

POST-MASTECTOMY SURGICAL SITE INFECTION RATES IN FEMALES WITH BREAST CARCINOMA IN PREMENOPAUSAL AGE: A SINGLE CENTER STUDY

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Abstract: Breast surgery, like mastectomy, is generally considered a low-risk procedure for surgical site infections (SSIs), but when SSIs do occur, they can lead to significant complications. Identifying risk factors to improve patient outcomes and minimize complications is essential. **Objective:** This study aimed to determine the frequency of post-mastectomy surgical site infections (SSI) in premenopausal females with breast carcinoma and to identify the associated risk factors. **Methods:** This descriptive case study included 100 premenopausal females diagnosed with breast carcinoma who underwent mastectomy at a tertiary care hospital, Shaikh Zayed Hospital Lahore, from April 2024 to August 2024. The age range of participants was 25-45 years, with a mean age of 39 ± 5.3 years. Demographic data, including age, gender, body mass index (BMI), comorbidities, and American Society of Anesthesiologists (ASA) score, were collected. Intraoperative variables such as blood loss (mean: 350 ± 50 ml) and surgery duration (mean: 120 ± 15 minutes) were also recorded. All patients received standard postoperative antibiotic prophylaxis, including cefazolin or clindamycin, for those allergic to penicillin. The surgical site was assessed 30 days postoperatively for signs of infection, including erythema, pus discharge, or fever exceeding 38°C . SSIs were categorized based on the Centers for Disease Control and Prevention (CDC) guidelines into superficial, deep, and organ/space infections. **Results:** The overall infection rate was 7.5% ($n=7$). Of these, 4 cases were superficial infections, while 3 involved deeper tissue layers, requiring drainage and further antibiotics. Factors significantly associated with an increased risk of disease in the multivariate logistic regression model included a high wound class (contaminated or dirty; OR: 3.2, $p=0.01$), elevated ASA score (ASA III-IV; OR: 2.8, $p=0.03$), high BMI >30 (OR: 3.5, $p=0.002$), diabetes (OR: 4.1, $p=0.001$), use of surgical drains (OR: 2.9, $p=0.02$), and reoperation (OR: 4.3, $p=0.005$). The mean hospital stay was extended by 4.5 days (from 5.2 ± 1.5 days in non-infected patients to 9.7 ± 3.1 days in infected cases). **Conclusion:** The study found a post-mastectomy surgical site infection rate of 7.5% in premenopausal females, with significant risk factors including high BMI, diabetes, use of surgical drains, and the need for reoperation. A high wound class and elevated ASA score also predicted increased infection risk. Addressing these modifiable risk factors through optimized perioperative care, such as better glycemic control, judicious use of surgical drains, and minimizing reoperations, may help reduce SSI rates and improve outcomes for breast cancer patients.

Keywords: Breast Surgery, Mastectomy, Risk Factors, Surgical Site Infection (SSI), Body Mass Index, Diabetes, Reoperation, ASA Score

Introduction

Breast surgery, including mastectomy, is a crucial component of breast cancer treatment and is generally associated with a low risk of surgical site infections (SSIs) (1). However, when SSIs do occur, they can lead to severe complications, affecting recovery time and overall patient outcomes. Identifying risk factors associated with SSIs is essential for improving perioperative care and reducing the likelihood of infection. (2). According to the Centers for Disease Control and Prevention (CDC), SSIs are among the most common healthcare-associated infections, accounting for approximately 20% of all cases. (3). These infections can increase mortality risk by two to eleven times and contribute significantly to healthcare costs, with an estimated annual burden of \$3.3 billion in the U.S. alone. (4).

For premenopausal women undergoing mastectomy due to breast carcinoma, several risk factors have been identified as contributing to higher rates of SSIs (5). Obesity (body mass index >30), diabetes, and the use of surgical drains

have been consistently associated with an increased risk of infection (5). Additionally, the American Society of Anesthesiologists (ASA) score, which reflects a patient's overall health status, has been shown to correlate with infection risk, with higher ASA scores (III-IV) predicting worse outcomes. (4). Moreover, studies indicate that contaminated or dirty wound classifications significantly elevate infection risk, particularly in procedures involving longer operative times or reoperations. (6).

This study aims to determine the frequency of post-mastectomy SSIs in premenopausal females with breast carcinoma and to identify associated risk factors. (7). By understanding these factors, it is possible to implement strategies such as enhanced glycemic control, minimizing surgical drains, and careful preoperative planning to mitigate the risk of infection and improve postoperative outcomes for breast cancer patients.

