(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 6, Issue 2 , Page No: 958-964
March-April 2023

IJMSCR

# The Impact Of Anemia And Diabetes Mellitus On Surgical Wound Culture Outcomes In Patients Undergoing Lower Segment Cesarean Section (LSCS): A Cross-Sectional Study In Maharashtra, India

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Type of Publication: Original Research Paper
Conflicts of Interest: Nil

**Abstract**

**Background**: LSCS is a common obstetrical procedure with significant impact on maternal and neonatal outcomes, but it comes with risks such as surgical site infections and wound healing complications. Anemia and diabetes mellitus are common conditions associated with negative outcomes in pregnant women, yet little research exists on their influence on surgical wound culture outcomes in LSCS patients in Maharashtra, India.

**Methods:** A cross-sectional study was conducted in a tertiary care hospital in Maharashtra, India, to assess the impact of anemia and diabetes on surgical wound culture outcomes in patients undergoing LSCS. Patients who underwent LSCS and had a wound culture performed over a period of 18 months were included in the study. Data were collected from patient records and analyzed using descriptive statistics and chi-square tests

**Results**: The study analyzed 545 LSCS patients in Maharashtra, India, with 60.92% having anemia and a relatively lower prevalence of diabetes mellitus. Wound cultures showed growth in 59.4% of cases, with 89.1% being monomicrobial. Diabetes and anemia were statistically associated with increased culture positivity and higher risk of surgical site infection ($p<0.05$).

**Conclusion**: Anemia and diabetes mellitus are significant risk factors for SSI in post-LSCS patients. Targeted interventions to address these factors may improve maternal outcomes and reduce the burden of SSI in this population The study highlights the need early detection and management of these modifiable risk factors, such as regular blood glucose monitoring and timely correction of anemia to reduce the incidence of surgical site infection in post-LSCS patients.

**Keywords**: Anemia, Diabetes Mellitus, Cesarean Section, Surgical Wound Infection

## Introduction

In the past few years, the lower segment caesarean section (LSCS), a standard obstetrical procedure, has considerably improved maternal and neonatal outcomes (1). The rate of cesarean section has increased substantially in the last decade, with a two to three-fold rise compared to the initial rate of 10% (2). With this increase in the number of C-sections, it is crucial to gain a better understanding of the factors that impact their outcomes.

Despite its benefits, the LSCS procedure is not without risks, including surgical site infection and complications related to surgical wound healing. Even though not all operations or caesarean sections end in surgical site infection or wound complications,

those that do typically have one or more risk factors. Two such common medical conditions, namely anemia and diabetes mellitus, are known to have a negative impact on pregnant women's health and their surgical outcome, particularly in the case of caesarean sections (3,4).

Anemia, which is characterized by a deficiency of red blood cells or hemoglobin, can have serious consequences for pregnant women and their developing babies. When there is insufficient oxygen delivery to the tissues, a range of adverse outcomes can occur, including an increased risk of infections, postpartum hemorrhage, and stunted fetal growth (3). Nearly all wound-healing activities depend on oxygen, notably for the creation of ATP, which provides energy for cells during metabolism (5).In addition, oxygen stimulates fibroblast proliferation and collagen production, boosts keratinocyte differentiation, migration, and re-epithelialization, increases angiogenesis, protects wounds from infection, and encourages wound contraction (6). Therefore, poor tissue perfusion due to anemia can significantly delay wound healing,

On the other hand, diabetes mellitus refers to a spectrum of metabolic disorders that are marked by hyperglycemia caused on by abnormalities in secretion of insulin, sensitivity to insulin or both. It is known to impair wound healing, increase the risk of infection, and adversely affect the outcomes in mother and the neonate (7,8). Gestational diabetes mellitus (GDM), a type of diabetes mellitus that develops during pregnancy, affects up to 14% of pregnancies globally (9).

India has a high prevalence of anemia among pregnant mothers along with an increasing incidence of diabetes mellitus in the general population (10–12). Maharashtra, a state in India, has also been grappling with these health challenges. Despite the known impact of these conditions on general health, there is limited research on the influence of anemia and diabetes on surgical wound culture outcomes in patients undergoing LSCS in our region.

This cross-sectional study aims to investigate the association between anemia and diabetes mellitus and surgical wound culture outcomes in a cohort of women undergoing LSCS in Maharashtra, India. By better understanding the relationship between these conditions and surgical outcomes, we hope to provide valuable insights for healthcare providers to improve the management of anemic and diabetic pregnant women undergoing LSCS, thus enhancing maternal and neonatal health outcomes.

