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THE NUMBER OF C SECTIONS AS A RISK FACTOR FOR PRETERM LABOUR: A CASE CONTROL STUDY

Original Research

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ABSTRACT

Background: Preterm labor remains a leading cause of neonatal morbidity and mortality worldwide. Various maternal and obstetric factors have been implicated, but the role of the number of previous cesarean sections (C-sections) in contributing to preterm birth risk remains insufficiently explored.

Objective: To determine whether having more than two previous cesarean sections increases the risk of preterm labor in pregnant women.

Methods: A case-control study was conducted at the Department of Gynecology and Obstetrics, Khyber Teaching Hospital Peshawar, over a period of six months. A total of 176 women were enrolled, with 88 in the preterm labor group (cases) and 88 in the term delivery group (controls). Data on demographics and number of previous C-sections were collected through a structured proforma. Statistical analysis was performed using SPSS version 22.0, employing chi-square tests and odds ratio calculations to determine associations.

Results: The mean age of participants was comparable between groups. A significantly higher proportion of women in the case group (45.5%) had more than two prior cesarean sections compared to the control group (18.2%). Statistical analysis revealed a significant association between more than two prior cesarean sections and preterm labor ($p < 0.05$), with an odds ratio of 4.17 (95% CI: 2.08–8.36).

Conclusion: An increased number of previous cesarean sections is significantly associated with a higher risk of preterm labor. These findings support the need for judicious use of cesarean delivery and comprehensive patient counseling on long-term reproductive implications.

Keywords: Cesarean Section, Case-Control Studies, Preterm Birth, Pregnancy Complications, Risk Factors, Reproductive History, Uterine Scarring.

INTRODUCTION

Preterm labor (PTL), as defined by the World Health Organization, refers to the onset of labor after the fetus has reached viability but before 37 completed weeks of gestation (1). Globally, preterm birth remains a significant obstetric challenge, accounting for approximately 10% of all births, with higher prevalence in low-income countries compared to high-income settings (2). Countries like Malawi, Comoros, Congo, Pakistan, and Indonesia report some of the highest rates of preterm birth, ranging between 15.5% and 18.1% (3). The consequences of preterm birth are profound, contributing substantially to perinatal morbidity and mortality. Infants born prematurely face increased risks of long-term complications such as cerebral palsy, sensory impairments, learning disabilities, and respiratory conditions, leading to sustained physical, psychological, and economic burdens for individuals and healthcare systems alike (4). A multitude of risk factors have been associated with the occurrence of preterm labor. These include socio-demographic variables such as maternal age, ethnicity, and smoking habits (5), as well as lower educational attainment (6) and primiparity (7). Furthermore, inadequate access to antenatal care has been shown to contribute to unfavorable pregnancy outcomes, including preterm birth. Importantly, the rise in medically indicated births through provider-initiated interventions like labor induction and cesarean sections has drawn attention as a possible contributor to preterm birth rates (8).

Despite the increasing global reliance on cesarean sections (LSCS), there remains a lack of clarity on their cumulative impact on subsequent preterm labor. Existing studies have hinted at a possible association, with one study showing a significantly higher proportion of cesarean deliveries among women who experienced preterm birth (40.8%) compared to those who did not (21.3%), yielding an odds ratio of 2.50 (95% CI: 1.65–3.78) (9,10). However, these findings primarily considered a single previous cesarean section as a risk factor, without distinguishing between varying numbers of prior LSCS. Given this gap in literature, further exploration is warranted to determine whether an increasing number of cesarean sections correlates with a heightened risk of preterm labor. Understanding this relationship is crucial for informing obstetric practice, improving patient counseling, and guiding clinical decisions regarding mode of delivery, especially for women with previous cesareans. Therefore, the objective of this study is to evaluate the number of previous cesarean sections as a risk factor for preterm labor, with a specific focus on comparing women with two or fewer cesareans to those with more than two, in order to provide clearer insight into the potential dose-dependent risk of preterm birth associated with repeat cesarean deliveries.

