

## Hematologic Adverse Effects following Systemic Chemotherapy

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### Abstract

**Introduction:** Cytopenia is one of the most important side effects of chemotherapy. It presents as pancytopenia or bicytopenia or monocytopenia. Cytopenia is a challenging factor for delivering chemotherapy drugs.

**Methods:** In this study we were looking for the incidence of cytopenia in patients received chemotherapy in two different hospitals.

**Results:** 200 patients were included in our study. Most of the patients were female and anemia was the most adverse effect which was followed by leukopenia and thrombocytopenia. Bicytopenia and pancytopenia were the least side effects of chemotherapy drugs.

**Conclusion:** Although our study was not a head to head one anemia was the most adverse effect following systemic chemotherapy in both hospitals. Overall cytopenia was more prevalent in the university hospital than private hospital. This difference was significant for anemia ( $P$ -value  $\leq 0.05$ ) but it wasn't for leukopenia or thrombocytopenia. Bicytopenia and pancytopenia happened very rarely.

**Keywords:** Hematologic adverse effects; Cytopenia; Chemotherapy

### Material and Methods

### Introduction

Hematologic toxicity induced by chemotherapy is called cytopenia. Cytopenia (Pancytopenia) is described as decreasing of all three types of blood cells including Red blood cells (Anemia), White blood cells specially neutrophils (Leukopenia-Neutropenia) and Platelets (Thrombocytopenia). This condition is one of the most serious complications of chemotherapeutic drugs which can be led to mortality and morbidity directly or indirectly [1-4].

Anemia complicates cancer management. It causes fatigue, one of the most side effects of malignancy treatment. It may also decrease the effectiveness of chemotherapy drugs on malignant cells. Neutropenia is known as the most serious adverse effect of chemotherapy usually makes physician reduce the drug dosage or limit the drug administration which in many cases leading to treatment failure. Due to decreased amount of neutrophils in blood, there is a higher risk for dangerous infection [1-13].

On the other hand thrombocytopenia increases the risk of bleeding and sometimes makes physician decrease the dosage of chemotherapy drugs which in turn compromises treatment results.

According to a report published in 1997, dose reduction about 20% reduces the treatment success about 50%. So, it is very important to adjust the dose of chemotherapeutic agents properly to prevent unpleasant adverse effects and also to have a more successful treatment [14-18].

The current study is performed to find incidence of cytopenia in patients with different cancers who were receiving standard chemotherapy regimens. From March 20, 2016 to June 20, 2016; 200 patients with different histopathology proven cancers were admitted to Booali university hospital (BUH) (100 patients) and Tehran private hospital (TPH) (100 patients) in order to receive chemotherapy (minimum two cycles and maximum six to eight cycles).

Before starting chemotherapy a few tests including complete blood cell count (CBC) and cell differentiation, kidney function test, and liver function test and extra tests as needed were done. Hematologic toxicities including Anemia, Neutropenia, Thrombocytopenia, or combined form were considered.

Anemia is described as the hemoglobin concentration  $\leq 10$  g/dL. Neutropenia was considered when neutrophils count was  $\leq 1500/\mu\text{L}$  and thrombocytopenia when platelets count was  $\leq 100000/\mu\text{L}$ . All patients with primary decrease of each of blood cell components excluded from the study. Before each cycle of chemotherapy CBC and Liver and kidney function tests were considered and each abnormalities corrected by blood product transfusions or colony stimulating factors and supportive management for other biochemistry lab issues.

Most of our patients in both hospitals have been divided into three groups according to their pathologic reports including breast cancer, GI malignancies and others. Patients with ECOG performance 0 or 1 were chosen at both hospitals. We used Pearson's chi-squared test to compare the results as the statistical method.

## Results

In our study we selected 200 patients. At first we made a decision to omit 10 patients who suffered from hematologic malignancies (leukemia and multiple myeloma) in two hospitals. We didn't exclude patients with lymphoma (Non-Hodgkin and Hodgkin's). Overall 96 patients were admitted to Booali university hospital (BUH). They were 49 (51%) female and 47 (49%) male. The age range was (18-86) with average 56.8 years. Two thirds of our patients in both hospitals involved with breast cancer and GI malignancies.

Colon and stomach were the major sites of malignancies. 40.6% of the patients suffered from GI malignancies, 17.7% breast cancer and 41.7% other cancers including ovarian cancer, sarcoma, Hodgkin lymphoma and non-Hodgkin lymphoma, brain tumor and malignant melanoma. 94 patients were admitted to Tehran private hospital (TPH). They were 60 (64.4%) female and 34 (35.6%) male.

The age range was (13-79) with average 53.3 years. 40.4% of patients suffered from breast cancer, 26.5% GI cancers (gastric and colon carcinoma) and 33.1% others including ovarian cancer, sarcoma, Hodgkin lymphoma and non-Hodgkin lymphoma, malignant melanoma (Tables 1 and 2).

Profile of Cancers - Booali University Hospital	
Breast cancer	17 (17.7%)
GI Malignancies	39 (40.6%)
Others	40 (41.7%)

Table 1: Profile of cancers-Booali university hospital.

Profile of Cancers-Tehran Private Hospital	
Breast cancer	38 (40.4%)
GI Malignancies	25 (26.5%)
Others	31 (33.1%)

Table 2: Profile of cancers-Tehran private hospital.

