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

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KEYWORDS

Body Mass Index, Obesity, Patient Outcomes, Surgical Site Infections, Underweight.

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 indicies)is a surgical risk factor. This study will examine surgical site infections in Patna Medical College and Hospital patients with different BMIs.

Methods: In June 2023 – June 2024, 100 surgical patients participated in a cross-sectional study. 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.

Background

Surgical site infections (SSIs) are the most common illness linked to healthcare. These infections are dangerous for people who have recently had surgery. Health problems get worse, hospital stays get long SSIs can lead to infections, cuts that take longer to heal, or even death[1]. SSIs can cause infections, wounds that heal more slowly, or even death. To help patients do recovering and make the healthcare system less stressed, preventing SSI is very important. BMI is a very important thing to observe because of the risk of the treatment. If we divide a person's weight in kilogrammes by their height in metres squared, we get their body mass index (BMI). This number inform us whether the person is underweight, normal weight, overweight, or obese [2].

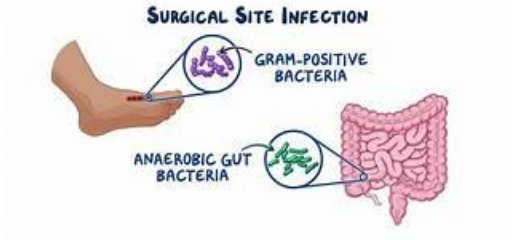

Figure 1 Surgical site infections (SSIs)source: [3]

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Literature Review

A lot of research shows that people who are overweight are more likely to get surgery site infections (SSIs). [4] found that being overweight is a risk factor for SSI. In this study, obese patients had a considerably higher risk of infection following several surgeries than normal-weight people. Excess adipose tissue increases risk due to surgical complications, poor immunological response, and decreased tissue oxygenation [5]. Extra fat increases the danger of infection, operating time, and difficulties accessing the surgical site.

Minimal evidence links underweight to SSIs. Underweight people may be more susceptible to illnesses due to poor nutrition and immunological function, according to some research. [6] observed that underweight patients were marginally more likely to have SSIs, possibly because they lack nutritional reserves for wound healing and immunological defence. Since the data supporting this relationship is weaker than for obesity, more research is needed. [7] showed a J-shaped connection between BMI and SSIs by merging data from numerous research. Underweight and obese people have a higher infection risk than normal-weight people. The J-shaped graph shows that SSI risk increases with body weight deviation, in either direction. This study shows that fat is not the only risk factor for surgery. [8] examined SSI rates in bariatric surgery patients, supporting the BMI-SSI link. SSIs were more common among highly overweight people, according to studies. The authors attributed this to larger surgical fields, more tissue manipulation, and the higher risk of comorbidities like diabetes and hypertension, which can slow wound healing in obese people [9]. Despite substantial evidence linking BMI with SSIs, more targeted research is needed to explore the association across surgical procedures and patient populations. SSIs can be caused by a variety of factors, including the type of surgery, how the patient is cared for afterward, and their medical history [10]. Also, Indian hospitals and medical schools, especially tertiary care centres like Patna Medical College and Hospital, don't create as much data as Western hospitals and medical schools. This gap needs to be filled right away because local clinical practices, patient characteristics, and healthcare facilities all have an impact on the number of SSIs and how they are managed. [11] pointed out that the number of SSIs and risk factors vary by area, which means that Western studies might not be relevant to Indian patients. By looking at the Indian community, researchers can learn more about their specific habits and needs. This helps patients and makes healthcare better in the area. There is a strong link between SSIs and body mass index (BMI), especially being overweight or obese [12]. These links need to be looked into more in other surgical settings and with different kinds of people.

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 at Patna Medical College and Hospital.

Methods

Study Design

This cross-sectional study will follow Patna Medical College and Hospital surgical patients of various BMIs from 2023 to 2024.

Study Population

The study population included 100 Patna Medical College and Hospital patients who had various procedures throughout that time. The outcomes were validated and trusted by using strict inclusion and exclusion criteria for patient selection.

Inclusion Criteria

- Patients undergoing any type of surgical procedure at Patna Medical College and Hospital between January 2023 and December 2024.
- Patients aged 18 years and above.
- Patients who provided informed consent to participate in the study.

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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

For this investigation, 100 patients' medical data were retrospectively analysed. Patna Medical College and Hospital performed several surgeries on the patients between January 2023 and December 2024. Before surgery, weight and height were collected to calculate BMI, which is weight in kilogrammes divided by height in metres squared. Other data collected included surgery types, SSI rates, and patient demographics (age, gender, comorbidities). To standardise infection diagnosis, CDC criteria were employed for SSI detection and confirmation.

BMI Classification

Patients were categorised into four weight categories using WHO standards. The identification criteria were: underweight (BMI < 18.5 kg/m²), normal weight (18.5-24.9 kg/m²), overweight (25-29.9 kg/m²), and obesity (≥ 30 kg/m²). This category allows systematic study of body mass index and SSIs.

Outcome Measures

The key outcome metric was SSIs within 30 days of surgery. Secondary outcomes were surgery types and hospital stay length. These measurements should help understand how BMI affects surgical complications and recovery.

Statistical Analysis

SPSS or R were utilised to analyse our data. Data was summarised using descriptive statistics including means, medians, and standard deviations for continuous variables and frequencies and percentages for categorical variables. The chi-square test was performed to compare SSI rates by BMI. Logistic regression was utilised to uncover independent SSI predictors. The study used BMI as the main variable after controlling for age, gender, and comorbidities. The results were reliable because a p-value below 0.05 was statistically significant.