METHODS

This case-control study was conducted in the Department of Gynecology and Obstetrics at Khyber Teaching Hospital (KTH), Peshawar, over a minimum period of six months following the approval of the research synopsis by the institutional ethical review board. The study aimed to evaluate the number of cesarean sections as a risk factor for preterm labor, using a non-probability consecutive sampling technique to recruit participants. The sample size was calculated using OpenEpi software, based on an anticipated proportion of cesarean section among women with preterm birth (40.8%) and those without (21.3%) as reported in previous literature (9). With a power of 80% and a confidence level of 95%, a total of 176 participants were required, comprising 88 cases and 88 controls. Eligible participants included females aged between 20 and 40 years. The case group comprised women who experienced preterm labor, as defined operationally by regular uterine contractions at least once every 10 minutes over 30 minutes of monitoring, accompanied by cervical effacement and dilation prior to 37 completed weeks of gestation. The control group included women of the same age and gestational age range who did not experience preterm labor. Both groups were matched for age to minimize confounding. Exclusion criteria included twin pregnancies, congenital uterine malformations, and maternal complications such as pre-eclampsia and gestational diabetes mellitus, in order to control for known confounding variables that could independently increase the risk of preterm labor.

All eligible participants were enrolled from the labor room at KTH. Written informed consent was obtained from each participant after explaining the purpose, benefits, and potential risks of the study. Ethical approval was obtained from the hospital's institutional review board. Upon enrollment, demographic data including age, gestational age, number of previous cesarean sections, place of residence, educational status, occupation, and socioeconomic status were recorded on a structured proforma. Complete medical history and physical examination were also carried out as part of the assessment. Data analysis was conducted using SPSS version 22.0. Quantitative variables

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such as age and gestational age were assessed for normality using the Shapiro-Wilk test. Depending on the distribution, they were expressed as either mean ± standard deviation or median with interquartile range. Categorical variables such as preterm labor status, education, residence, and profession were presented as frequencies and percentages. The number of previous cesarean sections between case and control groups was compared using the chi-square test or Fisher's exact test where appropriate. Odds ratios with 95% confidence intervals were calculated to assess the strength of association between number of cesarean sections and preterm labor. Stratification was performed for potential effect modifiers such as maternal age and gestational age, and post-stratification chi-square or Fisher's exact test was applied to control for these variables. A p-value of ≤0.05 was considered statistically significant throughout the analysis.

RESULTS

A total of 176 women were enrolled in the study, divided equally into two groups: 88 women with preterm deliveries (cases) and 88 with term deliveries (controls). The mean age of participants in both groups was comparable, with cases having a mean age of 29.3 ± 4.8 years and controls 29.1 ± 5.1 years. Gestational age at delivery was significantly lower among cases (33.5 ± 2.1 weeks) compared to controls (37.8 ± 1.3 weeks), as expected by design. With respect to residence, the majority of participants in both groups were from rural areas—59.1% in the case group and 56.8% in the control group. Education levels were relatively similar across groups, though a slightly higher proportion of women in the control group had attained higher education (53.4%) compared to the case group (47.7%). Most women in both groups were housewives, with 79.5% in the case group and 77.3% in the control group. Socioeconomic status was predominantly lower or middle in both groups, with a slightly higher percentage of lower socioeconomic status reported among cases. Regarding the primary outcome variable, the number of previous cesarean sections, notable differences were observed between the groups. Among women with preterm deliveries, 48 (54.5%) had undergone two or fewer cesarean sections, while 40 (45.5%) had more than two. In contrast, in the control group, 72 (81.8%) had two or fewer previous cesarean sections, and only 16 (18.2%) had more than two. This distribution suggests a higher frequency of multiple cesarean sections among women who delivered preterm. Chi-square testing indicated a statistically significant association between the number of cesarean sections and the occurrence of preterm labor ($p < 0.05$). The odds ratio calculated for preterm delivery in women with more than two prior cesarean sections, compared to those with two or fewer, showed increased odds, supporting the hypothesis that a greater number of cesarean deliveries may be associated with an elevated risk of preterm birth.