All of our patients have received at least 2 cycles of chemotherapy at both hospitals and the average of cycles at (BUH) was 3.92 and at (TPH) was 4.64. Two thirds of patients were in adjuvant setting and remaining in metastatic setting.

Hematologic adverse events in patients with solid tumors-Booali University Hospital						
Cancer	Patients	Anemia	Neutropenia	Thrombocytopenia	Bicytopenia	Pancytopenia
Breast Cancer	17	3	2	1	1	0
GI Malignancies	39	9	2	1	1	0
Others	40	11	5	6	6	3
<b>Total</b>	<b>96</b>	<b>24%</b>	<b>9.40%</b>	<b>8.30%</b>	<b>8.30%</b>	<b>3.10%</b>

Table 3: Hematologic adverse events in patients with solid tumors-Booali university hospital.

Anemia was the major adverse event among our patients who suffered from solid tumors in hospitals, 24% in BUH, and 10.4% in TPH (Figures 1 and 2).

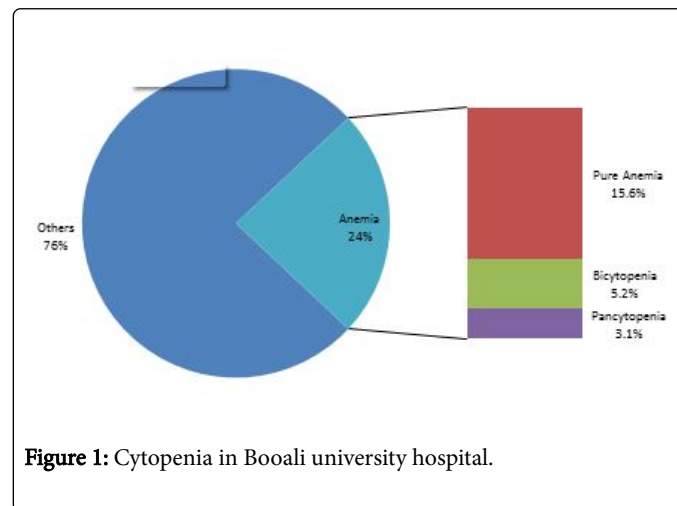


Figure 1: Cytopenia in Booali university hospital.

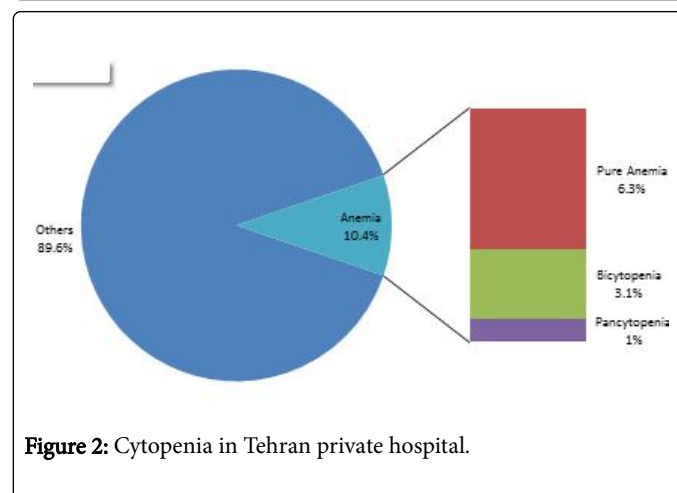


Figure 2: Cytopenia in Tehran private hospital.

It was followed by Neutropenia, 9.4% in BUH and 8.3% in TPH and thrombocytopenia, 8.3% in BUH and 5.2% in TPH respectively. Bicytopenia was also seen in 8.3% of patients in BUH and in 3.1% of patients in TPH. There was pancytopenia, 3.1% in BUH in comparison with 1% of patients in (TUH) (Tables 3 and 4).

Hematologic adverse events in patients with solid tumors-Tehran Private Hospital						
Cancer	Patients	Anemia	Neutropenia	Thrombocytopenia	Bicytopenia	Pancytopenia
Breast Cancer	38	1	2	0	0	0
GI Malignancies	25	6	4	2	2	1
Others	31	3	2	3	1	0
<b>Total</b>	<b>94</b>	<b>10.40%</b>	<b>8.30%</b>	<b>5.20%</b>	<b>3.10%</b>	<b>1.00%</b>

**Table 4:** Hematologic adverse events in patients with solid tumors-Tehran private hospital.

## Conclusions

As it is seen although our study was not a head to head one anemia was the most adverse effect following systemic chemotherapy in our patients in both hospitals. Cytopenia was more prevalent in the university hospital than private hospital. We didn't want to explore the cause of it but the difference of number of patients with different types of malignancies, different sex distributions, economic status and diet regimens may be related. There was a significant difference between occurrences of anemia between two hospitals (P-value  $\leq 0.05$ ); however this difference wasn't significant for leukopenia and thrombocytopenia (P-value  $\geq 0.05$ ). Combined cytopenia including bicytopenia and pancytopenia happened with less intensity. In this study we didn't separate the patients according to treatment setting including adjuvant or metastatic so, it might be an interfering factor in the overall results.

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