

## Neutropenia and First Cycle of Chemoradiotherapy: A Retrospective Analysis of 100 Cancer Patients

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### Abstract

**Introduction:** Chemoradiotherapy-induced neutropenia can occur after the first cycle of treatment. It becomes a major dose-limiting factor and affects the further management of the patient.

**Material and Method:** A retrospective analysis of 100 patients who received chemoradiotherapy was done to know about percentage of reduction of low absolute neutrophilic counts after first cycle of treatment and their relation with absolute neutrophilic values before the treatment started.

**Results:** Post chemoradiotherapy reduction in absolute neutrophilic counts was seen in 25% and neutropenia in 4% of the cases irrespective of pre-treatment values. Majority of the neutropenic cases were of carcinoma breast.

**Conclusion:** It was observed that 4% of the total cases had neutropenia irrespective of pre-treatment absolute neutrophilic counts.

**Keywords:** Chemotherapy, Carcinoma, Neutropenia, Absolute neutrophilic count, Blood Parameter.

### Introduction

Chemotherapy unavoidably suppresses the hematopoietic system hence impairing host defence mechanisms. Neutropenia is the generally serious hematologic toxicity of chemotherapy.<sup>(1,2)</sup> Febrile neutropenia is a significant subject with a negative impact on quality of life, causing increased morbidity and mortality rates, and elevating treatment costs.<sup>(3,4)</sup> Neutrophils are the first line of defence against infection as the first cellular component of the inflammatory response and a key component of innate immunity. In future, chemotherapy-induced neutropenia will become an even greater issue as elderly population increased in developed countries, leading to a higher prevalence of cancers and an increase in the age-related risk of chemotherapy-induced neutropenia.<sup>(5)</sup> The reported incidence and prevalence of neutropenia vary widely. The literature suggests an incidence of neutropenia in 7.83 cases per 1000 cancer patients.<sup>(6)</sup> In the current study retrospective analysis of absolute neutrophilic value was done before and after first cycle of chemoradiotherapy to assess the percentage and level of neutropenia.

### Materials and Method

This study was a retrospective measure of the haematological toxicity risk in patients with solid tumours during their first chemotherapy cycle. Total of 100 patients with male and female ratio of 1:1.8 were taken into consideration with age range of 6-86 (55.1±15.1) years. Majority of the patients were females with predominant group of carcinoma breast (Table 1).

The pretreatment as well as post first cycle of chemoradiotherapy reports of all the blood samples collected in EDTA vacutainers and processed with automated hematology analyzer were re-collected. The pretreatment values of cases with reduction in ANC after first cycle of chemotherapy were categorised (Table 2) into neutrophilia, normal range and neutropenia.<sup>(7)</sup> Hematopoietic growth factors were given to neutropenic cases. Post treatment data obtained was analysed and discussed in detail.

### Results

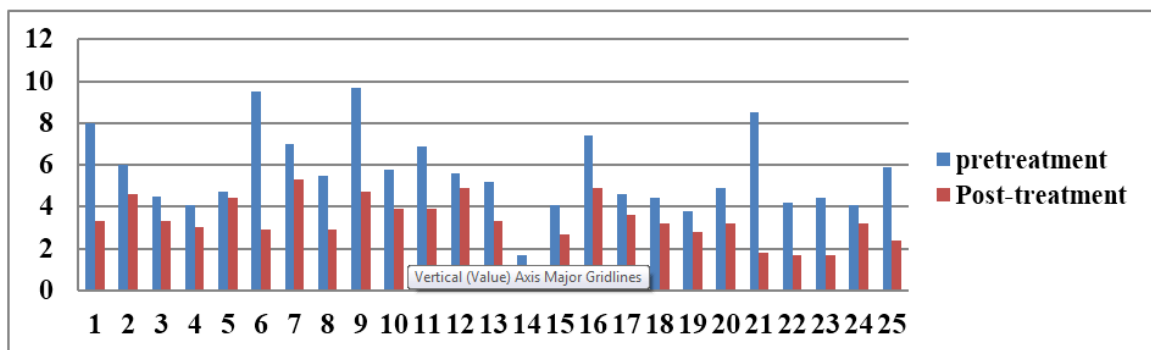
Pretreatment values of ANCs were compared with post treatment values after first cycle of treatment. Total mean value of ANC in pretreatment patients was  $5.3 \pm 1.1 \times 10^9/L$  (mean±standard deviation) with post treatment value of  $5.3 \pm 3.6 \times 10^9/L$  (Table 3). Total of 25 out of 100 cases (25 %) showed reduction in ANC after first cycle of chemoradiotherapy. When observed in total cases neutropenic patients were 1% only. Total out of 25% affected cases, 12% cases were having neutrophilia and 4% cases had pre-treatment neutropenia. Rest of the 87.6% cases had absolute counts within normal range. After further analysis, neutropenia was detected in 16% of the affected cases. But overall post treatment neutropenic cases were 4% including 3% patients of carcinoma breast.

