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ORIGINAL ARTICLE

Proportions of Blood Cell Deficits in Breast Cancer Patients Undergoing Chemotherapy

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Abstract

Introduction: Anaemia, leucopenia and thrombocytopenia are at the forefront of haematological derangements encountered in the management of breast cancer. However, there is a gap in knowledge regarding their degree of occurrence at different stages of chemotherapy.

Methods: Longitudinal design and purposive sampling technique were adopted to enroll 50 adult female breast cancer patients who were accessing chemotherapy at the University of Calabar Teaching Hospital in Calabar, Cross River State of Nigeria. Ethical approval and informed consent were duly obtained. The blood cell counts were carried out by automation. Frequencies of anaemia, leucopenia and thrombocytopenia were calculated after applying cut-off point using age- and gender-specific refence ranges (<120 g/l of Haemoglobin concentration for anaemia, <4.0 x 10^9/l of total white blood cell count for leucopenia and <150 x 10^9/l of platelet count for thrombocytopenia).

Results: A greater number of the subjects had anaemia with prevalence ranging from 78% at the onset to 100% by the fifth course. Leucopenia ranged from 14% at the beginning to 100% by the third course. Thrombocytopenia was not present at pre-chemotherapy stage but appeared slightly (4%) during the assessment for second treatment course and rose to 55% at the last assessment.

Conclusion: This study observed increasing proportions of cytopenia in association with progressing chemotherapy. There is high prevalence of anaemia in breast cancer even before commencement of chemotherapy, while leucopenia develops more rapidly during chemotherapy.

Key words: Breast cancer, chemotherapy,anaemia, leucopenia, thrombocytopenia

Introduction

Breast cancer occurs predominantly among adult females with increasing risk as age advances. Probably due to increasing awareness and proper documentation, its prevalence has been observed to be increasing[1-3]. This fact coupled with the high mortality rate makes breast cancer an emerging important maternal health condition and as such demands both clinical and research attention towards better management. Laboratory findings in relation to breast cancer encompass histological analysis for diagnosis and haematological/ biochemical investigations for prognosis and monitoring. Concerning haematological parameters, full blood count remains vital for minimal and extensive assessments both in general disease conditions and in malignant conditions to be precise. This is because effects of both the disease and treatment interventions such as surgical operation, chemotherapy and radiotherapy have been shown to reduce blood cell populations[4,5]. Consequently, anaemia, leucopenia and thrombocytopenia are at the forefront of haematological derangements encountered in the management of breast cancer[6-9]. In fact, these deficits constitute part of the indices in monitoring disease progression and effective therapy as earlier stated.

Previous studies from this locality have reported several haematological and biochemical derangements in association with breast cancer[6,7,10,11]. More specifically, cytopenia exists at different stages of the condition as shown in some of these mentioned cross-sectional studies. In general, cross-sectional attempts at investigating these deficits reveal at most their occurrence, prevalence and the demonstration of associations. This has left a gap on the degree of occurrence through a treatment follow up period. The necessity of a longitudinal design lies in the inherent potential of understanding critical times during chemotherapy when blood cell deficits are most prevalent. The present study, therefore, took a follow up approach to investigate the proportions of anaemia, leucopenia and thrombocytopenia that occurred in the population during chemotherapy.

Materials and methods

Longitudinal design and purposive sampling technique were adopted to enroll 50 breast cancer patients who were accessing chemotherapy at the University of Calabar Teaching Hospital in Calabar, Cross River State of Nigeria. They were all females between the ages of 30 and 55 years. Ethical approval was duly sought and obtained from The Ethics and Health Research Committee of the hospital. Informed consent was obtained from each study participant.

The blood cell counts were carried out by automation using SMART-1 Hematology Analyzer from Kinghawk Technology Co., Ltd, China. This analyser was controlled and calibrated according to manufacturer's instructions to ensure its fitness for use. Frequencies of anaemia, leucopenia and thrombocytopenia were calculated after applying cut-off point using age- and gender-specific refence ranges (<120 g/l of Haemoglobin concentration for anaemia, <4.0 x 10^9/l of total white blood cell count for leucopenia and <150 x 10^9/l of platelet count for thrombocytopenia). Results are presented as frequencies in a table and a figure.

Results

The present study enrolled 50 participants (100%) at the onset to be followed up during the six courses of chemotherapy. Only 62% of the initial number participated to the end. Decision to change facility as well as opting out of the drug regimen to seek for alternative care caused discontinuation in 24% of the subjects, while 14% ceased from participation because of death (Table 1).

