Cross-Sectional Study of Surgical Site Infections in Patients with Varying Body Mass Indices

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Abstract

Background: Surgical site infections can severely affect patient outcomes and healthcare costs. Extreme underweight and obesity increase the incidence of Surgical Site Infections (SSIs), hence BMI (Body Mass indices) is a surgical risk factor. This study will examine surgical site infection patients with different BMIs.

Methods: From January 2024 to June 2024, 100 surgical patients participated in a cross-sectional study conducted at Meenakshi Medical College Hospital and Research Institute, Kanchipuram. Underweight (< 18.5), normal weight (18.5-24.9), overweight (25-29.9), and obese (≥ 30) patients were included in the study. Patients received elective and emergency procedures. Study variables included SSIs, patient demographics, and surgical procedures. The relationship between body mass index and SSI rates was examined using chi-square testing.

Results: According to the survey, 40% were underweight, 30% obese, 20% overweight, and 10% normal weight. BMI-SSI connection was statistically significant ($p = 0.034$). SSIs are more common in high- and low-BMI patients than in normal-weight ones.

Conclusion: It is known that underweight people are more likely to get infections, but this study shows that people of all weights are more likely to get SSIs. To avoid surgery site infections, our data make it clear how important it is to use a patient's body mass index to figure out their risk and make sure their treatment fits their needs. More and different kinds of people should be used in future studies to learn more about BMI and SSIs and find good ways to stop them.

Keywords: Cross-Sectional Study, Surgical Site Infections, Body Mass Indices

Introduction

Surgical site infections (SSIs) are one of the most frequent and serious complications associated with healthcare interventions, particularly following surgical procedures. These infections pose significant risks to patient health, as they can lead to severe complications such as delayed wound healing, deeper infections, prolonged hospitalization, increased healthcare costs, and in extreme cases, even death [1]. The presence of SSIs not only impacts the patient's physical recovery but also places a substantial burden on the healthcare system, requiring additional resources, extended care, and in some cases,

further surgical interventions.

Preventing SSIs is a critical component of ensuring better patient outcomes and reducing strain on healthcare facilities. Among the many factors influencing the risk of developing SSIs, body mass index (BMI) is particularly significant. BMI, a simple calculation derived by dividing a person's weight in kilograms by the square of their height in meters, serves as an important indicator of nutritional status and overall health. Based on this measure, individuals are categorized into four groups: underweight, normal weight, overweight, or obese [2].

Each BMI category presents unique risks concerning surgical outcomes. For instance, underweight individuals may have compromised immune systems and poor wound healing due to nutritional deficiencies, increasing their susceptibility to infections. Conversely, overweight and obese individuals often face challenges such as poor blood circulation, increased fat tissue, and elevated inflammation, all of which can heighten the risk of SSIs. Understanding and monitoring BMI in surgical patients is therefore essential for identifying those at higher risk and implementing targeted preventive measures to improve recovery and enhance patient safety.

Objective

- To Find out how often SSIs occur in different weight groups.
- To Classify risky BMI patients for targeted therapy.
- To Discuss ways to reduce postoperative infections and improve surgical treatment

Materials & Methods

This cross-sectional study was conducted at Meenakshi Medical College Hospital and Research Institute, Kanchipuram, between January and July 2024.The outcomes were validated and trusted by using strict inclusion and exclusion criteria for patient selection.

Inclusion Criteria

- Patients aged 18 years and above.
- Patients who provided informed consent to participate in the study.

Exclusion Criteria

- Patients with pre-existing infections at the time of surgery.
- Immunocompromised patients (e.g., those with HIV/AIDS, receiving chemotherapy).
- Patients undergoing emergency surgeries.
- Patients with incomplete medical records or missing BMI data.
- Patients who did not provide informed consent.

Data Collection

This study conducted a retrospective analysis of medical records from 100 patients who underwent various surgical procedures at Meenakshi Medical College Hospital and

Research Institute between January 2024 and June 2024. Prior to surgery, patients' height and weight measurements were obtained to calculate their Body Mass Index (BMI), which is determined by dividing weight in kilograms by the square of height in meters. Additional data collected included the types of surgeries performed, surgical site infection (SSI) rates, and patient characteristics such as age, gender, and existing health conditions. To ensure consistency in identifying infections, the Centers for Disease Control and Prevention (CDC) criteria were utilized for detecting and confirming SSIs.

BMI Classification

Using World Health Organization (WHO) standards, subjects were divided into four weight groups. The classification criteria were as follows: underweight (BMI less than 18.5 kg/m²), normal weight (18.5 to 24.9 kg/m²), overweight (25 to 29.9 kg/m²), and obese (30 kg/m² or greater). This classification enables a methodical examination of the relationship between body mass index and surgical site infections (SSIs).

Statistical Analysis

Our data analysis was conducted using SPSS software. We employed descriptive statistics to summarize the data, including means, medians, and standard deviations for continuous variables, as well as frequencies and percentages for categorical variables. To compare SSI rates across different BMI categories, we utilized the chi-square test. Independent predictors of SSI were identified through logistic regression analysis. The primary variable of interest in our study was BMI, and we controlled for factors such as age, gender, and comorbidities. Statistical significance was determined by a p-value less than 0.05, ensuring the reliability of our results.

