast cancer patients currently undergoing chemotherapy at Rivers State University Teaching Hospital (RSUTH), Port Harcourt and apparently healthy female staffs of reproductive age at RSUTH who served as control over a period of six months, from January to June 2024. The cross-sectional design allowed for the collection of data at a single point in time from a sample of breast cancer patients receiving chemotherapy. This design was chosen to provide a snapshot of anaemia prevalence, severity, and associated factors among this patient population. It enabled the assessment of haematological parameters in relation to chemotherapy without the need for long-term follow-up. Blood samples were collected from both female breast cancer patients and apparently healthy females (non-cancer) patients into K<sub>2</sub>EDTA bottles and was transported at adequate temperature to avoid haemolysis and lysis to the laboratory for analysis. Quality Control measures were implemented at each stage of sample processing to ensure accuracy of results.

### Study Area

The study was conducted at Rivers State University Teaching Hospital (RSUTH), situated at 5-8 Harvey Street, Old GRA, Port Harcourt, Rivers State, Nigeria. RSUTH is a tertiary healthcare institution that serves as a referral center for complex medical cases across the region. It provides comprehensive medical services including specialized care in oncology,

surgery, pediatrics, and internal medicine. With modern diagnostic and therapeutic facilities, the hospital is well-equipped to manage a wide array of medical conditions, including cancer care, which makes it an ideal location for this study on anemia in breast cancer patients undergoing chemotherapy.

Port Harcourt, the capital city of Rivers State, is one of Nigeria's major economic hubs, particularly known for its oil and gas industries. The city's population, along with the surrounding region, has access to RSUTH, which caters to a diverse group of patients from both urban and rural settings. This demographic diversity provides a robust sample for studying health conditions like breast cancer, as it reflects a wide spectrum of socio-economic backgrounds and access to healthcare services.

### **Study population**

The study population consist of individuals that were diagnosed of breast cancer and are currently undergoing chemotherapy at the surgery department of Rivers State University Teaching Hospital Port Harcourt and apparently healthy female staffs of Rivers State University Teaching Hospital serving as the control group. A written consent was obtained from each participant to access their medical records and blood samples.

### **Eligibility Criteria**

#### **Inclusion Criteria**

- i. Female Breast cancer patients of reproductive age undergoing chemotherapy treatment in Rivers State University Teaching Hospital Port Harcourt.
- ii. Patients who are within their second and third cycle.
- iii. Consenting Breast cancer patients.

### **Exclusive Criteria**

- i. Female Breast cancer patients with missing data / incomplete medical records, patients receiving radiotherapy
- ii. Patients on their first cycle of chemotherapy
- iii. Patients who refused to give consent.

### **Ethical Approval**

Ethical approval for this study was obtained from the Rivers State University Teaching Hospital Health Research Ethics Committee Port Harcourt, a written informed consent was obtained from each participant prior to sample collection, and this was after reading, understanding and signing the written informed consent form.

### **Sample Analysis**

The analysis was performed using the Sysmex XN-330 automated haematology analyzer. This analyzer uses three technologies: electric impedance, fluorescent flow cytometry, and chemical reagents to analyze the complete blood count. The blood sample passed through the analyzer, which automatically diluted, lysed, and analyzed the different blood components.

### **Statistical Analysis**

Data was analyzed using graph pad prism 6.1. Descriptive statistics, including mean, frequencies, and percentages were used to summarize the demographic and clinical characteristics of the study population and used to categorize the severity of anaemic breast cancer patients. The prevalence and severity of anaemia was presented as frequencies and percentages.

### **Results**

**Table 1: Demography of the Study Population**

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

Firstly, we focus on the age distribution while analyzing the research population's demographic makeup. Age groups 21–30, 31–40, 41–50, and 51–60 comprised the participants. Four out of every five respondents (48%) were between the ages of 31 and 40, and the remaining 27 percent were between the ages of 41 and 50. 2% and 13% of the population, respectively, were made up of the younger (ages 21 to 30) and older (ages 51 to 60) cohorts.

Looking at the gender distribution, the study population demonstrated a notable skew, with 100% of the participants identifying as female. This gender composition is a crucial aspect to consider, as it may influence various facets of the study, such as prevalence rates, treatment responses, and overall outcomes.

