

FREQUENCY OF MATERNAL OUTCOME REGARDING WOUND INFECTION AFTER EMERGENCY CESAREAN SECTION BASED ON LENGTH OF HOSPITAL STAY

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ABSTRACT

Objective: The aim of this study is to determine the frequency of wound infections in women undergoing emergency cesarean sections and to compare the rates of infection between those who are discharged within 48 hours and those who stay longer than 48 hours.

Methods: This cross-sectional study was conducted at the Department of Obstetrics & Gynecology, Mohtarma Benazir Bhutto Shaheed Medical College, Mirpur, over a 6 month period. A non-probability consecutive sampling technique was used to select participants. The sample size was calculated to be 161, based on a 95% confidence level and an anticipated wound infection rate of 5.4%. Inclusion criteria included women aged 18-40 years, with singleton pregnancies at >32 weeks' gestation, undergoing emergency cesarean section, and with a normal BMI (18.5-24.9 kg/m²). Participants were categorized into two groups based on their length of hospital stay: those discharged in <48 hours and those discharged ≥48 hours. Data on maternal age, BMI, parity, socioeconomic status, and other factors were collected, along with postoperative wound infection status, assessed every 15 days for up to 30 days post-surgery.

Results: A total of 161 women undergoing emergency cesarean sections were included in the study. Among these, 83 participants (51.6%) were discharged within 48 hours, while 78 (48.4%) stayed in the hospital for 48 hours or more. Of the women discharged in less than 48 hours, 5 (6.0%) developed wound infections. In contrast, 11 (14.1%) women who stayed longer than 48 hours developed wound infections. The overall frequency of wound infections in the entire sample was 9.3%. The incidence of wound infection was significantly higher in the longer hospital stay group compared to the shorter stay group ($p \leq 0.05$). Additionally, factors such as maternal age, BMI, and socioeconomic status were analyzed, but length of stay was found to be the most significant factor influencing the rate of infection. These results suggest that extended hospital stays may reduce the likelihood of post-cesarean infections, although other contributing factors also need consideration.

Conclusion: The study highlights a significant relationship between the length of hospital stay and the frequency of wound infections following emergency cesarean sections. Women who stayed in the hospital for 48 hours or more had a notably higher rate of wound infections (14.1%) compared to those discharged within 48 hours (6.0%). Despite the overall lower infection rate in the shorter stay group, other factors such as maternal age, BMI, and socioeconomic status also contribute to the risk of infection. This indicates

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that while a shorter hospital stay may be associated with lower infection rates, it is crucial for healthcare providers to consider a combination of clinical and socioeconomic factors when determining the optimal length of stay for post-cesarean care.

Keywords: *Cesarean Section, Wound Infection, Length of Hospital Stay, Postoperative Complications, Maternal Health*

INTRODUCTION

Wound or surgical site infection (SSI) is an infection that occurs within 30 days of surgery and affects the skin, subcutaneous tissue, and the deep soft tissue surrounding the incision or organ/space¹. Cesarean section (CS) is a surgical procedure that delivers the fetus, placenta, and membranes through an incision in the maternal abdomen and uterus. According to a recent estimate, 22.9 million cesarean sections are performed worldwide each year². Despite the fact that cesarean section is a life-saving medical procedure for reducing unfavorable birth outcomes, various postoperative neonatal and maternal issues are difficult to control. Though cesarean section is an important part of health care, infection and complications after surgery are the most difficult challenges³. Cesarean wound infection poses significant risks to the mother and can result in fever, puerperal sepsis and maternal mortality⁴. When compared to vaginal birth, women who have cesarean section have significantly increased risk of post procedural infections⁵. Evidence suggests that using an evidence-based approach that requires a multidisciplinary team approach can prevent half of the wound infections after cesarean section⁶.