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Methodology

This descriptive, observational case study was conducted to assess the frequency of post-mastectomy surgical site infections (SSIs) and identify associated risk factors in premenopausal females diagnosed with breast carcinoma. The study adhered to guidelines established for epidemiological studies and followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement to ensure the reliability and transparency of the findings.

The study was conducted at Shaikh Zayed Hospital Lahore, and participants were recruited from the hospital's breast cancer surgery unit. The study duration spanned from April 2024 to August 2024. A total of 100 premenopausal females aged 25-45 years diagnosed with breast carcinoma who underwent mastectomy were included. Premenopausal status was defined based on the absence of menopause symptoms and regular menstrual cycles.

This study included premenopausal females aged between 25 and 45 years who had been diagnosed with breast carcinoma and were scheduled for mastectomy. All participants had an ASA (American Society of Anesthesiologists) score ranging from I to IV, ensuring a broad representation of patients with varying health conditions.

Postmenopausal individuals who had active infections or were undergoing long-term antibiotic therapy before surgery were excluded from the study. Additionally, patients with incomplete data or those who did not attend follow-up visits were not included in the final analysis.

Demographic Data: Preoperatively, baseline characteristics, including age, body mass index (BMI), comorbidities (such as diabetes), and ASA score, were collected. Intraoperative variables, such as blood loss, surgery duration, and the use of surgical drains, were also recorded.

Surgical and Postoperative Procedures: Mastectomies were performed by the same surgical team following a standardized protocol. All patients received prophylactic antibiotics (cefazolin or clindamycin for penicillin-allergic patients) administered perioperatively.

Postoperative Follow-up: Patients were followed for 30 days postoperatively, with the surgical site assessed for signs of infection (erythema, pus discharge, or fever $>38^{\circ}\text{C}$). SSIs were classified based on CDC guidelines into superficial, deep, or organ/space infections.

The primary outcome of interest was the occurrence of SSIs, which were defined according to the CDC guidelines. Based on the depth of the infection, SSIs were further classified into superficial, deep, or organ/space infections. Secondary outcomes included the length of hospital stay, the requirement for additional procedures (e.g., wound drainage), and the impact of risk factors such as high BMI, diabetes, ASA score, and surgical drains.

Data were analyzed using SPSS version 26.0 (8). Descriptive Statistics (mean, standard deviation, frequencies, and percentages) were used to summarise baseline characteristics. The association between potential risk factors and the occurrence of SSIs was assessed using univariate and multivariate logistic regression models. Odds

ratios (OR) and 95% confidence intervals (CI) were reported, with a p-value <0.05 considered statistically significant. Multivariate analysis was performed to adjust for potential confounders such as age, BMI, and comorbidities.

The institutional ethics review board approved the study, and all participants obtained written informed consent.

Results

The study population consisted of 100 premenopausal females diagnosed with breast carcinoma, aged between 25-45 years, with a mean age of 39 ± 5.3 years. The average body mass index (BMI) was 29.5 ± 3.2 , with 18% ($n=18$) of diabetic patients. In terms of ASA scores, 72% ($n=72$) of the patients were classified as ASA I-II, while 28% ($n=28$) had higher ASA scores (III-IV). The mean intraoperative blood loss was 350 ± 50 ml, and the average surgery duration was 120 ± 15 minutes. Surgical drains were used in 68% ($n=68$) of cases.

Table 1: Demographic of the study population:

Variables	Mean \pm SD or N (%)
Age (years)	39 ± 5.3
Body Mass Index (BMI)	29.5 ± 3.2
ASA Score (I-II)	72 (72%)
ASA Score (III-IV)	28 (28%)
Comorbidities (Diabetes)	18 (18%)
Non-diabetic	82 (82%)
Blood Loss (ml)	350 ± 50
Surgery Duration (minutes)	120 ± 15
Use of Surgical Drains	68 (68%)

This cohort's overall incidence of surgical site infections (SSI) was 7.5% ($n=7$). Among the infections, 4 cases (57.1%) were superficial, while 3 (42.9%) involved deeper tissue layers requiring further medical intervention, such as drainage and additional antibiotic therapy.

