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Case Report

CHEMOTHERAPY INDUCED FEBRILE NEUTROPENIA WITH REFRACTORY HYPOKALEMIA POST BREAST CANCER TREATMENT: A CASE REPORT

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ABSTRACT

Chemotherapy is considered as the gold standard treatment regimens for most cancers. One of the most serious complications that occurs in patients receiving chemotherapy is chemotherapy induced febrile neutropenia. This condition is unpredictable for individual patients, despite thorough risk evaluation. They occur at any stage of chemotherapy, but the highest risk is during the first cycle of chemotherapy. Almost 50-59% of the neutropenic episodes across major cancer types occurs during this initial cycle. It is vital and crucial to immediately treat febrile neutropenia as it can lead to fatal complications like systemic infections, septic shock, organ failure and compromises in cancer treatment which can put the patient at spotlight for cancer morbidity and mortality (17.36%). We present the clinical details of a women diagnosed with chemotherapy induced febrile neutropenia with refractory hypokalemia post breast cancer treatment. This case report presents the clinical observations of the patient and highlights the role of an oncology nurse in facilitating treatment and prevention of febrile neutropenia.

Key words: Breast cancer, Treatment, Chemotherapy, Febrile neutropenia, Hypokalemia.

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INTRODUCTION

Chemotherapy induced febrile neutropenia is a fatal medical oncology emergency condition and often develops within 7-12 days after a chemotherapy treatment. For solid tumors febrile neutropenia accounts for 10-50% of the cases and 80% for hematologic malignancies [1]. It is largely caused by myelosuppressive drugs and depends on specific drug combinations and dosages. These drugs suppress the bone marrow from producing white blood cells (WBC's) and due to the short life span of neutrophils, it causes a rapid drop in the neutrophil count [2].

Neutropenia is a decrease in the number of neutrophil cell count and is clinically defined as the absolute neutrophil count (ANC) < 500 neutrophil / mcL - According to Infectious disease society of America (IDSA) [3]. These cells defend the body through phagocytosis against microbial infections and thus play an important role as the body's first-line defense. Hence, neutropenia poses a threat for increase in risk for infection for patients which is often indicated by high body temperature (febrile) [4].

Studies have highlighted multiple factors that had significantly influenced febrile neutropenia notably, the type of chemotherapy regime patient received, hematologic malignancies, exposure to radiation therapy, cancer metastasis, compromised immune function, older age (≥65 years) and co-morbidities especially diabetes or

hyperglycemic (~32%), kidney and liver diseases increase the risk [5].

Febrile neutropenia can cause even a minor infection to become more severe. The severity is graded based on ANC count by common terminology criteria for adverse events (CTCAE) as grade 1 (ANC: 1.5 - 2.0 $\times 10^9$/L), grade 2 (ANC: 1.0 - 1.5 $\times 10^9$/L), grade 3 (ANC: 0.5 - 1.0 $\times 10^9$/L) and grade 4 (ANC: <0.5 $\times 10^9$/L) [5]. They often present with the following symptoms such as fever, chills, shortness of breath, cough, diarrhea, vomiting, abdominal pain, painful urination, sore throat and mouth sores [5, 6].

Immediate rigorous antibiotic treatment is essential to keep the infection under control and to prevent from life-threatening complications. Febrile neutropenia substantially impacts cancer treatment plans and hinders disease control and survival of the patients [7]. It poses a constant challenge for health care providers, as it delays treatment administration and its efficacy demanding alteration in the dosages and substantially increasing the number of emergency hospitalizations and treatment cost leading to poorer clinical outcomes [8].

The standard care for febrile neutropenia is granulocyte colony-stimulating factors (G-CSFs), these agents accelerate bone marrow recovery and neutrophil production with broad-spectrum antibiotics to control infection and chemotherapy regime adjustments [8, 9]. Thorough assessment of the patient and preventive prophylaxis in risk groups is warranted to reduce the morbidity and mortality among cancer patients on chemotherapy [10].

CASE SUMMARY

Mrs. X aged 62 years presented to the emergency department with the chief complaints of fever for one day, loose stools for 5 days, vomiting 3 episodes, loss of appetite and tiredness. She had no other co-morbidities and was on neo-adjuvant chemotherapy treatment (NACT) for breast cancer.

History of illness – Patient had complaints of right breast lump for 2 months with a sudden onset, no pain, bleeding or discharge and non-progressive. On clinical breast examination two palpable masses noted in the outer quadrant of right breast.

Right mammogram report showed an ill-defined heterogenous hypoechoic lesion 25×14×24 mm at 9-10^0 clock position and right axillary lymph node lesion measuring 2.9×1.9 cm. PET scan revealed soft tissue lesion with central necrotic area showing spiculated margins in the right upper outer quadrant measuring 1.6×2.1×2.1 cm. Necrotic conglomerate lymph nodal mass noted in level 1 right axillary station measuring 2.4×2.5×3.1 cm with SUV max 10.5.

A trucut biopsy confirmed right breast cancer, negative for ER, PR and Her2. Triple-negative breast cancer (TNBC) with Ki 67 index 70%. Post investigations the patient was diagnosed as right breast cancer (TNBC-$T_2N_2M_0$).