## Material And Methods

Ethical Consideration: The study was carried out over a period of 18 months in the department of Microbiology of our tertiary care hospital in Maharashtra, following the approval from our tertiary care hospital's ethical committee. Informed consent was obtained from the study population as well.

Study Design and Setting: A cross-sectional study was conducted to assess the impact of anemia and diabetes on surgical wound culture outcomes in patients undergoing lower segment cesarean section (LSCS) in Maharashtra, India.

Study Population: Patients who underwent lower segment cesarean section and had a wound culture performed at our tertiary care hospital in Maharashtra, India over a period of 18 months were included in the study. Participants were excluded if they had incomplete medical records or underwent LSCS at another healthcare facility. Also, patients with a history of pre-existing infection or other underlying medical conditions that may affect wound culture outcomes were not included in the study.

Data Collection: Any pus specimens or wound swabs from incisional sites of LSCS patients, obtained at our tertiary care hospital's Microbiology laboratory were processed and cultured according to standard laboratory procedures. Wound culture results were then recorded. A positive microbiological culture report was considered to be indicative of surgical site infection. Relevant data of these patients, including age, anemia status, diabetes status, were collected from the patient’s case record files and laboratory reports with the help of a predefined case record form.

Data Analysis: All the data was entered into Microsoft excel sheet version 2016. The collected data was analyzed using descriptive statistics. The chi-square test was used to assess the association between anemia and diabetes and wound culture results (either positive or negative). In this study, all the inferences were obtained at 5% level of significance and hence $p$ value $< 0.05$ has been considered as statistically significant.



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## Results

This study included 545 patients who underwent lower segment cesarean section (LSCS) and met the inclusion and exclusion criteria. The majority of patients were in the age group of 21-30 years (82.2%), with a mean age of 25.3 ± 4.36 years. A small proportion of patients were in the age group of 18-20 years and 31-40 years as shown in Table-1. None of the patients were below 18 years of age and only 0.36% (n=2) were between 41-50 years of age.

Over half (53.4%) of the patients included in the study were multiparous, indicating that they had previously given birth, while the remaining 46.6% were nulliparous as depicted in Table-2. This finding suggests that women who have given birth before may be at a higher risk of requiring LSCS in subsequent pregnancies, as previous cesarean sections are a known risk factor for LSCS. It also highlights the importance of effective management of previous cesarean sections to reduce the need for repeat procedures, which carry a higher risk of surgical site infection and other complications.

In this study, the prevalence of diabetes mellitus among patients who underwent LSCS was 9.9% as shown in Figure-1. The prevalence of anemia, defined as a hemoglobin level below 10.9 gm% (13) was 60.92% (332/545) as demonstrated in Figure-2 These results suggest that a significant proportion of the patient population undergoing lower segment cesarean section (LSCS) were affected by anemia despite of various antenatal interventions available for pregnant population in order to correct anemia. The prevalence of diabetes mellitus amongst study population was found to be relatively low as compared to anemia.

Furthermore, the results of the microbiology analysis of 545 samples received at the tertiary care hospital revealed that 59.3% (323/545) of the samples showed growth on culture as depicted in Figure-3. Of these positive culture results, 91% (294/323) were found to be monomicrobial in nature, while 9% (29/323) were determined to be polymicrobial as shown in Figure-4. On the other hand, 40.7% (222/545) of the samples were found to be sterile, with no growth observed on culture media after overnight incubation as observed in Figure-3. These findings suggest a high rate of bacterial growth among the tested samples, with the majority of infections being monomicrobial in nature. Culture positivity indicated the presence of infection at the primary surgical incisional site i.e., surgical site infection. This information can provide valuable insight into the patterns of surgical site infection of bacterial origin among patients undergoing LSCS and inform the development of diagnostic and treatment strategies.

The results of the study further revealed a statistically significant association between the presence of diabetes mellitus and anemia with surgical wound outcomes amongst the study population. We observed in our study that out of the 54 patients that had diabetes mellitus, 75.92%(n=41) of the patients had a positive culture report. While out of the 332 patients who were diagnosed with anemia, 66.7% (221) of the patients showed culture positivity as shown in Table-3.

On statistical analysis, diabetes mellitus and anemia, both, were found to have statistically significantly impact (*p* value <0.05 )on the culture positivity in the study population, in turn, reflecting a higher risk of surgical site infection amongst the patients with these co-morbid states.