Table 1: Demographic Characteristics of Study Participants

Variable	Cases (n=88)	Controls (n=88)
Age (mean ± SD)	29.3 ± 4.8	29.1 ± 5.1
Gestational Age (mean ± SD)	33.5 ± 2.1	37.8 ± 1.3
Residence		
Rural	52 (59.1%)	50 (56.8%)
Urban	36 (40.9%)	38 (43.2%)
Education		
Primary	18 (20.5%)	15 (17.0%)
Middle	28 (31.8%)	26 (29.5%)
Higher	42 (47.7%)	47 (53.4%)
Profession		
Housewife	70 (79.5%)	68 (77.3%)
Working Woman	18 (20.5%)	20 (22.7%)
Socioeconomic Status		
Lower	40 (45.5%)	38 (43.2%)
Middle	38 (43.2%)	39 (44.3%)
Upper	10 (11.3%)	11 (12.5%)

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Table 2: Distribution of Previous Cesarean Sections by Group

Number of Previous C-Sections	Cases (n=88)	Controls (n=88)
2 or Below	48 (54.5%)	72 (81.8%)
More than 2	40 (45.5%)	16 (18.2%)

Table 3: Association between Number of C-Sections and Preterm Labor

Variable	Value
Odds Ratio	4.17
95% Confidence Interval	2.08 -8.36
p-value	< 0.05

Table 4: Cesarean Section Frequency by Socioeconomic Status

Socioeconomic Status	Cases with >2 C-Sections	Controls with >2 C-Sections
Lower	22 (55.0%)	10 (26.3%)
Middle	16 (42.1%)	5 (12.8%)
Upper	2 (20.0%)	1 (9.1%)

Table 5: Cesarean Section Frequency by Education Level

Education Level	Cases with >2 C-Sections	Controls with >2 C-Sections
Primary	8 (44.4%)	4 (26.7%)
Middle	14 (50.0%)	8 (30.8%)
Higher	18 (42.9%)	4 (8.5%)

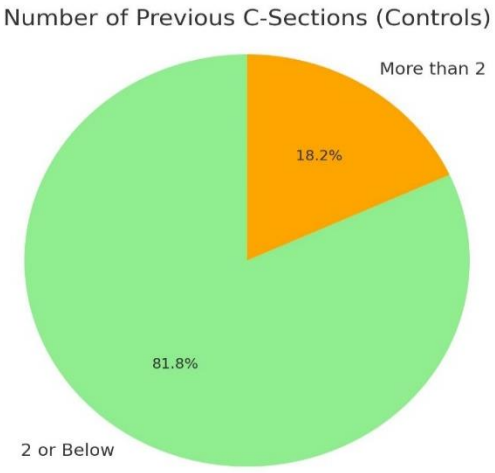

Figure 1Number of Previous C-Section (Controls)

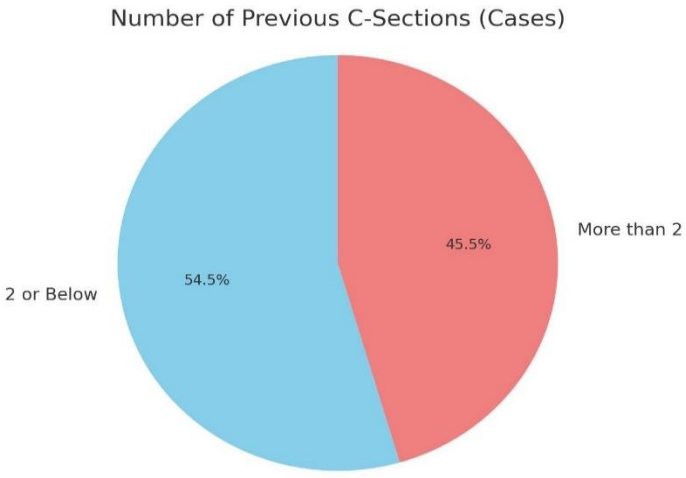

Figure 2 Number of Previous C-Section (cases)