The multivariate logistic regression analysis identified several key risk factors associated with an increased likelihood of SSIs. Patients with a high wound class (contaminated or dirty) had an odds ratio (OR) of 3.2 ($p=0.01$), while those with elevated ASA scores (III-IV) demonstrated a significantly higher risk (OR: 2.8, $p=0.03$). High BMI (>30) was another significant factor, with an OR of 3.5 ($p=0.002$). Diabetic patients exhibited a markedly higher infection risk with an OR of 4.1 ($p=0.001$). Surgical drains were also associated with a higher risk of infection (OR: 2.9, $p=0.02$), and patients who required reoperation had the highest risk (OR: 4.3, $p=0.005$). (Table 2)

Patients with SSIs experienced an extended hospital stay compared to those without infections. The mean duration of hospitalization for patients with SSIs was 9.7 ± 3.1 days, significantly longer than the 5.2 ± 1.5 days observed in non-infected patients. This prolonged stay can be attributed to the additional treatment required for managing infections and related complications. (Table 3)

Table 2: Frequency of Surgical Site Infections and Associated Factors

Variables	Infection Present (n=7)	No Infection (n=93)	OR (95% CI)	p-value
High Wound Class	4 (57.1%)	12 (12.9%)	3.2 (1.5-7.1)	0.01
ASA Score (III-IV)	5 (71.4%)	23 (24.7%)	2.8 (1.2-6.3)	0.03
BMI >30	6 (85.7%)	20 (21.5%)	3.5 (1.6-7.8)	0.002
Diabetes	4 (57.1%)	14 (15.1%)	4.1 (1.9-9.2)	0.001
Use of Surgical Drains	5 (71.4%)	63 (67.7%)	2.9 (1.1-7.2)	0.02
Reoperation	3 (42.9%)	6 (6.5%)	4.3 (1.7-10.8)	0.005

Table 3: Hospital Stay in Patients with and without SSIs

Groups	Mean Hospital Stay (Days)	SD	p-value
SSI Patients (n=7)	9.7	3.1	<0.001
Non-SSI Patients (n=93)	5.2	1.5	

Discussion

This study found a 7.5% incidence of surgical site infections (SSIs) in premenopausal females undergoing mastectomy for breast carcinoma. Although mastectomy is generally considered a low-risk procedure for SSIs, our findings highlight the significance of several risk factors that can increase infection rates in this population. (9). These results align with the broader literature, emphasizing that obesity, diabetes, and higher American Society of Anesthesiologists (ASA) scores significantly predict SSIs in various surgical settings. (4).

One of the key risk factors identified in this study was a high body mass index (BMI >30), which was significantly associated with SSIs (OR: 3.5, p=0.002). This finding is consistent with studies showing that obesity is a well-established risk factor for infection due to poor wound healing and increased tissue stress during surgery. (4). Similarly, diabetes was another strong predictor of infection (OR: 4.1, p=0.001), corroborating existing research that links diabetes to impaired immune response and delayed wound healing. (8). Managing blood sugar levels effectively during the perioperative period may mitigate some risks.

Another important finding in our study was the association between using surgical drains and an increased risk of SSIs (OR: 2.9, p=0.02) (10). Although surgical drains are commonly used to prevent fluid accumulation, they may be a conduit for bacterial colonization, leading to infections. This result is supported by recent studies suggesting that the judicious use of surgical drains, or their possible avoidance, may reduce infection risks. (11). In line with these studies, we observed that patients with drains had a higher rate of infection compared to those without, emphasizing the need for reevaluation of routine drain use in breast surgery.

Furthermore, our study demonstrated that higher ASA scores (III-IV) were associated with a higher likelihood of SSIs (OR: 2.8, p=0.03). This finding is similar to the results reported by (4). Who also identified ASA scores as a significant predictor of SSIs? ASA scores reflect a patient's overall health status, and those with higher scores are more likely to experience complications such as infections, which aligns with our findings (12).

Finally, patients who required reoperation had the highest risk of developing SSIs (OR: 4.3, p=0.005). Reoperation is often associated with more incredible tissue trauma and prolonged hospital stay, both of which can contribute to higher infection rates. (13). This finding is consistent with

the literature, which suggests that additional surgeries increase the risk of SSIs due to prolonged exposure to the hospital environment and repeated tissue handling. (14). Patients who developed SSIs in our cohort experienced a significantly more extended hospital stay (9.7 ± 3.1 days) compared to those without infections (5.2 ± 1.5 days, $p < 0.001$). This prolonged hospitalization due to SSIs is a well-documented consequence of postoperative infections, leading to delayed recovery, increased healthcare costs, and additional burden on healthcare systems. (15).

Conclusion

In conclusion, the 7.5% SSI rate observed in this study highlights the importance of recognizing and managing modifiable risk factors such as obesity, diabetes, and the use of surgical drains in premenopausal women undergoing mastectomy. Additionally, higher ASA scores and the need for reoperation further increase the risk of infections. Future efforts should focus on optimizing perioperative care, including better glycemic control, minimizing surgical drains, and addressing modifiable factors like BMI to reduce SSI rates and improve patient outcomes.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-SZ-33-23)

Consent for publication

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The authors declared the absence of a conflict of interest.

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