Treatment Plan – Patient was undergoing NACT with AC (Adriamycin + Cyclophosphamide) + Toripalimab, q3 weekly for 6 cycles, thereafter will undergo surgery.

On eliciting the patient history, she had well tolerated the first 2 cycles of chemotherapy, but after the 3rd cycle within a week she had developed fever (sign of infection), loose stools, vomiting, loss of appetite and extreme tiredness. On examination her vital signs were slightly unstable with Temperature (100.2^{0}F), pulse – 88 bpm, Respiration- 18 bpm, BP – 90/70mmHg, SpO_2 -94%, dehydration + and pallor +

Table 1: Lab investigations reports

Investigations	Patient values	Interpretation
Hb	6 g/dL	Severe anemia
Leukocyte count	0.59 $\times 10^3/\mu$L	Leukopenia
ANC	0.41 $\times 10^9$/L	Severe neutropenia
RBC	2.26 million cells/mcL	Anemic
Platelet count	35000/ µL	Severe thrombocytopenia
ESR	14 mm/hr	Low
Sodium	131 mEq/L	Slightly low
Potassium	2.91 mEq/L	Hypokalemia
Chloride	99 mEq/L	Normal
Total protein	4.8 g/dL	Hypoproteinemia
Total bilirubin	0.37 mg/dL	Normal
Direct bilirubin	0.22 mg/dL	Normal
Indirect bilirubin	0.15 mg/dL	Low

The patient was clinically diagnosed as Chemotherapy induced febrile neutropenia with refractory hypokalemia and IRAE (immune related adverse events) grade 2 hypothyroidism. The following treatment was rigorously initiated– Injection G-CSF, IV antibiotics (Piptaz 4.5g), Thyronorm 50mcg, T. Flucanazole 150 mg,

Tab Loperiamide 2mg, Syrup Potklor 10ml, normal saline 0.9% IV fluids and advised on plenty of oral fluid intake.

NURSING CARE PERSPECTIVES

Patients on chemotherapy require a team-based monitoring of adverse effects of the drugs. Specially oncology nurses caring for cancer patients on chemotherapy can foster management and prevention of risk by implementing key strategies involving - assessment of predictive risk factors such as planned chemotherapy regimen, older age, uncontrolled co-morbidities, nutritional status. Risk assessment - using tools like multinational association for supportive care in cancer (MASCC) and clinical index of stable febrile neutropenia (CISNE). Assessing blood investigation values, monitoring temperature (100.4^0F or 38^0C or higher) is important as fever is the earliest sign of an underlying infection, prompt administration of antibiotic and G-CSFs therapy, restore fluid and electrolyte balance through normal saline or ringers' lactate as prescribed, assess for dehydration, monitor intake and output.

Educate the patient on infection control measures as it can significantly lower the risk of acquiring an infection such as frequent hand wash for at least 20 seconds, avoid crowded areas, prefer to wear a face mask in public places limiting contact with sick individuals, strict adherence to safe food handling, maintain a clean household environment. Instruct the patient to immediately report to health care, if any signs of infection such as fever, extreme fatigue, vomiting, diarrhea, burning micturition, body ache, mouth sores etc. after a chemotherapy [5, 9, 8, 11].

DISCUSSION

The present case report has showed that the patient X, 62 years old on AC chemotherapy regime developed chemotherapy induced febrile neutropenia after the third cycle. This indicates that the condition can occur during any chemo cycles and also highlights the combination of chemotherapy that are more likely to produce adverse effects in risk individuals. The present observations are in consistent with a longitudinal study conducted by Dessalegn M, et'al (2023) to assess the incidences of chemotherapy-induced neutropenia, febrile-neutropenia and associated factors in solid cancer patients in Ethiopia. 101 patients diagnosed with any type of solid cancer were recruited using convenience sampling method. Patients were followed-up until they completed five cycles of chemotherapy. The results revealed that the incidence of neutropenia was 65 (70.7%) and the incidence of febrile neutropenia was 46 (50.0%). Adriamycin + cyclophosphamide and Adriamycin + cyclophosphamide + paclitaxel were the most commonly used anti-cancer treatments in this study. The study concluded that more than two thirds of the patients had chemotherapy associated neutropenia while half of the patients had febrile neutropenia, close monitoring of such patients is warranted [12].

CONCLUSION

Chemotherapy induced febrile neutropenia is an oncology emergency, if left untreated can result in rapid progress of bacterial, viral or fungal infection and can lead to fatal complications such as septic shock, multi-organ failure and even death. Owing to the burden of multiple cancer treatments and cost, this grave adverse effect overloads patients with emergency hospitalizations, costs, delays in cancer treatment and potential risk for morbidity and mortality. Although the condition is unpredictable, close monitoring of patients based on combination of chemotherapy regimens and routinely assessing the risk for febrile neutropenia using standardized tools and encourage patients to immediately report adverse effects is essential.

ETHICAL CONSIDERATION

Prior permission was obtained from the concerned authorities of the institution. Institutional ethical clearance was obtained with IEC No – 239/2026. Participant information sheet was given to the patient and the purpose of the study was explained assuring confidentiality and informed consent was taken from the patient for the study.

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Nil

CONFLICTS OF INTEREST

There are no conflicts of interest

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