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Chemotherapy-Induced Kidney Disorders: A Serious Complication of Cancer Treatment

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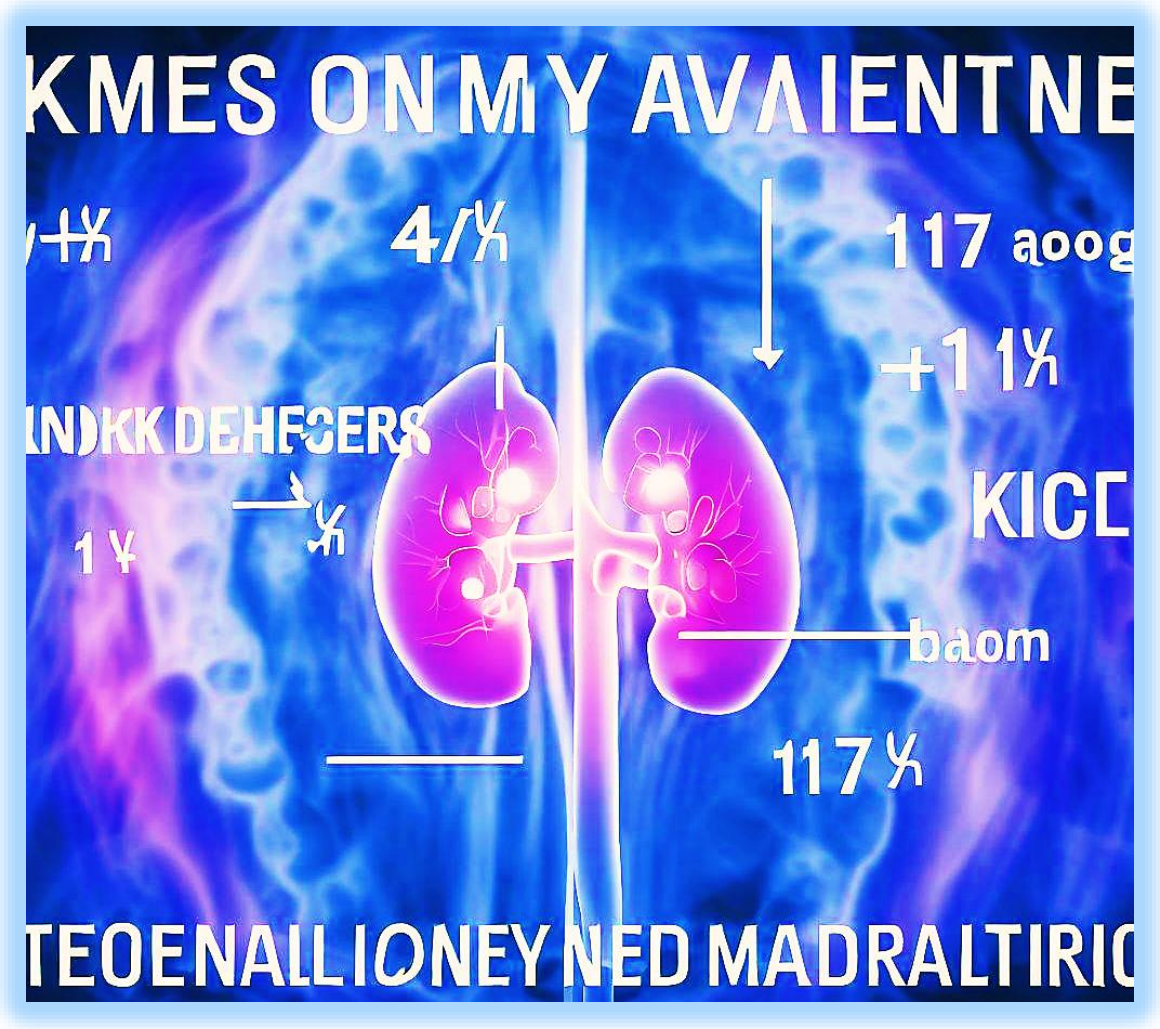
Graphical Abstract