## Discussion And Conclusion:

The present study was conducted to evaluate the impact of anemia and diabetes mellitus on surgical wound culture outcomes in patients undergoing lower segment cesarean section (LSCS) in Maharashtra, India. The results of the study demonstrated a high prevalence of anemia (60.92%) amongst the study population, indicating that a significant proportion of patients undergoing LSCS were affected by this condition, which is consistent with previous studies conducted in India(14,15). The prevalence of diabetes mellitus was relatively lower (9.91%) compared to anemia. Additionally, the study identified a significant association **(*p* value <0.05)** between the presence of anemia and diabetes mellitus with surgical wound culture outcomes, indicating a higher risk of surgical site infection in patients with these co-morbid states. These findings are in line with previous research that has highlighted the detrimental effects of anemia and diabetes on wound healing and susceptibility to infections (7,16–18).



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The high prevalence of anemia in this population is a matter of concern, as anemia has been associated with unfavorable pregnancy outcomes and delayed wound healing, as discussed earlier. Also, this increased prevalence of anemia amongst the study population indicates a failure of current interventions to address this issue adequately. Effective management of anemia during pregnancy is critical for avoiding negative outcomes and promoting maternal and foetal health(19). Strategies such as iron supplementation, dietary interventions, and the treatment of underlying conditions contributing to anemia must be implemented to address this issue effectively.

Our study also revealed a relatively low prevalence of diabetes mellitus among patients undergoing LSCS (9.91%), which is lower than the reported prevalence of diabetes in the general population of Maharashtra (12.4% among women) (20).

This finding suggests that diabetes mellitus may not be a significant risk factor for requiring LSCS amongst the women in this region. However, we found that the presence of diabetes mellitus was significantly associated with a higher risk of surgical site infection, which is consistent with a study conducted by Mangram et al (21).

Our study also revealed a high rate of bacterial growth (59.3%) in the tested samples, with the majority of infections being monomicrobial in nature. These findings are consistent with previous studies reporting a high rate of bacterial growth in surgical site infections (22,23). The high rate of bacterial growth observed in our study highlights the need for effective infection control measures in healthcare settings. This includes strict adherence to hand hygiene practices, proper disinfection of equipment and surfaces, implementation of bundle care measures, and appropriate use of antibiotics to prevent and treat infections. It is also important to monitor the patterns of bacterial infections and antimicrobial resistance in the hospital setting to guide appropriate treatment strategies (24).

However, our study was conducted at a single center, which may limit the generalizability of our findings to other settings.

In conclusion, our cross-sectional study revealed a high prevalence of anemia and a relatively low prevalence of diabetes mellitus among patients undergoing LSCS at our tertiary care hospital. However, both anemia and diabetes mellitus were found to be significant risk factors for surgical site infections in this patient population. Our findings suggest the importance of effective management of anemia and diabetes mellitus in pregnant women to reduce the risk of SSI and improve maternal and neonatal outcomes. Healthcare providers should be aware of these risk factors and take appropriate measures to prevent and manage SSIs in patients undergoing LSCS. Future studies may consider investigating the impact of other potential risk factors for SSI, such as obesity or blood transfusion, in this patient population.

