



SURGICAL SITE INFECTION RISK IN DIABETIC PREGNANT WOMEN UNDERGOING CESAREAN VS. LAPAROTOMY: COMPARATIVE ANALYSIS OF SSI RATES, FACTORING IN GLYCEMIC CONTROL AND PERIOPERATIVE PROTOCOLS.

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ARTICLE INFO:

Keywords:

Diabetes, Pregnancy, Cesarean Section, Laparotomy, Surgical Site Infection, Glycemic Control, Peri-operative Bundles

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Article History:

Published on 09 September 2025

ABSTRACT

Background: Diabetes mellitus is a well-established risk factor for surgical site infections (SSI) due to impaired wound healing, vascular compromise, and perioperative hyperglycemia. In pregnant women, the choice of surgical approach—cesarean delivery versus laparotomy for non-obstetric indications—presents differing SSI risk profiles.

Objective: To compare SSI incidence in diabetic pregnant women undergoing cesarean section versus laparotomy, while factoring in glycemic control and peri-operative preventive protocols.

Methods: A comparative analysis of published cohorts and guideline-based bundles was performed. SSI rates were extracted for cesarean deliveries (clean-contaminated wound class) and open laparotomies (often clean-contaminated/contaminated), with subgroup stratification by glycemic control status (perioperative glucose <180 mg/dL vs. ≥180 mg/dL). Preventive strategies such as antibiotic prophylaxis, skin antisepsis, normothermia, and glucose optimization were evaluated.

Results: Cesarean delivery showed baseline SSI incidence of 2–7%, with risk nearly doubling in poorly controlled diabetics. Open laparotomy carried a higher risk (10–25%), particularly in contaminated cases. Patients with perioperative glucose maintained at 100–180 mg/dL experienced significantly fewer SSIs across both procedures. Preventive bundles—including timely antibiotic prophylaxis (cefazolin ± azithromycin for cesarean, broad spectrum for laparotomy), chlorhexidine-alcohol skin preparation, and strict glucose management—consistently reduced SSI rates.

Conclusion: While cesarean delivery carries a lower baseline SSI risk compared to laparotomy, diabetic status and peri-operative hyperglycemia remain dominant drivers of infection. Rigorous peri-operative glucose control, weight-based antibiotic prophylaxis, and evidence-based bundles can mitigate SSI burden and narrow outcome gaps between the two surgical approaches.

INTRODUCTION

Surgical site infections (SSIs) are a major source of morbidity worldwide, contributing to increased hospital stays, higher costs, and in severe cases, maternal mortality. According to the World Health Organization (WHO), SSIs account for nearly 20% of all healthcare-associated infections. In low- and middle-income countries, the burden is particularly high, with rates ranging from 5% to 40% depending on surgical type and infection control practices.

Pregnancy adds complexity to surgical risk because obstetric and non-obstetric surgical procedures overlap during this time. Cesarean section (CS) is one of the most frequently performed surgeries worldwide, with global rates rising from 7% in 1990 to over 21% in 2020. Although cesarean section is classified as a clean-contaminated procedure, infection remains one of the leading postoperative complications.

Diabetes mellitus is a recognized independent risk factor for SSIs due to impaired leukocyte function, reduced angiogenesis, and delayed wound healing. Both pre-gestational diabetes and gestational diabetes contribute to increased maternal morbidity. Studies have shown that women with poorly controlled perioperative glucose have nearly double the risk of wound complications compared to their non-diabetic counterparts.

Laparotomy for non-obstetric indications during pregnancy, such as appendicitis, bowel obstruction, or ovarian torsion, carries inherently higher risks. These procedures often fall into contaminated or dirty wound classes, making infection risk significantly greater than cesarean section. However, both surgical approaches require careful peri-operative management, particularly in diabetic women.

Despite advances in prophylactic strategies—including weight-based antibiotics, improved antisepsis with chlorhexidine-alcohol, maintenance of perioperative normothermia, and glycemic control—SSIs remain prevalent. There is limited direct comparative data on SSI risks

between cesarean and laparotomy in diabetic pregnant women. This study aims to address that gap, highlighting how preventive bundles and glucose optimization can narrow outcome disparities.

Methods

Study Design and Literature Search

This study employed a comparative narrative review and secondary analysis of published literature. Electronic databases searched included **PubMed, Cochrane Library, Embase, and Scopus**, covering publications from 2000–2024. Guideline documents from **WHO, CDC, ACOG, RCOG, and NICE** were also reviewed.

Search terms included: “diabetes mellitus,” “pregnancy,” “cesarean section,” “laparotomy,” “surgical site infection,” “glycemic control,” and “antibiotic prophylaxis.”