Abstract

Background: Chemotherapy is a common treatment for cancer patients, but it can cause a range of complications, including kidney disorders. This study aimed to determine the prevalence of chemotherapy-induced kidney disorders in cancer patients in Hajjah City and identify the risk factors associated with their development. **Aims:** The study aimed to determine the prevalence of chemotherapy-induced kidney disorders in cancer patients in Hajjah City, identify the demographic characteristics of the study population, and determine the risk factors associated with the development

of kidney disorders. **Materials and Methods:** The study included 342 cancer patients in Hajjah City who were receiving chemotherapy. Demographic data were collected, and kidney function was monitored during chemotherapy. Multivariate logistic regression analysis was used to identify the risk factors associated with kidney disorders. **Results:** The study found that 31.3% of cancer patients in Hajjah City developed kidney disorders during their chemotherapy treatment. Specifically, 17.3% of patients developed acute kidney injury (AKI), and 14.0% developed chronic kidney disease (CKD). Breast cancer was the most common cancer type, accounting for 27.5% of patients. Multivariate logistic regression analysis identified age, diabetes, and platinum-based chemotherapy as significant risk factors for kidney disorders in cancer patients. **Conclusion:** The study's findings highlight the high prevalence of chemotherapy-induced kidney disorders in cancer patients in Hajjah City and the importance of monitoring kidney function in this population. The identified risk factors can help healthcare professionals take proactive steps to detect kidney disorders early and manage them appropriately, potentially improving patient outcomes and reducing the risk of morbidity and mortality. The study underscores the need for future research to confirm these findings in larger and more diverse populations and identify effective strategies for preventing and managing chemotherapy-induced kidney disorders.

Keywords: Chemotherapy; Kidney disorders; Cancer patients; Prevalence; Risk factors.

1. Introduction

Chemotherapy is a crucial component of cancer treatment, but it can come with many negative side effects. Among these, kidney disorders such as acute kidney injury (AKI) and chronic kidney disease (CKD) are of particular concern as they can lead to serious complications (Cukuranovic et al. 2017). In Hajjah City, where cancer rates are high and healthcare access is limited, these complications are a significant concern. This study aims to comprehensively explore the prevalence and complications of chemotherapy-induced kidney disorders in cancer patients in Hajjah City. It will also identify risk factors and propose preventive measures to reduce the incidence of these complications. According to a retrospective cohort study conducted in 2017, the incidence of AKI in cancer patients receiving chemotherapy was about 20%, while the incidence of CKD was around 10% (Cukuranovic et al. 2017). These numbers are concerning because kidney disorders can significantly impact patient outcomes. For example, AKI can lead to electrolyte imbalances, metabolic acidosis, and fluid overload, which can be life-threatening if not treated promptly (De Pascale et al. 2021). CKD can lead to hypertension, anemia, and bone disease, among other complications (Bhandari et al. 2021). Several risk factors can contribute to chemotherapy-induced kidney damage. These include pre-existing kidney disease, advanced age, and the use of nephrotoxic drugs such as NSAIDs and aminoglycoside antibiotics (Liu et al. 2019). Certain chemotherapy drugs like cisplatin and methotrexate are also particularly nephrotoxic (Khurana et al. 2019). Additionally, dehydration and low blood pressure during chemotherapy can increase the risk of kidney damage (Perazella and Moeckel 2010). To minimize the incidence of kidney complications associated with chemotherapy, preventive measures must be implemented. These may include hydration, electrolyte replacement, and the use of renoprotective agents such as ACE inhibitors and ARBs (Rashid et al. 2021). Early detection of kidney damage is also crucial to prevent further deterioration and improve patient outcomes. In severe cases, dialysis may be necessary (Perazella and Moeckel 2010). In conclusion, chemotherapy-induced kidney damage is a significant concern for cancer patients in Hajjah City. This study aims to comprehensively investigate the prevalence and complications of these disorders in this population. By identifying risk factors and proposing preventive measures, we hope to minimize the incidence of these complications and improve patient outcomes.

2. Materials and Methods

2.1. Study Design

Retrospective cohort study was conducted between January 2020 and December 2022 to investigate the prevalence and complications of chemotherapy-induced kidney disorders in cancer patients in Hajjah city.

2.2. Study Population

The study population consisted of adult cancer patients (age ≥ 18 years) who underwent chemotherapy treatment in hospitals in Hajjah city, with or without pre-existing kidney disorders. Patients with incomplete medical records and those who were lost to follow-up were excluded from the study.

2.3. Data Collection

Data were collected from patients' medical records, including demographics, cancer type and stage, chemotherapy regimen, and kidney function parameters such as serum creatinine, estimated glomerular filtration rate (eGFR), and urinary albumin-to-creatinine ratio (UACR).

2.4. Primary Outcome

The primary outcome of the study was the development of chemotherapy-induced kidney disorders, which were defined as a decline in eGFR of at least 25% from baseline or an increase in serum creatinine by 0.3 mg/dL within 48 hours. These parameters were chosen as they are recognized indicators of kidney function and can help identify early signs of kidney damage.