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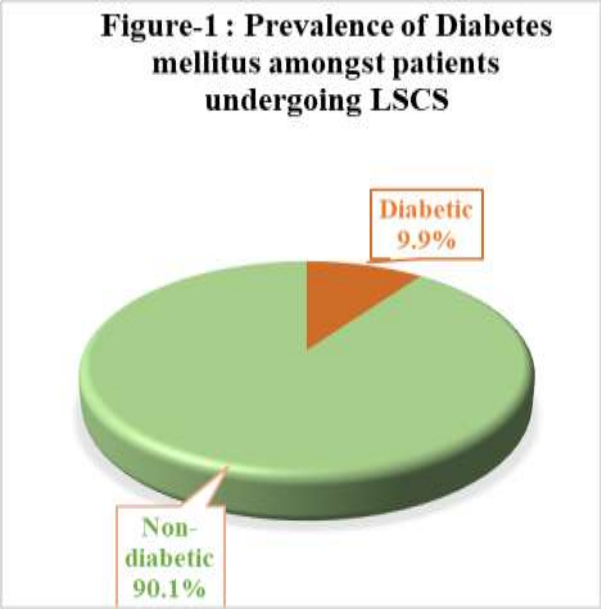
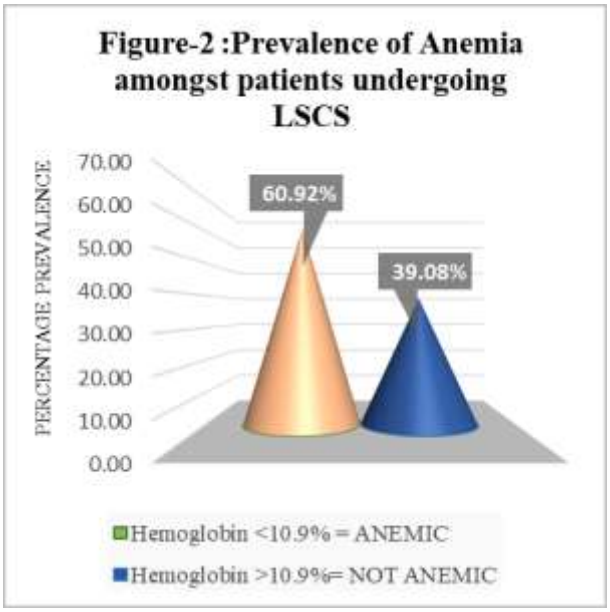
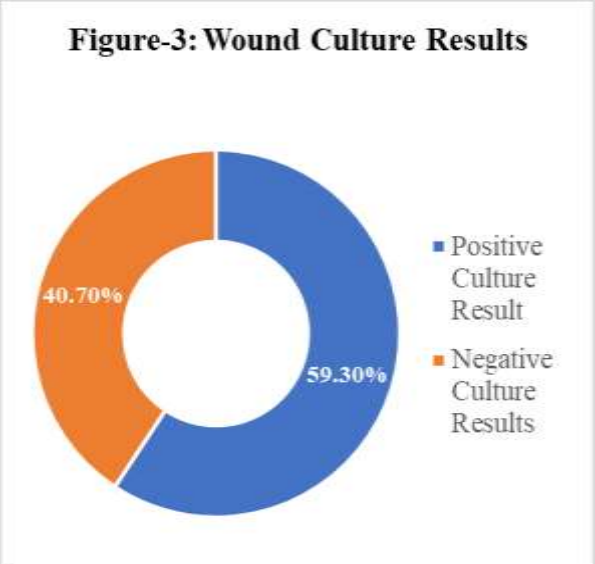
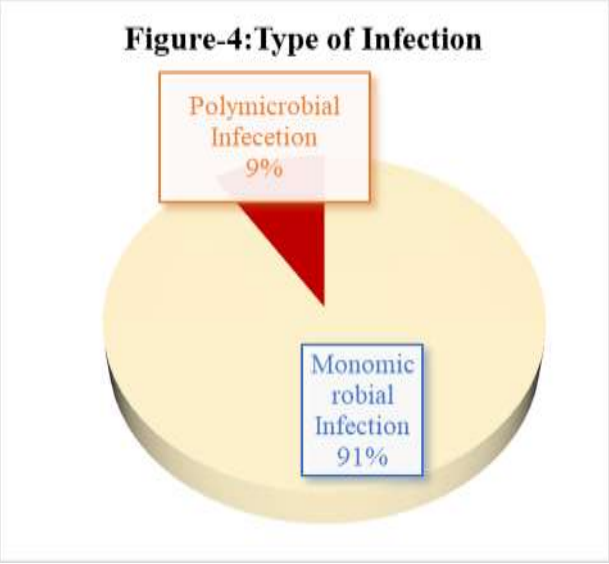
**Figures/Graphs :**



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**Tables :**

**Table-1: Distribution of patients according to age**

| Age Group (years) | Frequency(n) | Percentage (%) |
|---|---|---|
| 18-20 | 50 | 9.17% |
| 21-30 | 448 | 82.2% |
| 31-40 | 45 | 8.2% |
| 41-50 | 2 | 0.36% |
| **TOTAL** | **545** | **100%** |
| Mean Age ± Standard deviation = 25.3 ± 4.36 years | | |

**Table-2: Distribution of patients according to parity**

| Parity | Frequency (n) | Percentage(n) |
|---|---|---|
| **Nulliparous** | 254 | 46.6% |
| **Multiparous** | 291 | 53.4% |
| **TOTAL** | **545** | **100%** |

**Table -3: Comparison of Risk factors based on Positive culture report**

| Sr. No | Risk factor | Positive Culture Report | | | *p* value |
|---|---|---|---|---|---|
| | | **Yes** | **No** | **Total** | |
| **1.** | **Diabetes** | | | | |
| | Yes | 41 | 13 | 54 | |
| | No | 282 | 209 | 491 | **< 0.05*** |
| | **TOTAL** | **323** | **222** | **545** | |
| **2.** | **Anemia** | | | | |
| | Yes | 221 | 111 | 332 | |
| | No | 102 | 111 | 213 | **< 0.05*** |
| | **TOTAL** | **323** | **222** | **545** | |

*** :** *p* value <0.05 is statistically significant



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