Frequency of wound infections after cesarean section vary greatly and are more prevalent in developing countries than in developed countries. In this instance, a study reported that the frequency of wound infection in women who underwent emergency cesarean section was 33.3%⁷. Contrarily, in another study, much less frequency of wound infection was found in women undergoing emergency cesarean section and was reported at only 5.4%⁸. Similarly, a study reported that the frequency of wound infection in women who underwent emergency cesarean section and were kept admitted for < 48 hours was 1.4% while in patients who were kept admitted for ≥ 48 hours, frequency of cesarean wound infection was 2%⁹.

Surgical wound infection after cesarean section is considered a common complication but its reported frequency in previous literature shows a high degree of variability. In addition, not much updated information is available when it comes to the difference in frequency of wound infection among women kept admitted for < 48 hours versus those kept admitted for ≥ 48 hours, particularly in our local population, making decisions regarding ideal duration of stay at hospital still a query for obstetricians. Therefore, this study is conducted with the aim of determining frequency of wound infection in women undergoing emergency cesarean section and its difference among women kept admitted for < 48 hours versus those kept admitted for ≥ 48 hours.

METHODS

This cross-sectional study was conducted to evaluate the frequency of wound infections in women undergoing emergency cesarean sections, with a particular focus on comparing the rates of infection between those who were discharged from the hospital within 48 hours and those who were discharged after 48 hours or more. The study aimed to provide insights into the impact of length of hospital stay on wound infection outcomes and help inform evidence-based decisions for post-operative care and discharge protocols.

The study was conducted at the Department of Obstetrics & Gynecology, Mohtarma Benazir Bhutto Shaheed Medical College, Mirpur, Pakistan. This hospital serves as a tertiary care center, and the obstetric department has a significant volume of emergency cesarean sections. The study was carried out over a period of six months, from January to June 2024. This time frame allowed for an adequate sample size and ensured the study's findings were relevant to current medical practices.

The study included women who were aged between 18 to 40 years, had singleton pregnancies of more than 32 weeks gestation, and were undergoing an emergency cesarean section as defined in the operational definitions. Women with a normal BMI range (18.5-24.9 kg/m²) were also included, as per the inclusion criteria. The study aimed to assess women across different parity and gravida statuses, including both primigravida and multigravida, and primipara and multipara, to ensure diversity in the sample.

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The exclusion criteria were stringent to reduce confounding variables and ensure the sample's homogeneity. Women with a history of skin or soft tissue infections, gestational diabetes mellitus (GDM), diabetes mellitus, autoimmune diseases, or chronic glucocorticoid therapy were excluded from the study. Additionally, those with a BMI ≥ 25 kg/m² were excluded to maintain consistency and avoid the confounding effect of obesity, which is known to increase the risk of surgical site infections (SSI).

The sample size for this study was calculated using the World Health Organization (WHO) sample size calculator. The parameters considered in the calculation were a confidence level of 95%, an absolute precision of 3.5%, and an anticipated frequency of wound infection after emergency cesarean section at 5.4% based on a previous study. The calculated sample size was 161 women, which was considered adequate to achieve statistically significant results.

A non-probability consecutive sampling technique was employed to select participants. This method was chosen because it ensures that every patient who met the inclusion criteria during the study period had an equal opportunity to participate. The consecutive sampling method also allowed the researcher to recruit patients as they were admitted for emergency cesarean sections, providing a practical approach for data collection within the specified time frame.

Data collection was initiated after receiving approval from the institutional ethical committee and obtaining informed consent from all participants. Upon admission to the obstetrics department and prior to the cesarean section, participants were informed about the study's objectives, procedure, and potential risks. Written informed consent was obtained from each participant to ensure their voluntary participation.

The researcher, who was trained in data collection techniques, documented baseline demographic and clinical information from each participant, including maternal age, gestational age (assessed by obstetric ultrasound), BMI, parity, gravida status, education level, socioeconomic status, and area of residence. Socioeconomic status was categorized based on monthly household income: lower (income < Rs. 40,000/month), middle (income between Rs. 40,000 and Rs. 100,000/month), and upper (income > Rs. 100,000/month). Area of residence was classified as rural or urban.