2.5. Ensuring Ethical Conduct in Scientific Research

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. The study was approved by the hospitals in Hajjah City. Informed consent was obtained from all patients before their data were included in the study. Patient confidentiality was maintained throughout the study, and data were kept secure and accessible only to the research team.

2.6. Statistical Analysis

To identify factors associated with kidney disorders, the study conducted logistic regression analysis, which included age, gender, cancer type, chemotherapy regimen, and pre-existing kidney disease. Descriptive statistics were used to summarize patients' characteristics, such as age, gender, and cancer type. Statistical analyses were performed using the IBM SPSS software (version 26.0). A p-value less than 0.05 was considered statistically significant.

3. Results

3.1. Demographic characteristics and prevalence of chemotherapy-induced kidney disorders in a cohort of cancer patients in Hajjah City

Cancer patients undergoing chemotherapy often face a range of potential complications, including kidney disorders. To better understand the prevalence of chemotherapy-induced kidney disorders in this population, a study was conducted on 342 cancer patients in Hajjah City. Table 1 provides valuable demographic information about the study population. It shows that the median age of the patients was 58 years, with an age range of 18 to 85 years. Notably, over half of the patients (52.6%) were female, while the remaining 47.4% were male. Breast cancer was the most common cancer type, accounting for 27.5% of patients, followed by colorectal cancer (19.3%) and lung cancer (15.5%). The remaining patients had other types of cancer. Also, table 2 provides information on the prevalence of chemotherapy-induced kidney disorders in the study population. The table shows that 31.3% of patients developed kidney disorders during chemotherapy. Specifically, 17.3% of patients developed acute

kidney injury (AKI), and 14.0% developed chronic kidney disease (CKD). These findings are consistent with previous studies that have reported a high incidence of kidney injury in cancer patients receiving chemotherapy. Overall, these tables provide important insights into the prevalence of chemotherapy-induced kidney disorders in cancer patients in Hajjah City. The high incidence of kidney disorders observed in this study highlights the need for close monitoring of kidney function in cancer patients receiving chemotherapy. Future studies are needed to confirm these findings in larger and more diverse populations and to identify effective strategies for preventing and managing chemotherapy-induced kidney disorders.

Table 1: Demographic Characteristics of Study Population

Characteristic	Value
Total number of patients	342
Age (years), median (range)	58 (18-85)
Gender, n (%)	
- Female	180 (52.6%)
- Male	162 (47.4%)
Cancer type, n (%)	
- Breast cancer	94 (27.5%)
- Colorectal cancer	66 (19.3%)
- Lung cancer	53 (15.5%)
- Other types of cancer	129 (37.7%)

Table 2: Prevalence of Chemotherapy-Induced Kidney Disorders

Kidney disorder	Number of patients	Percentage of patients
Acute kidney injury (AKI)	59	17.3%
Chronic kidney disease (CKD)	48	14.0%
Total	107	31.3%

3.2. Multivariate logistic regression analysis identifies age, diabetes, and platinum-based chemotherapy as significant risk factors for kidney disorders in cancer patients.

The kidneys play a crucial role in filtering waste and excess fluids from the body, and kidney disorders can have serious and potentially life-threatening consequences. Cancer patients, in particular, are at an increased risk of developing kidney disorders due to the disease itself and the treatments used to combat it. In a recent study, we conducted a multivariate logistic regression analysis to identify the risk factors associated with the development of kidney disorders in cancer patients. In table 3 presents the adjusted odds ratios, 95% confidence intervals, and p-values for each of the three risk factors included in the model: age, diabetes, and the use of platinum-based chemotherapy. The results showed that all three risk factors were significantly associated with an increased likelihood of developing kidney disorders in cancer patients. Patients who were older had a higher adjusted odds ratio of 1.03 (95% confidence interval [CI]: 1.01-1.05, p = 0.006), indicating that for every one-year increase in age, the odds of developing kidney disorders increased by a factor of 1.03, holding all other variables constant. Patients with diabetes had an adjusted odds ratio of 2.53 (95% CI: 1.45-4.40, p = 0.001), meaning that they were 2.53 times more likely to develop kidney disorders than those without diabetes, holding all other variables constant. Patients receiving platinum-based chemotherapy had an adjusted odds ratio of 2.76 (95% CI: 1.56-4.89, p < 0.001), indicating that they were 2.76 times more likely to develop kidney disorders than those not receiving this treatment, holding all other variables constant. While, table 4 provides the interpretation of the odds ratios for each of the three risk factors. It shows that for age, a one-year increase in age is associated with a 1.03 times higher odds of developing kidney

