Volume 4, Issue 6, 2026

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

ASSOCIATION OF MATERNAL TACHYCARDIA WITH SCAR COMPLICATIONS IN PATIENTS WITH PREVIOUS ONE CESAREAN SECTION

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DOI: https://doi.org/10.5281/zenodo.20915792

Keywords

Maternal tachycardia; Uterine rupture; Scar dehiscence; Previous cesarean section; Repeat cesarean delivery

Article History

Received: 24 April 2026
Accepted: 06 June 2026
Published: 21 June 2026

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Abstract

Background

Uterine scar complications remain an important cause of maternal and fetal morbidity in women with a previous cesarean section. Maternal tachycardia has been proposed as a simple bedside clinical sign that may facilitate early recognition of these complications; however, evidence regarding its diagnostic value is limited.

Objective

To determine the association between maternal tachycardia and uterine scar complications in patients with one previous cesarean section undergoing repeat cesarean delivery.

Methodology

This hospital-based case-control study was conducted at the Department of Obstetrics and Gynaecology, Khyber Teaching Hospital, Peshawar, from 1 October 2025 to 31 March 2026. A total of 184 women with one previous cesarean section were enrolled, including 92 cases with maternal tachycardia and 92 controls without maternal tachycardia. Baseline demographic and obstetric characteristics were recorded. Maternal tachycardia was defined as a heart rate >100 beats/minute. Uterine scar complications, including uterine rupture and scar dehiscence, were confirmed intraoperatively. Data were analyzed using SPSS version 24.

Results

Baseline characteristics were comparable between the two groups. Uterine scar complications occurred significantly more frequently among women with maternal tachycardia than those without tachycardia (32.6% vs. 14.1%; p=0.003). Scar dehiscence was the most common complication. Maternal tachycardia was associated with a significantly increased likelihood of uterine scar complications (OR=2.95; 95% CI: 1.43–6.09; p=0.003).

Volume 4, Issue 6, 2026

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ISSN: (e) 3007-1607 (p) 3007-1593

Conclusion

Maternal tachycardia was significantly associated with uterine scar complications in women with one previous cesarean section. As a readily available bedside clinical sign, maternal tachycardia may assist in the early identification of women at increased risk and support timely obstetric intervention. Further prospective multicenter studies are warranted to validate these findings.

INTRODUCTION

Cesarean section is one of the most commonly used obstetric procedures in the world and has risen significantly in the last 20 years. Worldwide the rate of cesarean section has been increased to around 21% and in Pakistan, it has been increased from 3.2% in 1991 to nearly 20% these days. Many of these additional deliveries are attributed to repeat cesareans and cesarean deliveries without adequate medical reasons. As a result, in subsequent pregnancies, more women come with a scarred uterus, creating important clinical challenges for obstetricians [1,2].

Women who have had one cesarean are often considered candidates for vaginal birth after cesarean (VBAC), if other selection criteria are met. A successful VBAC lowers morbidity risks for mom, shortens recovery time and lowers risks of repeated cesarean delivery. But Trial of Labour following cesarean has the risk of complications related to the uterine scar, such as uterine scar dehiscence and uterine rupture. While rare (about 1/200 women who attempt VBAC), these complications can cause the mother and baby to suffer significant morbidity, and they can be life-threatening if not identified and treated immediately [3,4].

The clinical manifestations of uterine scar complications are vague and the diagnosis is difficult in the early stages. Several obstetric conditions can have symptoms of abdominal pain, tenderness over scars, vaginal bleeding, maternal hypotension and fetal heart rate abnormalities, and individually may lack diagnostic accuracy. Uterine rupture or scar dehiscence may be missed, leading to a catastrophic maternal hemorrhage, fetal hypoxia, hysterectomy and perinatal mortality [5].

A number of strategies have been suggested to help identify problems with the uterine scar during labor. These are referred to as careful obstetric risk assessment prior to trial of labour, continuous electronic fetal cardiac monitor, cardiotocography and intrauterine pressure monitoring. Of these, abnormal fetal heart rate patterns are believed to be the most reliable early sign of impending uterine rupture. However, the use of sophisticated monitoring equipment is often not possible in resource poor health care environments and it is therefore important to identify reliable bedside clinical indicators that may help in early diagnosis [6,7].