Moving on to marital status, the participants were divided into three categories: single, married, and divorced. Most of the respondents, comprising 86%, reported being married, while 13% identified as single, and a smaller percentage, 3%, indicated that they were divorced.

Finally, the distribution of cancer stages within the study cohort sheds light on the severity and progression of the disease among the participants. Most individuals, accounting for 69%, were diagnosed at Stage III, followed by Stage II (13%), Stage IV (8%), and Stage I (10%).

**Table 2: Prevalence of Anaemia among Breast Cancer Patients Receiving Chemotherapy**

Variable	Frequency	Percentage (%)
Anaemic	16	16
Non-Anaemic	84	84
<b>Severity of Anaemia</b>		
Mild	2	2
Moderate	11	11
Severe	3	3
Anaemic Subjects Mean Hb Level at Baseline (g/dl)	11.12 (g/dl)	
Anaemic Subjects Mean Hb Level after receiving Chemotherapy (g/dl)	10.34 (g/dl)	

Hb Reference Range in Female: 12-16 g/dL (Pagana *et al.*, 2019)

The result in Table 2 comprised two main variables: Anaemic and Non-Anaemic subjects. Of the total breast cancer patients undergoing chemotherapy, 16% are identified as anaemic, while 84% are non-anaemic.

The severity of anaemia was further categorized into Mild (2%), Moderate (11%), and Severe (3%). This classification provided insights into the distribution of anaemia severity within the anaemic group.

Finally, the mean hemoglobin levels at baseline and after receiving chemotherapy showed that the anaemic subjects exhibit a baseline mean Hb level of 11.12 g/dl, which decreases to 10.34 g/dl after chemotherapy. This reduction suggests a potential impact of chemotherapy on hemoglobin levels in anaemic patients.

**Discussion**

Anaemia is a common complication among critically ill and cancer patients and has been associated with a decrease in the quality of life and poor prognosis Muthanna *et al.* (2021). Furthermore, feelings of sadness, frustration, and exhaustion can contribute to patients perceiving life as pointless due to the reduced quality of life associated with anaemia (Feteh *et al.*, 2016).

According to the study, approximately 16% of patients undergoing chemotherapy experience anaemia, while around 84% do not. This contrasts with the findings of Muthanna *et al.* (2022), who reported a high prevalence of anaemia in patients undergoing chemotherapy. The disparity in prevalence rates from the study may be attributed to clinical features in immunocompromised patients, such as poor performance status, acute physiological changes, and inadequate nutrition due to the severity of illnesses, leading to cancer-related anaemia. The decline in packed cell volume (PCV) may indicate chemotherapy-induced anaemia, with suppressed erythropoiesis being a common side effect of chemotherapy. Addressing anaemia is crucial for ensuring patient well-being and treatment adherence.

The study also reveals that while most patients were non-anaemic, among those identified as anaemic, the majority had moderate anaemia, with a smaller subset showing mild anaemia. This distribution of anaemia severity is noteworthy. In comparison to other studies, the predominance of moderate anaemia aligns with findings from Ballas (2018), which also highlighted that moderate anaemia is often more

prevalent than severe or mild forms in clinical settings, especially in populations with chronic conditions like sickle cell disease or those undergoing intensive treatment.

However, some studies have reported a higher incidence of mild anaemia, particularly in less critical patient populations (Adewoyin & Nwogoh, 2014). The difference may stem from the underlying health conditions of the patients in our study. For instance, in resource-limited settings, moderate anaemia could reflect delayed healthcare access or the presence of comorbidities that exacerbate the condition.

The clinical implications of this severity distribution are significant. Moderate anaemia often requires more active intervention than mild anaemia, as it can lead to worsened patient outcomes if not properly managed. For healthcare providers at Rivers State University Teaching Hospital, this suggests a need for regular screening and targeted treatments, especially for those at risk of developing moderate anaemia. Addressing moderate cases early on could reduce the risk of progression to severe anaemia and improve overall health outcomes

### Conclusion

The findings of this study emphasize the significant impact of chemotherapy on haematological parameters, particularly the reduction in haemoglobin levels among anaemic breast cancer patients. Moderate anaemia is the most common form observed, necessitating vigilant monitoring and timely intervention to prevent further complications. Addressing CIA proactively could improve treatment adherence, reduce treatment delays, and ultimately enhance patient outcomes.

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