**Table 1: Distribution of various carcinomas**

Organ affected	Type of carcinoma	Percentage (%)
Breast	Infiltrating ductal cell carcinoma	25%
Oral cavity	Squamous cell carcinoma	09%
Uterus	Adenocarcinoma endometriun	02%
Ovary	Cystadenocarcinoma	02%
Oesophagus	Squamous cell carcinoma	02%
Skin	Squamous cell carcinoma	02%
Axilla	Mucinous carcinoma skin	01%
Rectum	Adenocarcinoma	02%
Liver	Hepatocellular carcinoma	02%
Thyroid	Papillary carcinoma thyroid	02%
Lung	Squamous cell carcinoma	01%
Total		100%

**Table 2: Showing distribution of absolute neutrophil count (ANC) in 25% cases of reduced post treatment values**

ANC× 10 <sup>9</sup> /L	No of cases (Pre-treatment)	No of cases (Post treatment)
<2	1	4
2-7	21	21
>7	3	Nil



**Fig. 1: Showing pre-treatment and post-treatment values of ANC**

## Discussion

Neutropenia or febrile neutropenia is one of the major haematological complications of chemotherapy. In the current study, post chemotherapy neutropenia was detected in 4% after first cycle of treatment. Incidence and prevalence of neutropenia varies widely. However depending on the cancer type, disease staging, patient functional status and chemotherapy regimen, neutropenia has been observed in 6–50% of patients.<sup>(8)</sup> It is amongst dose-limiting toxicities seen in clinical oncology practice. Neutropenia is clinically significant

As pre-treatment neutropenia was detected in 1% cases, only these patients were identified as at risk and hematopoietic growth factors were given. The work conducted by Chang has manifested marked benefits in patients, if they were identified as high risk patients prior to chemotherapy. In time use of growth factors can avoid the occurrence of delay in therapy as well as dose reduction.<sup>(11)</sup> Although with the use of hematopoietic growth factors incidence, severity and duration of neutropenia can be reduced. But these agents are negatively associated with bone pain, fever. And also not all chemotherapy regimens bear the same risk of neutropenia. So these factors are not recommended for use in all the patients. On the other hand total of 4% cases including previous 1% cases of low ANC, showed neutropenia after treatment. So patient's selection should be improved for the use of these types of factors.<sup>(12,13)</sup>

In our study it was found that 75% neutropenic cases were of carcinoma breast only. This may be correlated with the higher number of cases of carcinoma breast (25%) who were planned for chemotherapy. However many authors have also mentioned the need for a tool to identify high-risk patients among that undergoing adjuvant chemotherapy

as it causes increased morbidity and mortality rates and possibly compromised treatment outcomes, and excess healthcare costs. A study done by Shirdel EA and associates predicted the significant fall in neutrophilic counts in patients receiving chemotherapy treatment.<sup>(9)</sup> In the review of literature it was found that research in quantitative analysis of neutropenic complications and their risk, may help in the near future to target patients at greater risk. So that appropriate preventive measures can be taken up to maximizing the benefits and minimizing the costs of chemotherapy.<sup>(10)</sup> for early-stage breast cancer.<sup>(12,13,14)</sup> Several studies had been done to know the correlations between risk groups and blood count data in various malignancies for any particular regimens. But none of them have produced any predictor that can suggest tumour type or treatment regimen to make a distinction between high risk patients from low risk patients especially in carcinoma breast.<sup>(15-21)</sup> A study done on 35 patients also have shown significant fall in ANC in cases where pre-treatment ANC counts were low.<sup>(21)</sup>

## Conclusion

Neutropenia is the commonest adverse effect amongst all post chemotherapy complications. In our observation it was 4% of the total cases and can occur in any case irrespective of prechemotherapy ANC counts. ANC values of post first cycle chemotherapy treatment can play important role in the further plan of treatment in cancer patients.

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