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Risk Factors for Sepsis in Postoperative Patients

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ABSTRACT

Sepsis is a severe acute infection that can lead to organ failure and mortality in 30-50% of patients. It ranks among the top 10 causes of mortality in the United States and has increased significantly since the 1970s. Postoperative sepsis, the primary type of sepsis, accounts for almost one-third of all sepsis cases.

Postoperative sepsis is a major cause of illness and death for hospitalized patients, often leading to multiple organ failure and mortality. A study found that patients aged 18 years or older who have undergone surgical interventions and have been hospitalized for at least 4 days after the operation have a higher likelihood of developing sepsis. The most prevalent complication after radical gastrectomy for stomach cancer is postoperative infection, which occurs through leukocyte depletion in transfusion patient.

Being male or over 65 significantly increased the likelihood of having postoperative sepsis. Sex hormones significantly influence the body's response to sepsis, and elderly individuals may be more susceptible due to deterioration of immune system function and age-related immunosenescence. Chronic renal illness, diabetes, and chronic heart failure have the highest risks of developing postoperative sepsis, ranked first, second, and third, respectively.

Dysfunctions in the cardiovascular and hematological systems also have the highest probability of leading to the development of postoperative sepsis. These findings suggest potential areas for future research to decrease the impact of the disease.

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INTRODUCTION

Sepsis is the most severe form of acute infection, characterized by a complicated syndrome that can lead to failure of numerous organs and ultimately end in mortality in 30-50% of patients. Sepsis, a significant contributor to illness and death on a global scale, ranks among the top 10 causes of mortality in the United States. The prevalence of sepsis is on the rise. During the 1970s, there were over 164,000 instances of sepsis reported annually in the United States. Studies conducted by the National Center for Health Statistics have shown that the occurrence of sepsis has increased from 221 cases per 100,000 individuals in 2000 to 377 cases per 100,000 individuals in 2008. This is an annual increase of 7% to 8%. A research conducted in Taiwan found that the

occurrence of severe sepsis increased from 135 cases per 100,000 individuals in 1997 to 217 cases per 100,000 individuals in 2006, representing an annual rise of around 3.9%. The expenses related to the treatment of sepsis have risen due to the growing need for medical equipment, medical supplies, and healthcare services aimed at improving sepsis outcomes [1, 2].

The Agency for Healthcare Research and Quality defines postoperative sepsis based on the Ninth Revision and Clinical Modification codes of the International Classification of Diseases (ICD-9-CM. The study included individuals aged 18 years or older who have received surgical interventions and have been hospitalized for at least 4 days after the operation. Postoperative sepsis is the primary type of sepsis, constituting almost one-third of all sepsis cases. Postoperative sepsis is a major cause of illness and death for patients in the hospital. It often leads to multiple organ failure and mortality [3].

Table 1 . The quick Sequential Organ Failure Assessment (qSOFA) is a tool used to identify patients with suspected infection who are at greater risk for a poor outcome, including sepsis. It's a simplified version of the SOFA score, designed for quick assessment in non-intensive care settings.

Criterion	**Description**	**Threshold**
Altered Mental Status	Change in consciousness or confusion	Glasgow Coma Scale (GCS) score of ≤ 13
Respiratory Rate	Increased breathing rate	≥ 22 breaths per minute
Systolic Blood Pressure	Low blood pressure	≤ 100 mmHg