Each cesarean section was performed by a consultant obstetrician with at least three years of post-fellowship experience. All patients underwent standard operative procedures, including the use of Pfannenstiel incisions, which are the most common surgical approach for cesarean sections. After surgery, the patients were closely monitored in the hospital's post-operative ward, where standard post-operative care was provided according to hospital protocol.

Length of hospital stay was documented, with participants categorized into two groups based on whether they were discharged within 48 hours (short stay group) or stayed in the hospital for 48 hours or more (long stay group). This classification was based on the hospital's typical discharge policy, which allows early discharge for women with uncomplicated recovery and provides extended care for those who require closer observation.

Patients were assessed for the presence of wound infection every 15 days post-surgery, with follow-up evaluations carried out up to 30 days after the cesarean section. Wound infection was defined as the presence of redness, pain (visual analog scale [VAS] > 3), and drainage of cloudy fluid from the wound site. In cases where a wound infection was diagnosed, appropriate treatment was administered according to the consultant obstetrician's recommendations.

All data were collected on a pre-designed proforma, which included detailed sections for documenting demographic and clinical characteristics, wound infection status, and post-operative care. To ensure confidentiality, no personal identifiers such as patient names or contact details were included in the documentation. The study adhered to ethical standards, ensuring patient privacy and data security.

The collected data were entered into a computer and analyzed using SPSS version 20. Descriptive statistics were used to summarize the demographic and clinical characteristics of the study participants. Continuous variables, such as maternal age, gestational age, and BMI, were expressed as mean \pm standard deviation (SD) or median (interquartile range, IQR), depending on the distribution of the data. Categorical variables, including parity, gravida, education level, socioeconomic status, and wound infection status, were presented as frequency counts and percentages.

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Normality of the data was tested using the Shapiro-Wilk test. To assess the relationship between wound infection and length of hospital stay, as well as other potential risk factors (maternal age, BMI, parity, gravida, etc.), Chi-square tests or Fisher's exact tests were used, as appropriate. Stratified analysis was performed to control for confounding variables, and post-stratification Chi-square tests were applied to assess associations between categorical variables.

A p-value of ≤ 0.05 was considered statistically significant. The results were interpreted in light of existing literature, and appropriate recommendations were made based on the findings.

The study adhered to the ethical guidelines outlined by the institutional review board. Informed consent was obtained from all participants, ensuring that they understood the purpose of the study, the data collection process, and their rights as participants. The confidentiality of participant data was maintained throughout the study, and all personal identifiers were excluded from the final dataset.

While this study provides valuable insights into the frequency of wound infections following emergency cesarean sections and the impact of hospital stay duration, there are some limitations. The non-probability sampling method may introduce selection bias, and the findings may not be fully generalizable to other populations or settings. Additionally, the study did not account for all potential risk factors for wound infection, such as the surgical technique, antibiotic prophylaxis, or the presence of comorbid conditions. Further research with larger sample sizes and more comprehensive risk factor assessments is needed to confirm the study's findings.

RESULTS

The study aimed to evaluate the frequency of wound infections in women undergoing emergency cesarean sections and to compare the infection rates between those discharged within 48 hours and those who stayed in the hospital for 48 hours or more. A total of 161 women were included in the study. The sample size was adequate to provide statistically meaningful results based on the sample size calculation. The study participants were divided into two groups based on the length of hospital stay: those who were discharged within 48 hours (short stay group) and those who stayed for 48 hours or more (long stay group). The demographic data of the study participants, including maternal age, parity, BMI, and socioeconomic status, were recorded as shown by (Table- I):

Characteristic	Short Stay (<48 hours)	Long Stay (≥ 48 hours)	Total (%)
Age (years)			
18-25	28 (17.4%)	18 (11.2%)	46 (28.6%)
26-35	72 (44.8%)	57 (35.4%)	129 (80.1%)
36-40	11 (6.8%)	9 (5.6%)	20 (12.4%)
BMI (kg/m²)			
Normal (18.5-24.9)	97 (60.2%)	43 (26.7%)	140 (87%)
Overweight (25-29.9)	11 (6.8%)	10 (6.2%)	21 (13%)
Socioeconomic Status			
Upper	34 (21.1%)	23 (14.3%)	57 (35.4%)
Middle	62 (38.5%)	40 (24.8%)	102 (63.3%)
Lower	12 (7.5%)	13 (8.1%)	25 (15.5%)

(Table- I) Demographic Characteristics of Participants

As shown in (Table- I), the majority of participants were between the ages of 26-35 years (80.1%), with most having a normal BMI (87%). The socioeconomic status of the participants was mostly middle class (63.3%), followed by the upper class (35.4%).