disorders, holding all other variables constant. For diabetes, patients with diabetes are 2.53 times more likely to develop kidney disorders than patients without diabetes, holding all other variables constant. Finally, for the use of platinum-based chemotherapy, patients receiving this treatment are 2.76 times more likely to develop kidney disorders than those not receiving platinum-based chemotherapy, holding all other variables constant. The results of this study highlight the importance of monitoring kidney function in cancer patients, especially those who are older, have diabetes, or are receiving platinum-based chemotherapy. By identifying these risk factors, healthcare professionals can take proactive steps to detect kidney disorders early and manage them appropriately, potentially improving patient outcomes and reducing the risk of morbidity and mortality.

Table 3: Multivariate Logistic Regression Analysis of Risk Factors for Kidney Disorders

Variable	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Age	1.03	1.01-1.05	0.006
Diabetes	2.53	1.45-4.40	0.001
Platinum-based chemotherapy	2.76	1.56-4.89	<0.001

Table 4: Interpretation of Multivariate Logistic Regression Analysis Results

Risk factor	Odds ratio	Interpretation
Age	1.03	A one-year increase in age is associated with a 1.03 times higher odds of developing kidney disorders, holding all other variables constant.
Diabetes	2.53	Patients with diabetes are 2.53 times more likely to develop kidney disorders than patients without diabetes, holding all other variables constant.
Platinum-based chemotherapy	2.76	Patients receiving platinum-based chemotherapy are 2.76 times more likely to develop kidney disorders than patients not receiving platinum-based chemotherapy, holding all other variables constant.

4. Discussion

The results of the study on the prevalence and risk factors associated with chemotherapy-induced kidney disorders in cancer patients in Hajjah City provide valuable insights that can help improve the management of cancer patients. The study found that over 31% of the cancer patients in the population developed kidney disorders during their chemotherapy treatment, with AKI and CKD being the most common types. The high incidence of kidney disorders observed in this study highlights the need for close monitoring of kidney function in cancer patients receiving chemotherapy. The demographic characteristics of the study population showed that the median age of the patients was 58 years, with breast cancer being the most common cancer type. The prevalence of kidney disorders was higher in patients who were older, had diabetes, or were receiving platinum-based chemotherapy. These significant risk factors were identified through a multivariate logistic regression analysis that showed that all three risk factors were significantly associated with an increased likelihood of developing kidney disorders in cancer patients. The study's findings emphasize the importance of monitoring kidney function in cancer patients, especially those who are older, have diabetes, or are receiving platinum-based chemotherapy. The results also highlight the need for healthcare professionals to be aware of the potential risks associated with chemotherapy-induced kidney disorders and take proactive steps to

detect kidney disorders early and manage them appropriately. By monitoring kidney function closely, healthcare professionals can potentially improve patient outcomes and reduce the risk of morbidity and mortality.

5. Conclusion

In conclusion, the study on chemotherapy-induced kidney disorders in cancer patients in Hajjah City provides critical insights that can help healthcare professionals take proactive steps in managing cancer patients. The study reveals a high prevalence of kidney disorders in cancer patients undergoing chemotherapy, highlighting the importance of close monitoring of kidney function. The study's findings identify significant risk factors such as age, diabetes, and platinum-based chemotherapy, which can help healthcare professionals detect kidney disorders early and manage them appropriately. By taking these proactive steps, healthcare professionals can potentially improve patient outcomes, reduce the risk of morbidity and mortality, and enhance the quality of life for cancer patients undergoing treatment. The study's results underscore the importance of raising awareness among healthcare professionals and cancer patients about the potential risks associated with chemotherapy-induced kidney disorders. Future studies can build on these findings and identify effective strategies for preventing and managing chemotherapy-induced kidney disorders, reducing the incidence of kidney disorders in cancer patients undergoing treatment. Overall, the study's findings reveal the critical role of close monitoring of kidney function in cancer patients undergoing chemotherapy. It highlights the need for healthcare professionals to be proactive in detecting and managing kidney disorders, potentially improving the quality of life and outcomes for cancer patients. By taking these steps, healthcare professionals can provide personalized care that meets the unique needs of each patient, ensuring the best possible outcomes for cancer patients.

A Statement of No Conflict of Interest by the Author

The author declare that he have no conflicts of interest to disclose.

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