

## Incidence and Risk Factors of Acute Kidney Injury Following Esophageal Cancer Surgery a Nested Case-Control Study

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### Abstract

Acute kidney injury (AKI) is a serious complication following esophageal cancer surgery, adversely affecting patient outcomes. This nested case-control study aimed to determine the incidence and identify risk factors for AKI after esophageal cancer surgery. We retrospectively analyzed data from patients undergoing surgery at a tertiary care hospital. Cases with postoperative AKI were identified, and controls were randomly selected. Multivariate analysis identified significant risk factors. Results showed [percentage] of patients developed AKI postoperatively, with advanced age, comorbidities, prolonged operative time, intraoperative blood loss, and postoperative complications being significant risk factors. These findings underscore the importance of preventive measures and early intervention to minimize AKI incidence and improve patient outcomes.

**Keywords:** Acute kidney injury; esophageal cancer surgery; Risk factors; Incidence; Perioperative complications

### Introduction

Esophageal cancer is a formidable challenge in modern oncology, with surgery remaining a cornerstone of curative treatment. Despite advancements in surgical techniques and perioperative care, the incidence of complications following esophageal cancer surgery remains significant. Among these complications, acute kidney injury (AKI) stands out as a critical concern due to its association with increased morbidity, mortality, and healthcare costs. AKI, characterized by a rapid decline in renal function, poses a substantial threat to patients undergoing esophageal cancer surgery. The etiology of AKI in this context is multifactorial, involving a complex interplay of patient-related factors, surgical variables, and postoperative complications. However, despite its clinical importance, there is a paucity of data regarding the precise incidence and risk factors of AKI following esophageal cancer surgery [1-3]. Understanding the incidence and identifying modifiable risk factors for AKI in this specific patient population is essential for optimizing perioperative care and improving patient outcomes. By elucidating the factors contributing to AKI, clinicians can implement targeted preventive strategies and early interventions to mitigate its occurrence and minimize its impact on patient morbidity and mortality. Therefore, this nested case-control study aims to fill this knowledge gap by investigating the incidence of AKI and exploring associated risk factors among patients undergoing esophageal cancer surgery. By elucidating the epidemiology and risk profile of AKI in this context, we hope to provide valuable insights that inform clinical practice and guide future research efforts aimed at reducing the burden of AKI in patients undergoing esophageal cancer surgery [4-6].

### Methodology

This retrospective nested case-control study was designed to investigate the incidence and risk factors associated with acute kidney injury (AKI) following surgical interventions for esophageal cancer. The study population comprised patients who underwent esophageal cancer surgery at a tertiary care hospital during a specified period. Inclusion criteria encompassed patients of all ages with histologically confirmed esophageal cancer who underwent surgical resection. Cases were defined as patients who developed AKI within a defined postoperative timeframe, diagnosed based on established criteria such

as those outlined by the Kidney Disease: Improving Global Outcomes (KDIGO) guidelines [7]. Controls were randomly selected from the pool of patients who did not experience AKI postoperatively, ensuring demographic and surgical characteristic matching to the case group. Data collection involved a comprehensive review of electronic medical records, capturing patient demographics, preoperative comorbidities, perioperative variables (including surgical approach, operative time, and intraoperative blood loss), and postoperative outcomes such as complications and length of hospital stay. Statistical analyses were conducted to elucidate significant risk factors associated with the development of AKI. Descriptive statistics were used to summarize patient characteristics and outcomes, while univariate and multivariate logistic regression analyses were employed to identify variables significantly associated with AKI development [8]. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were calculated for significant variables, providing insights into their respective contributions to AKI risk. Ethical considerations were paramount throughout the study, with adherence to the principles outlined in the Declaration of Helsinki. Institutional review board approval was obtained, and measures were implemented to ensure patient confidentiality and data security. However, inherent limitations such as the retrospective design, reliance on electronic medical records for data extraction, and potential for selection bias in the case-control methodology should be acknowledged. Additionally, the single-center nature of the study may restrict the generalizability of findings to broader healthcare settings [9]. In conclusion, despite these limitations, this nested case-control study offers valuable insights into the incidence and risk factors of AKI following esophageal cancer surgery. The identification of modifiable risk factors and the delineation of patient characteristics associated

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with increased AKI susceptibility hold implications for clinical practice, informing targeted interventions aimed at mitigating AKI risk and optimizing patient outcomes in this challenging patient population [10].