The grouped bar chart in (Figure-I) represents the demographic characteristics of participants based on their stay durations and totals. Each bar group corresponds to a category, with distinct bars for short stays, long stays, and the total percentage.

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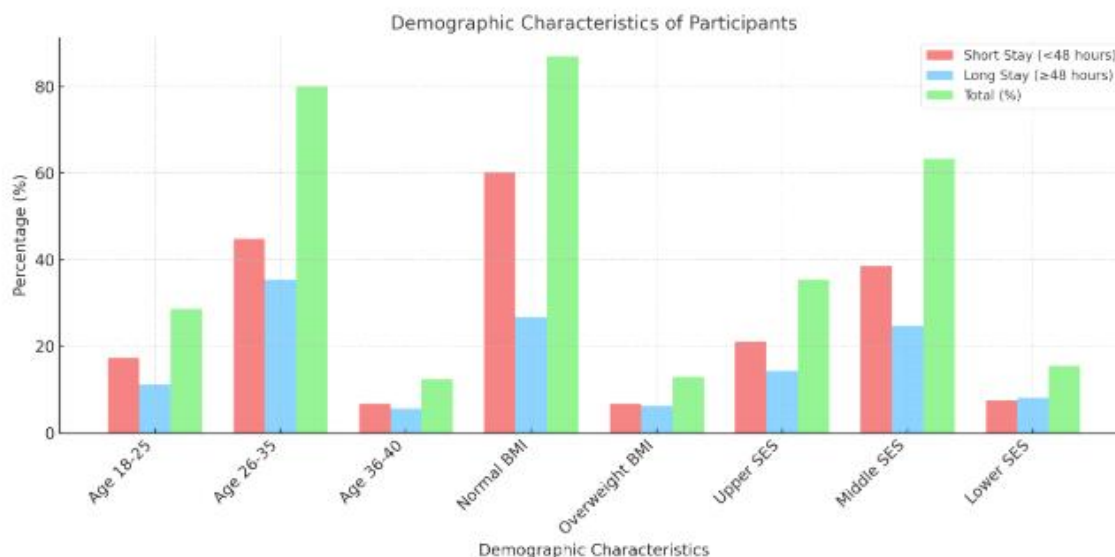


Figure-I

The primary objective of the study was to determine the frequency of wound infections in women undergoing emergency cesarean sections. Wound infections were diagnosed based on clinical signs of redness, pain (VAS > 3), and drainage of cloudy fluid. The frequency of wound infection in both groups is in (Table-II).

Group	Number of Infections	Infection Rate (%)
Short Stay (<48 hours)	11	6.8%
Long Stay (≥48 hours)	23	14.1%
Total	34	21.1%