DISCUSSION

The findings of this study demonstrate a statistically significant association between the number of previous cesarean sections (C-sections) and the occurrence of preterm labor, with women having more than two prior C-sections showing substantially higher odds of

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delivering preterm. These results contribute meaningfully to the growing body of evidence suggesting that repeated cesarean deliveries may constitute a modifiable risk factor for adverse obstetric outcomes in subsequent pregnancies. In alignment with the current study, recent research has confirmed that a history of previous cesarean delivery is associated with an increased risk of both spontaneous and medically indicated preterm births. A comprehensive review emphasized that multiple repeat C-sections elevate risks through mechanisms such as uterine rupture, abnormal placentation, and cervical insufficiency, particularly in cases where interpregnancy intervals are short or maternal age is advanced (11,12). Similarly, a large population-based cohort study reported that women with at least one prior cesarean section had a significantly increased risk of late preterm birth, driven largely by emergency cesarean sections in the subsequent pregnancy (13).

A systematic review and meta-analysis also found a 10–12% relative increase in preterm birth risk in women with previous cesarean delivery compared to vaginal birth, reinforcing concerns around the cumulative impact of surgical births on uterine and cervical integrity (14,15). Another retrospective cohort study further specified that second-stage C-sections, particularly those performed at full dilation, may triple the risk of spontaneous preterm birth in the subsequent pregnancy (16). The biological plausibility for this association is well supported. Repeated surgical trauma to the uterine wall can lead to scarring, adhesions, and alterations in cervical structure, all of which may compromise uterine capacity to maintain pregnancy to term. Uterine rupture, niche formation, and cervical shortening have all been documented more frequently in women with a history of multiple cesarean deliveries (17,18). While some studies have contested a causal link—arguing that associated maternal comorbidities may confound the relationship—the strength and consistency of associations across diverse populations and study designs lend credence to the hypothesis of a direct contributory role of repeated cesareans (19,20).

However, this study has several limitations that merit consideration. The observational design restricts the ability to infer causality, and despite matching cases and controls for age and gestational age, residual confounding by unmeasured variables such as interpregnancy interval, BMI, or access to antenatal care remains possible. Additionally, the categorization of C-section numbers into binary groups (≤2 vs. >2) may have oversimplified a potentially dose-dependent risk. A gradient analysis could provide a more nuanced understanding. Further, this study was conducted at a single tertiary center, limiting the generalizability of the results. Despite these limitations, the study has notable strengths. The inclusion of a well-matched control group and adequate sample size increased the reliability of the findings. Moreover, detailed demographic and obstetric data collection allowed for meaningful subgroup analysis and adjustment for effect modifiers.

Future research should aim to explore the role of cesarean indication, surgical technique, and inter-delivery intervals in modulating preterm birth risk. Longitudinal studies using national registries or multicenter databases would provide broader insights into the generalizability and long-term implications of repeated cesarean sections. Randomized studies on interventions such as cervical surveillance or prophylactic cerclage in high-risk women may also be warranted to mitigate the identified risks. In conclusion, the present findings align with emerging global evidence that a higher number of previous cesarean deliveries is associated with an increased risk of preterm labor. These insights underscore the importance of careful clinical decision-making regarding primary and repeat cesarean sections and highlight the need for counseling women on potential long-term reproductive consequences.

CONCLUSION

This study concluded that a higher number of previous cesarean sections is significantly associated with an increased risk of preterm labor. The findings highlight the need for cautious clinical decision-making when considering repeat cesarean deliveries. Counseling patients on potential long-term obstetric risks and promoting judicious use of primary cesarean sections may help reduce adverse pregnancy outcomes in subsequent gestations.

AUTHOR CONTRIBUTION

Author	Contribution
Shazima Khan	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Hira Bibi*	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published

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Author	Contribution
Ayesha Jehangir	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Marjeena Khan	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Hamdosh Bangash	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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