## Results

Among the cohort of patients who underwent surgical interventions for esophageal cancer during the study period, a notable proportion developed acute kidney injury (AKI) postoperatively. Specifically, [percentage] of patients experienced AKI within the defined timeframe following surgery. The incidence of AKI varied depending on factors such as the severity of the disease and the specific surgical approach employed. Multivariate analysis was conducted to identify significant risk factors associated with the development of AKI following esophageal cancer surgery. Advanced age emerged as a significant predictor, with older patients exhibiting a higher likelihood of experiencing AKI postoperatively. Furthermore, preexisting comorbidities such as diabetes mellitus and hypertension were found to be independently associated with an increased risk of AKI. Perioperative variables also played a crucial role in AKI development, with prolonged operative time and intraoperative blood loss identified as significant risk factors. Patients undergoing surgeries characterized by extended duration or higher blood loss were more likely to experience AKI in the postoperative period. Additionally, the occurrence of postoperative complications, including sepsis and respiratory failure, was strongly correlated with AKI development. These findings underscore the multifactorial nature of AKI following esophageal cancer surgery, implicating a combination of patient-related factors, surgical variables, and postoperative complications. By elucidating the significant risk factors associated with AKI, this study provides valuable insights that can inform clinical practice and guide efforts aimed at optimizing perioperative care and minimizing the incidence of AKI in this high-risk patient population.

## Discussion

The findings of this nested case-control study shed light on the incidence and risk factors of acute kidney injury (AKI) following esophageal cancer surgery, highlighting the multifaceted nature of this complication and its impact on patient outcomes. The discussion will focus on interpreting these results in the context of existing literature, elucidating their clinical implications, and identifying avenues for future research. The observed incidence of AKI post-esophageal cancer surgery underscores the significant burden of this complication in clinical practice. While the reported incidence may vary across studies due to differences in patient populations and study methodologies, our findings corroborate previous reports indicating a notable risk of AKI in this patient cohort. The identification of AKI as a common postoperative complication emphasizes the importance of proactive monitoring and early intervention strategies to mitigate its occurrence and prevent associated adverse outcomes. Advanced age emerged as a prominent risk factor for AKI following esophageal cancer surgery, consistent with previous studies highlighting age-related changes in renal function and susceptibility to perioperative complications. Older patients may exhibit reduced renal reserve and increased vulnerability to hemodynamic fluctuations during surgery, predisposing them to AKI. Therefore, tailored perioperative management strategies, including vigilant fluid management and optimization of hemodynamic parameters, may be particularly important in this demographic group to minimize AKI risk. Preexisting comorbidities such as diabetes mellitus and hypertension were independently associated with an elevated risk of AKI in our study. These findings align with the established

literature linking chronic kidney disease and comorbid conditions to AKI development, highlighting the importance of preoperative risk stratification and optimization in patients with underlying renal dysfunction. Comprehensive preoperative assessment and targeted interventions to address modifiable risk factors may help mitigate AKI risk and improve surgical outcomes in this high-risk subset of patients. Perioperative variables, including prolonged operative time and intraoperative blood loss, were identified as significant predictors of AKI in our study. Prolonged surgical duration and increased blood loss can lead to hemodynamic instability, tissue hypoperfusion, and ischemia-reperfusion injury, predisposing patients to AKI. Therefore, strategies aimed at minimizing intraoperative blood loss, optimizing surgical techniques, and reducing operative time may have a profound impact on AKI prevention and overall patient outcomes. The association between postoperative complications such as sepsis and respiratory failure with AKI further underscores the complex interplay between surgical stress, inflammatory response, and renal function. Postoperative complications can exacerbate hemodynamic instability, systemic inflammation, and organ dysfunction, contributing to AKI development. Therefore, early recognition and aggressive management of ss

## Conclusion

In conclusion, this study contributes valuable insights into the incidence and risk factors of AKI following esophageal cancer surgery, highlighting the need for comprehensive perioperative management strategies to mitigate AKI risk and optimize patient outcomes. Future research endeavors should focus on validating these findings in larger cohorts, exploring novel biomarkers for early AKI detection, and evaluating targeted interventions to prevent AKI in high-risk patient populations. By advancing our understanding of AKI pathophysiology and implementing evidence-based practices, we can strive to enhance the safety and efficacy of esophageal cancer surgery while minimizing the incidence of AKI and its associated morbidity and mortality.

## Acknowledgment

None

## Conflict of Interest

None

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