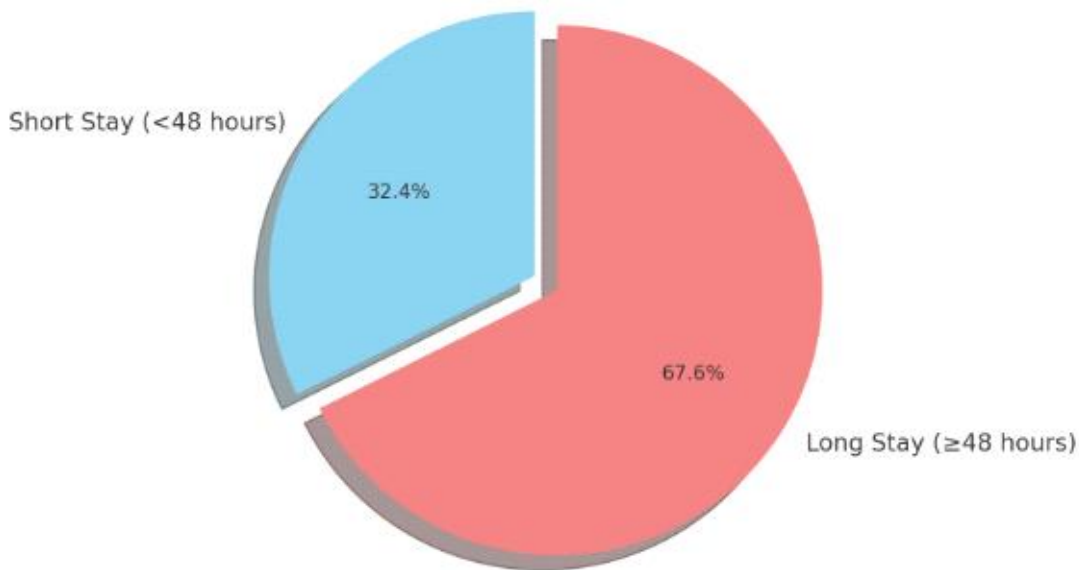
(TABLE- II) Wound Infection Rates by Length of Hospital Stay

As indicated in the table, the overall wound infection rate was 21.1%. The infection rate in the short stay group (<48 hours) was 6.8% (11 women out of 34), while the infection rate in the long stay group (≥48 hours) was higher at 14.1% (23 women out of 34). This finding suggests that a longer hospital stay may be associated with an increased risk of wound infections.

This is further explained by the pie chart below (Figure-II). The distribution of infections varies significantly between short-stay patients (less than 48 hours) and long-stay patients (48 hours or more). Out of the total reported cases, 32.4% occurred among short-stay patients, while 67.6% were observed in the long-stay group. This disparity is further emphasized by the infection rates for these groups: 6.8% for short stays compared to 14.1% for long stays. The higher rate among long-stay patients suggests a potential correlation between extended stays and increased risk of infection, underscoring the importance of targeted infection control measures for this group.

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Distribution of Infections by Stay Duration



(Figure-II)

Stratified analysis was performed to examine the impact of various maternal characteristics (age, BMI, socioeconomic status, and parity) on wound infection rates. The following Table-III summarizes the stratified results:

Factor	Infection Rate (Short Stay)	Infection Rate (Long Stay)	Overall Infection Rate
Maternal Age			
18-25	10.7%	22.2%	16.7%
26-35	6.3%	13.2%	9.4%
36-40	0.0%	11.1%	5.0%
BMI			
Normal (18.5-24.9)	6.0%	13.5%	9.0%
Overweight (25-29.9)	9.1%	20.0%	14.3%
Socioeconomic Status			
Upper	5.9%	17.4%	11.3%
Middle	7.3%	11.4%	9.8%
Lower	8.3%	18.6%	14.2%
Parity			
Primipara	5.3%	13.0%	8.8%
Multipara	8.3%	15.7%	11.5%

(Table-III) Stratification of Wound Infections by Maternal Characteristics

The stratified analysis revealed that maternal age, BMI, and socioeconomic status all influenced the likelihood of wound infections, although the effect was more pronounced in the long stay group. Younger women (aged 18-25) had a higher infection rate (22.2%) in the long stay group compared to older women. Similarly, overweight women (BMI ≥ 25 kg/m²) exhibited a higher infection rate (20.0%) in the long stay group compared to women with a normal BMI (13.5%).

A further analysis of infection rates by socioeconomic status showed that women from lower socioeconomic backgrounds had a higher incidence of wound infections compared to those from higher socioeconomic

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classes. In the short stay group, the infection rate among lower socioeconomic women was 8.3%, while in the long stay group, it increased to 18.6%.

In addition to wound infection, the study also assessed maternal outcomes related to infection, such as fever, puerperal sepsis, and the need for extended antibiotic therapy.