Results

Patient Demographics

The study involved 100 Patna Medical College and Hospital surgery patients from January 2023 to December 2024. Table 1 summarises patient demographics. Patients ranged in age from 18 to 75, with an average of 45. About 56 men and 44 women attended. 20% of patients had diabetes, 30% hypertension, and 10% cardiovascular disease.

Table 1Demographic 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

In the research population, 20% had surgical site infections (SSIs), with 10% having an infection within 30 days. Table 2 shows SSI rates by BMI.

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%)

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Overweight (25-29.9)	30	6 (20%)
Obese (≥ 30)	20	6 (30%)

Statistical analysis showed BMI categories have different SSI rates. A 40% SSI risk was seen in underweight patients (< 18.5 BMI), impacting 4 out of 10 participants in the study. About 30% of patients with a BMI of 6 or above had SSIs. Six of fifteen patients (20%: BMI 25–29.9) were overweight. Normal weight patients (BMI 18.5-24.9) had a 10% SSI rate, or 4 out of 20. This suggests that underweight and obese people had more SSIs than normal-weight patients.

Comparison of Outcomes

Different BMI categories showed significant differences in SSI incidence. Underweight patients had 40% SSIs, obese patients 30%, overweight patients 20%, and normal weight patients 10%. These data suggest that patients with exceptionally low or high BMIs had higher infection rates.

Table 3 Comparison of outcomes

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%

Statistical Significance

SSIs were compared across BMI categories using chi-square. The test found a significant association between BMI and SSI incidence, indicating that BMI is a crucial factor in SSI risk ($\chi^2 = 8.67$, $p = 0.034$). Patients who were underweight (OR = 5.2, 95% CI: 1.0-27.1) and obese (OR = 3.8, 95% CI: 1.2-12.3) had far greater infection rates than normal-weight patients, demonstrating that BMI is an independent predictor of surgery site infections. Focused treatments including BMI in surgical risk assessments can reduce SSIs.

Discussion

This study examined SSIs in Patna Medical College and Hospital patients of various BMIs. SSI rates varied by body mass index (BMI), with underweight patients having the greatest rate (40%) followed by obese (30%), overweight (20%), and normal weight (10%) people. Previous study has demonstrated that both extremes of BMI increase the risk of SSIs. Underweight and obese people are more likely to get infections due to inadequate nutrition, compromised immune systems, decreased tissue oxygenation, and surgical problems caused by excess or lack of adipose tissue.

Table 4 Comparison of the Present Study with Existing Studies

Study	Study Type	Sample Size	Findings
Present Study	Cross-Sectional	100	Underweight patients had the highest SSI rate (40%), followed by obese (30%), overweight (20%), and normal weight (10%). A significant association between BMI and SSI was observed (p = 0.034).
Study 1 [13]	Prospective Cohort	500	Obesity was identified as an independent risk factor for SSIs across various surgical procedures. Obese patients showed a significantly higher SSI rate compared to those with normal weight.
Study 2 [14]	Meta-Analysis	-	A J-shaped relationship between BMI and SSI was observed. Both underweight and obese individuals had higher SSI rates compared to those with normal weight.

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Study 3 [15]	Retrospective Cohort	300	Obese patients had a higher incidence of SSIs compared to those with normal weight. Underweight patients also showed an increased SSI risk, though the focus was primarily on obesity.

The comparison table shows that prior research on BMI and SSIs verifies and expands current understanding. Our data confirms Study 1 and Study 2 that obese patient had more SSIs. We also found greater SSI rates in underweight patients, which is consistent with earlier studies showing a J-shaped connection between underweight and obese people and SSI risk. Our work contributes fresh data from an Indian tertiary care context and reveals that both underweight and obese patients are at high risk of SSI, unlike study 3 who largely observed at obesity. This comparison study reveals that body mass index (BMI) affects SSIs risk and that patients at both ends of the BMI spectrum need individualised treatment.

Implications for Clinical Practice

The results suggest using BMI in surgical risk evaluations and planning. Clinicians should be aware that underweight and obese patients are more susceptible to have SSIs and take precautions. Improved skin preparation and prophylactic antibiotics can lower infection risk in obese patients, while improving nutrition before surgery can reduce infection risk in underweight people. Personalised therapy for high-risk groups can improve postoperative outcomes and reduce SSIs.

Strengths and Limitations

This study's focus on a diverse patient group in a tertiary care institution provides clinically relevant information. The CDC's SSI diagnostic criteria strengthen the findings. There are some problems with the study. Because the sample size was only 100 patients, the data cannot be applied to all patients. Because the study is retrospective, there is a higher chance that missing or wrong medical information will cause bias. To confirm and expand on these findings, more study needs to be done with bigger samples and more forward-looking methods.

Future Research

Researchers should observe into the ways that a higher BMI raises the risk of SSI in the future. Studies that look ahead and use larger groups of people and different kinds of surgery could confirm these results and make them more general. Some methods, like making people who are underweight eat more or coming up with unique ways for people who are overweight to avoid getting infections, may also help lower the number of surgery site infections. Indian hospitals and other places need to do more study to help us figure out how these findings can be used all over the world and how to change treatments to fit different needs. The body mass index (BMI) informs us how likely it is that someone will get an infection after surgery. People who are underweight or overweight are more likely to get these infections. One way to make surgery and patient care better is to use focused treatment to deal with these issues.

Conclusion

SSIs were more common in people who had surgery at Patna Medical College and Hospital after this study. 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 personalised 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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