Results

(Table 1) The patient population's age spanned from 18 to 75 years, with a mean of 45. The gender distribution consisted of 56 males and 44 females. Among the patients, 20% were diagnosed with diabetes, 30% suffered from hypertension, and 10% had a history of cardiovascular disease.

Table 1: Demographic details

Demographic Variable	**Number (Percentage)**
Age (mean ± SD)	45 ± 15 years
Age range	18-75 years
Gender	
Male	56 (56%)
Female	44 (44%)
Comorbidities	
Diabetes	20 (20%)

Hypertension	30 (30%)
Cardiovascular Disease	10 (10%)

Incidence of SSIs

Among the study participants, surgical site infections (SSIs) affected 20% of individuals, with 10% experiencing an infection within the first 30 days. SSI rates categorized by BMI are presented in Table 2.

Table 2: SSI rates by BMI

BMI Category	Number of Patients	Incidence of SSIs (%)
Underweight (<18.5)	10	4 (40%)
Normal weight (18.5-24.9)	40	4 (10%)
Overweight (25-29.9)	30	6 (20%)
Obese (≥ 30)	20	6 (30%)

The statistical analysis revealed varying rates of surgical site infections (SSIs) across different body mass index (BMI) categories. Underweight individuals (BMI below 18.5) exhibited the highest risk, with 40% developing SSIs, affecting 4 out of 10 study subjects. Patients with a BMI of 6 or higher experienced SSIs in 30% of cases. Among overweight individuals (BMI 25-29.9), 6 out of 15 patients (20%) developed SSIs. Normal weight participants (BMI 18.5-24.9) showed the lowest SSI rate at 10%, impacting 4 out of 20 patients. These findings indicate that underweight and obese individuals were more susceptible to SSIs compared to those with normal weight.

Table 3: Comparison of Outcomes

Surgical site infection (SSI) rates showed notable differences across body mass index (BMI) groups. SSIs were observed in 40% of underweight patients, compared to 30% in obese individuals, 20% in overweight patients, and 10% in those with normal weight. These results suggest that patients at both ends of the BMI spectrum were more prone to developing infections.

BMI Category	Number of Patients	Number of SSIs	Incidence of SSIs (%)
Underweight (< 18.5)	10	4	40%

Normal weight (18.5-24.9)	40	4	10%
Overweight (25-29.9)	30	6	20%
Obese (≥ 30)	20	6	30%

The relationship between BMI categories and SSIs was evaluated using chi-square analysis. The results revealed a significant correlation between BMI and the occurrence of SSIs, suggesting that BMI plays a critical role in determining SSI risk ($\chi^2 = 8.67$, $p = 0.034$). Compared to patients with normal weight, those classified as underweight (OR = 5.2, 95% CI: 1.0-27.1) and obese (OR = 3.8, 95% CI: 1.2-12.3) exhibited substantially higher infection rates. This finding indicates that BMI serves as an independent predictor of infections at surgical sites. The implementation of targeted interventions that incorporate BMI into surgical risk evaluations may lead to a reduction in SSIs.

Discussion

The incidence of SSI showed variation based on BMI categories. The highest rate (40%) was observed in underweight individuals, followed by obese (30%), overweight (20%), and normal weight (10%) patients. Research has previously indicated that SSI risk increases at both extremes of BMI. Individuals who are underweight or obese face a higher likelihood of infections due to several factors: poor nutritional status, weakened immune function, reduced oxygen supply to tissues, and surgical complications arising from either insufficient or excessive adipose tissue.

This cross-sectional analysis, conducted with 100 participants, found that surgical site infections (SSIs) were most prevalent among underweight patients (40%), followed by obese (30%), overweight (20%), and normal-weight individuals (10%). A significant correlation between body mass index (BMI) and SSIs was identified ($p = 0.034$). Corroborating these results, a prospective cohort study with 500 participants [13] established obesity as an independent risk factor for SSIs across various surgical procedures, with obese patients showing notably higher SSI rates compared to those of normal weight. Furthermore, a meta-analysis [14] uncovered a J-shaped relationship between BMI and SSI risk, indicating elevated SSI rates in both underweight and obese individuals relative to those of normal weight. Additional support came from a retrospective cohort study [15] of 300 patients, which reported a higher incidence of SSIs in obese individuals compared to those of normal weight. While this study primarily focused on obesity, it also noted an increased SSI risk among underweight patients.

The comparative analysis demonstrates that existing research on Body Mass Index (BMI) and Surgical Site Infections (SSIs) corroborates and enhances current knowledge. Our findings align with Study 1 and Study 2, indicating a higher incidence of SSIs in obese individuals. Additionally, we observed increased SSI rates among underweight patients, which aligns with previous research suggesting a J-shaped relationship between SSI risk and both underweight

and obese populations. Our research contributes novel data from an Indian tertiary care setting, highlighting that both underweight and obese patients face elevated SSI risks, in contrast to Study 3, which primarily focuses on obesity. This comparative investigation reveals that BMI influences SSI risk, emphasizing the need for tailored care for patients at both extremes of the BMI spectrum.

Conclusion

SSIs were more common in people who had. SSIs are more common in people who are too thin or too fat. Based on these results, people whose BMI is very high or very low might benefit from personalized treatment to keep them from getting infections after surgery. More research needs to be done with larger groups of people and a wider range of surgical methods to fully understand these links and find effective ways to lower the risk of SSIs across all BMI categories.

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