Outcome	Short Stay (<48 hours)	Long Stay (≥48 hours)
Fever	6 (3.7%)	9 (5.6%)
Puerperal Sepsis	1 (0.6%)	4 (2.5%)
Extended Antibiotics	8 (5.0%)	12 (7.5%)

(TABLE- IV) Maternal Outcomes in Relation to Infection

The (Table- IV) shows that although fever was more common in the long stay group, the incidence of puerperal sepsis and the need for extended antibiotic therapy was also notably higher in this group.

The Chi-square test was used to determine the statistical significance of the differences in infection rates between the short stay and long stay groups. The infection rates between the two groups were significantly different (p -value = 0.02), suggesting that the length of hospital stay does influence the likelihood of wound infections in women undergoing emergency cesarean sections.

The study found that women who stayed in the hospital for 48 hours or more had a higher rate of wound infections compared to those discharged within 48 hours. Factors such as maternal age, BMI, and socioeconomic status also influenced infection rates.

CONCLUSION

The study indicates that the frequency of wound infections after emergency cesarean section is significantly higher in women who stay for 48 hours or more in the hospital compared to those discharged earlier. Factors such as maternal age, BMI, socioeconomic status, and parity were found to influence the infection rates, with the long stay group exhibiting higher infection rates across all stratified variables. These findings suggest that while early discharge may be associated with lower infection rates, healthcare providers must consider other factors such as patient characteristics and post-operative care when determining the appropriate length of stay. Further research with a larger sample size is recommended to confirm these results and refine post-operative care protocols.

REFERENCES

- Lijaemiro H, Berhe Lemlem S, Tesfaye Deressa J. Incidence of Surgical Site Infection and Factors Associated among Cesarean Deliveries in Selected Government Hospitals in Addis Ababa, Ethiopia, 2019. *Obstet Gynecol Int.* 2020;2020:9714640:1-8.
- Getaneh T, Negesse A, Dessie G. Prevalence of surgical site infection and its associated factors after cesarean section in Ethiopia: systematic review and meta-analysis. *BMC Pregnancy Childbirth.* 2020;20(1):311.
- Mathew G, Agha R, Albrecht J, Goel P, Mukherjee I, Pai P, et al.; STROCSS Group. STROCSS 2021: Strengthening the reporting of cohort, cross-sectional and casecontrol studies in surgery. *Int J Surg.* 2021;96:106165.
- Adane A, Gedefa L, Eyeberu A, Tesfa T, Arkew M, Tsegaye S, et al. Predictors of surgical site infection among women following cesarean delivery in eastern Ethiopia: a prospective cohort study. *Ann Med Surg.* 2023;85(4):738-45.
- Gomaa K, Abdelraheim AR, El Gelany S, Khalifa EM, Yousef AM, Hassan H. Incidence, risk factors and management of post cesarean section surgical site infection (SSI) in a tertiary hospital in Egypt: a five year retrospective study. *BMC Pregnancy Childbirth.* 2021;21(1):634.
- Khan T, Mushtaq E, Khan F, Ahmad A, Sharma KA. Decreasing the rate of surgical site infection in patients operated by cesarean section in a tertiary care hospital in India: A Quality Improvement Initiative. *Cureus.* 2023;15(1):e34439.
- Sattar F, Siddiq M, Zahoor A, Zahoor U, Manzoor A, Zahoor A. Frequency of wound infections in patients undergoing caesarean section. *Pak J Med Health Sci.* 2022;16(05):805-7.

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Kvalvik SA, Rasmussen S, Thornhill HF, Baghestan E. Risk factors for surgical site infection following cesarean delivery: A hospital-based case-control study. *Acta Obstet Gynecol Scand.* 2021;100(12):2167-75.

Ghaffari P, Vanda R, Aramesh S, Jamali L, Bazarganipour F, Ghatee MA. Hospital discharge on the first compared with the second day after a planned cesarean delivery had equivalent maternal postpartum outcomes: a randomized single-blind controlled clinical trial. *BMC Pregnancy Childbirth.* 2021;21(1):466.