DISCUSSION

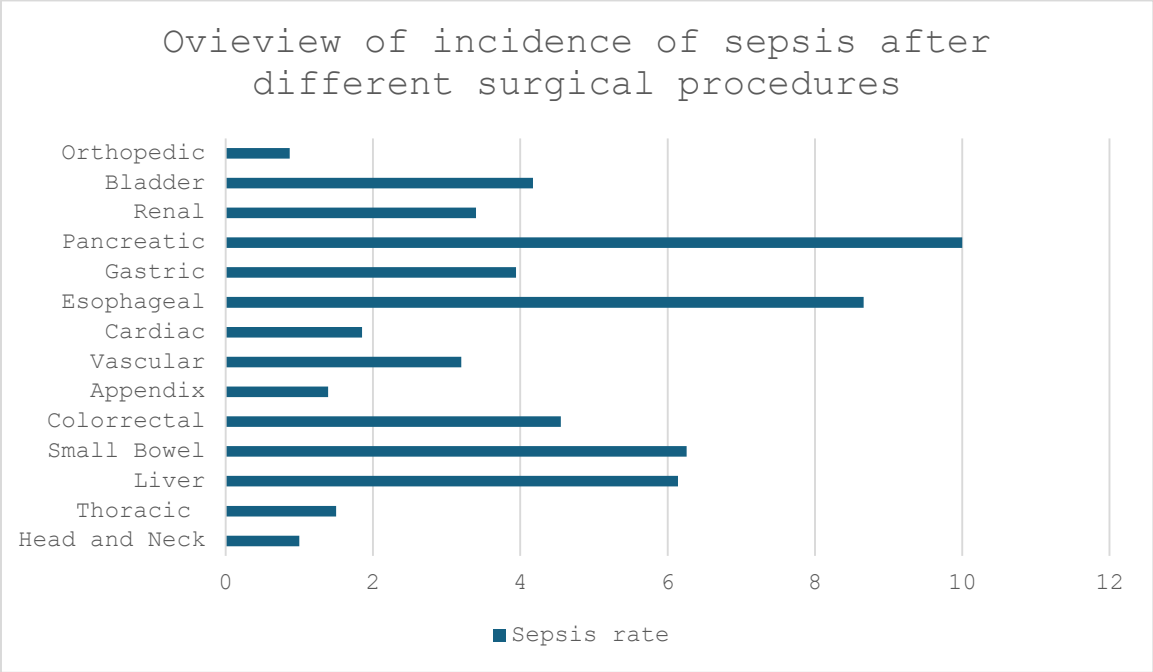
A study discovered that there is a higher likelihood of developing sepsis after undergoing surgical excision of the pancreas, either in its entirety or partially. The most prevalent complication after radical gastrectomy for stomach cancer is post-operative infection, which occurs through leukocyte depletion in transfusion patients. Postoperative infection is a life-threatening and hospitalization-inducing risk in patients who have undergone lower gastrointestinal surgery involving the small intestine, colon, rectum, or anus in the United States. Research has demonstrated that patients who had surgical esophagectomy faced a significant risk of postoperative complications, including sepsis and high fatality rates. The results were consistent with those found by researchers in the United States, suggesting that the greatest chances of postoperative sepsis in relation to general abdominal operations were linked to surgery involving the esophagus, stomach, pancreas, small bowel, and biliary system. In non-traumatic patients, open laparotomy is frequently performed due to intra-abdominal infection. This study found that patients aged 18-44 had a higher risk linked with pancreatic surgery, patients aged 45-64 had a higher risk connected with small bowel surgery, and patients aged 65 and beyond had a higher risk associated with splenic surgery. Furthermore, substantial data is suggesting that individuals have developed postoperative sepsis following a straightforward colonoscopic polypectomy, a technique considered to be safe, as a result of undiagnosed abdominal infections. The findings indicate that both intricate and ordinary abdominal operations have a substantial risk for the occurrence of postoperative sepsis [4, 5].

Being male or over the age of 65 significantly increased the likelihood of having postoperative sepsis. This increased risk has been regularly observed in numerous epidemiological research on sepsis and postoperative sepsis. Sex hormones significantly influence the way the body responds to sepsis. Elderly individuals may be more susceptible to postoperative sepsis due to the deterioration of their immune system function and age-related immunosenescence. Therefore, our findings supports the claim that being male and of older age may have significant influence on the occurrence of postoperative sepsis due to the control of sex hormone production and impaired immune function, respectively [4, 5].

An higher occurrence of postoperative sepsis was shown to be connected with several potential comorbidities and dysfunctions in organ systems. Patients with chronic renal illness, diabetes, and chronic heart failure had the highest risks of developing postoperative sepsis, ranked first, second, and third, respectively. Furthermore, the presence of chronic renal illness, diabetes, and chronic heart failure was found to be correlated with an increased probability of developing postoperative sepsis across all age groups. Consistent with the results of previous research, the chronic comorbidities indicated above were found to raise the probability of sepsis. Patients with these three chronic comorbidities may have an increased susceptibility to postoperative sepsis due to their association with an inflammatory response that leads to reduced and impaired functioning of leukocytes. These three chronic comorbidities are likely to have significant involvement in the development of postoperative sepsis. This is because they contribute to the formation of inflammation and malfunction in the immune system, as indicated by the available data [6].

An analysis was conducted on the malfunction of organ systems in all patients across all age groups. It was shown that dysfunctions in the cardiovascular and hematological systems had the highest probability of leading to the development of postoperative sepsis. The occurrence of sepsis was shown to be higher in individuals with malfunction of their organ systems. These findings corroborated the results of previous

research, which indicated that the cardiovascular and hematological systems have significant involvement in the progression of postoperative sepsis [7].



CONCLUSION

Patients who underwent various types of abdominal procedures, such as splenic, small bowel, pancreatic, gastric, and esophageal surgeries, had an increased probability of acquiring sepsis. Male and older patients demonstrated a significantly elevated susceptibility to developing postoperative sepsis compared to individuals in other groups. Chronic renal illness, diabetes, chronic heart failure, and malfunction in several organ systems, such as the cardiovascular and hematological systems, were shown to be linked to an increased risk of developing postoperative sepsis in patients of all ages. The main discovery of this study was the significant factors that indicate a higher chance of developing postoperative sepsis. These factors include being male or older, having splenic surgery, and having chronic renal comorbidities or cardiovascular system dysfunction. These findings suggest potential areas for future research to decrease the impact of the disease.

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