The frequencies of anaemia, leucopenia and thrombocytopenia were recorded prior to commencement of chemotherapy and at each routine check that is done before drug administration for the six courses of adjuvant 5-fluorouracil, epirubicin, cyclophosphamide (FEC) chemotherapy. A greater number of the subjects had anaemia with prevalence ranging from 78% at the onset to 100% by the fifth course. Leucopenia ranged from 14% at the beginning to 100% by the third course. Thrombocytopenia was not present at pre-chemotherapy stage but appeared slightly (4%) during the assessment for second treatment course and rose to 55% at the last assessment (Figure 1).

Table 1: Frequency of participation through the study period

Participation	Number n = 50	Frequency (%)
Treatment Course		
Pre-chemotherapy	50	100
1st Course	49	98
2nd Course	46	92
3rd Course	46	92
4th Course	40	80
5th Course	34	68
6th Course	31	62
Factors for discontinuation		
Patient's choice for alternative facility/ therapy	12	24
Death	7	14

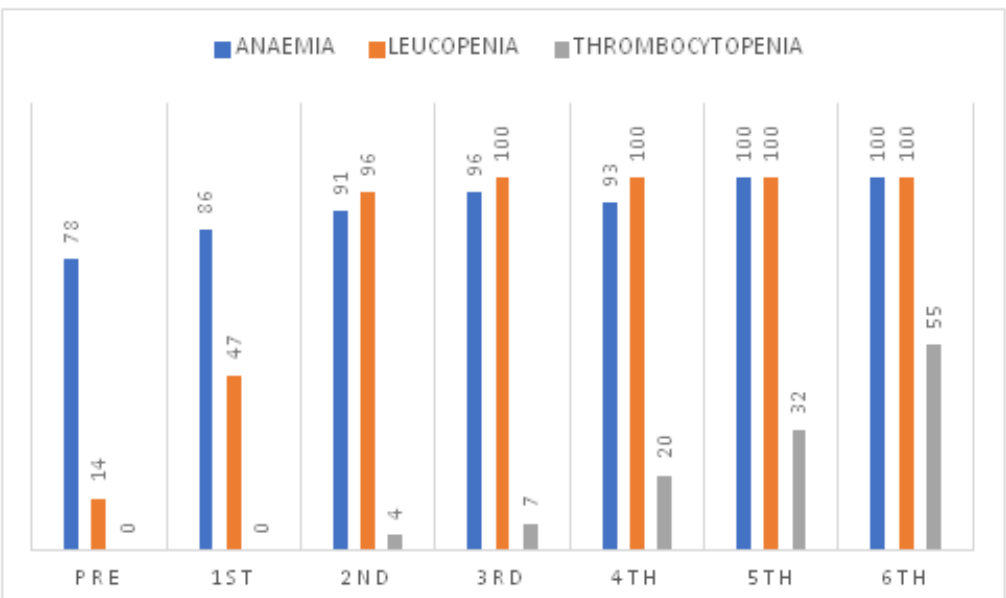

Figure 1: Proportions of blood cell deficits as treatment course progressed

Discussion

Anaemia in the Nigerian general population has been an issue of concern, particularly as women and children are more vulnerable than others. Contributing factors to high prevalence of anaemia in Nigerian women have been reported to include nutritional deficiencies (predominantly iron, vitamin B12 and folate) and malaria parasitaemia[12,13]. Although commendable effort is being made to combat these challenges through fortification, supplementation and malaria control measures, the situation seems to persist. Considering that breast cancer affects adult women predominantly and that tumour vascularization and diversion of nutrients mediates anaemia in cancer[4,5], the prevalence of anaemia in breast cancer is bound to be high. The present study observed 78% anaemia prior to commencement of chemotherapy.

Breast cancer chemotherapy affects both cancer cells and progenitor stem cells[14]. This non-selective cytotoxicity exerts a toll on blood physiology with possible life-threatening consequences in terms of reduced oxygen-carrying capacity, susceptibility to infection and coagulation disturbance[15-17,6,7]. Laboratory monitoring thus aids effective management of the condition for good outcome. Proportions of blood cell deficits increased as treatment course progressed. Leucopenia showed the most rapid rise from 14 % prior to commencement of chemotherapy to 100% by the third course of treatment. This was followed by anaemia in which there was a rise from 78% pre-chemotherapy proportion to 100% by the time of fifth course assessment. Thrombocytopenia that was non-existent at pre-chemotherapy and first treatment course stages rose steadily to 56% when assessment for sixth treatment course was made. These observations also imply that anaemia and leucopenia are at the top of blood cell deficits faced during chemotherapy for breast cancer. Consequently, provisions for transfusion services as well as haematopoietic stimulating agents such as erythropoietin and filgrastim are necessary adjuvant therapies for breast cancer management, particularly in the Nigerian setting[18,19].

In conclusion, this study observed increasing proportions of cytopenia in association with progressing chemotherapy. There is high prevalence of anaemia in breast cancer even before commencement of chemotherapy, while leucopenia develops more rapidly during chemotherapy.

Conflict of Interest

The authors declare no conflict of interest.

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