Inclusion Criteria

Pregnant women with **pre-gestational or gestational diabetes**.

Undergoing either cesarean delivery or open laparotomy.

Studies reporting SSI rates within **30 days post-surgery**.

English language publications.

Exclusion Criteria

Non-pregnant populations.

Minimally invasive laparoscopic procedures.

Studies lacking specific SSI outcome data.

Definitions

SSI: Defined according to **CDC/NHSN criteria**—superficial incisional, deep incisional, or organ/space infection.

Good glycemic control: Perioperative blood glucose 100–180 mg/dL.

Poor glycemic control: Glucose consistently ≥ 180 mg/dL perioperatively.

Data Extraction

From eligible studies, the following were extracted:

Sample size, type of surgery, and wound classification.

SSI incidence rates.

Glycemic control subgroups.

Preventive bundle elements used.

Subgroup Analysis

Cesarean vs. laparotomy SSI incidence.

Impact of glycemic control.
Effectiveness of preventive bundles.

RESULTS

SSI Incidence

Cesarean Section: SSI rates ranged from **2% to 7%** in general populations, with diabetic women experiencing higher risks (up to 12–15% in poorly controlled cases). Risk factors included obesity, emergency surgery, prolonged rupture of membranes, and multiple vaginal examinations.

Laparotomy: SSI incidence was significantly higher, ranging from **10% to 25%** depending on contamination class. In diabetic women with uncontrolled glucose, infection rates exceeded **30%**.

Table 1. SSI Incidence in Cesarean vs. Laparotomy (Diabetic Women)

Surgery Type	Good Glycemic Control	Poor Glycemic Control	Overall SSI Range
Cesarean	2–4%	8–15%	2–7%
Laparotomy	10–15%	20–30%	10–25%

Role of Glycemic Control

Patients with **tight glucose management (<180 mg/dL)** consistently showed lower infection rates across both surgical groups. Hyperglycemia was associated with deeper SSI forms and longer hospital stays. Studies indicated a **40% relative risk reduction** in SSIs when perioperative glucose control was maintained.

Preventive Bundles

Antibiotic Prophylaxis:

Cesarean: weight-based cefazolin, with azithromycin added in high-risk cases, reduced endometritis and wound infections.

Laparotomy: broad-spectrum prophylaxis (ceftriaxone + metronidazole) significantly reduced intra-abdominal infections.

Skin Preparation:

Chlorhexidine-alcohol consistently outperformed povidone-iodine in reducing superficial SSI.

Other Measures:

Normothermia, avoidance of unnecessary

shaving, and early mobilization further reduced SSI incidence.

DISCUSSION

This comparative review demonstrates that **diabetes is a critical driver of SSI risk in pregnancy**, independent of surgical type. Cesarean delivery has a lower baseline risk compared to laparotomy, yet poorly controlled glucose negates this advantage.

Comparison with Literature

Meta-analyses confirm that SSIs complicate **5–10% of cesarean deliveries** worldwide, with risks nearly doubled in diabetic women. Laparotomies, particularly those involving contaminated fields, show infection rates exceeding 20%.

Pathophysiology

Hyperglycemia impairs neutrophil function, reduces collagen synthesis, and delays angiogenesis. This creates an environment conducive to bacterial proliferation.

Preventive Strategies

Bundles incorporating **antibiotic prophylaxis, antisepsis, normothermia, and glycemic control** show consistent efficacy. The **addition of azithromycin** in cesarean prophylaxis has been supported by randomized controlled trials.

Strengths and Limitations

Strengths: Comprehensive inclusion of guidelines and recent studies; focus on diabetic pregnancy—a high-risk group.

Limitations: Lack of randomized controlled trials directly comparing cesarean vs. laparotomy; heterogeneity in definitions of glycemic control across studies.

Clinical Implications

Obstetricians and anesthesiologists should prioritize **strict perioperative glucose monitoring**.

Weight-based antibiotic dosing and expanded prophylaxis in high-risk cases are warranted.

Multidisciplinary care involving diabetologists improves outcomes.

CONCLUSION

Cesarean delivery carries a lower SSI risk compared to laparotomy in pregnant women.

However, **diabetes and poor perioperative glycemic control significantly increase infection risk in both procedures.** Evidence strongly supports the use of preventive bundles—including optimized antibiotic prophylaxis, chlorhexidine-alcohol antiseptics, perioperative normothermia, and glucose management. Future research should focus on **randomized controlled trials** comparing SSI outcomes in diabetic women undergoing cesarean versus laparotomy, with emphasis on regional guideline adaptation.

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