Early clinical signs of a uterine scar complication are suggested to include maternal tachycardia. Can be caused by pain, occult blood loss, hypovolemia, or physiologic changes associated with uterine rupture prior to apparent hemodynamic instability. A higher incidence of maternal tachycardia has been previously reported in women with uterine scar complications compared to women without complications [8]; this may prove to be a clinical alert sign for intrapartum evaluation. The evidence available, however, is restricted and the diagnostic value of maternal tachycardia has not been well studied in other populations.

Simple bedside clinical parameters may have a significant role in early diagnosis of Uterine Scar complications in resource challenged settings like Pakistan where advanced diagnostic modalities may be less available. The association of maternal tachycardia with uterine scar complications could aid in clinical decision making, prompt surgical intervention and ultimately decrease maternal and fetal morbidity. Yet, there is not much local evidence on this correlation. With these facts in mind, the following study was undertaken to investigate the relationship between maternal tachycardia and complications of the scar in women with a history of one cesarean section who underwent repeat cesarean delivery.

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Objective

To determine the association between maternal tachycardia and scar complications in patients with one previous cesarean section undergoing repeat cesarean section.

METHODOLOGY

Study design and setting

The study was case-control study design carried out in department of obstetrics and gynaecology, Khyber teaching hospital, Peshawar, Pakistan. The study was approved by the Institutional Ethical Review Committee and was conducted for six months from 1st October 2025 to 31st March 2026.

Study Population and Sampling

Consequential sampling technique of non-probability sampling method was chosen. The sample size was determined by the software OpenEpi using the 95% confidence level, 80% study power and the proportion of uterine scar complications anticipated to be 32.0% of women who had maternal tachycardia and 14.6% of women who did not have maternal tachycardia, which were derived from previous published data [8]. The sample size calculated was 184 (92 cases and 92 controls).

Inclusion Criteria

The study included women with singleton pregnancy, cephalic presentation, parity 1-4, and gestational age of 37-40 weeks with known history of lower segment cesarean section who underwent repeat cesarean section.

Exclusion Criteria

Fever, anemia, intrauterine fetal death, arrested first or second stage of labor (according to the recommendations of the American College of Obstetricians and Gynecologists), connective tissue disorders, hyperthyroidism, hypothyroidism or taking any drugs that affect heart rate such as beta-blockers, calcium channel blockers, antidepressants, lithium, antiarrhythmic drugs, inhaled corticosteroids, long-acting β2-agonists, and albuterol were excluded.

Data Collection

Patients of the Department of Obstetrics and Gynaecology were enrolled after giving written informed consent. All demographic and obstetric parameters such as age, gestational age, parity, birth weight, height, BMI, education, occupation and socioeconomic status were collected on a structured proforma.

Maternal heart rate was recorded in standard clinical conditions prior to surgery. If the baby's mother had a heart rate greater than 100 beats per minute, it was considered maternal tachycardia. The case group consisted of women who had maternal tachycardia, while women who did not had maternal tachycardia were in the control group. The age was matched between the cases and the controls.

All the subjects then had a repeat cesarean section. The operating obstetrician made sure to check the integrity of the previous uterine scar during surgery. It was confirmed that scar complications occurred during surgery and classified into either uterine rupture, or uterine scar dehiscence, based on the preset definitions. Uterine rupture was considered to be complete rupture of the uterine wall, and the escape of amniotic sac or fetal parts into the peritoneal cavity. The disruption of the myometrium, which was accompanied by keeping the serosal layer intact, with the presence of a visible uterine window with bulging membranes or fetal parts was defined as uterine scar dehiscence. Either finding was deemed to be a complication of the uterine scar.

Statistical Analysis

The data was entered and analyzed using IBM SPSS Statistics 24. All continuous variables (age, gestational age, weight, height, BMI) were tested for normality with the Shapiro–Wilk test and presented as mean ± standard deviation (SD) and median (IQR) as appropriate. Categorical variables such as parity, residence, education, occupation, socioeconomic status, maternal tachycardia and uterine scar complication were demonstrated as frequencies and percentages.

The correlation between maternal tachycardia and uterine scar complications was evaluated by using Chi square test or Fisher's exact test as appropriate.

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Associations were quantified by odds ratio (OR) and presented with its 95% confidence interval (CI). Stratified analyses were carried out by age, gestational age, BMI, parity, area of residence, socioeconomic status, to evaluate the impact of potential confounders. A p-value ≤0.05 was considered statistically significant.

RESULTS

A total of 184 women with one previous cesarean section were included in the study. Of these, 92 women with maternal tachycardia constituted the case group, while 92 women without maternal tachycardia served as the control group. The mean age of the study population was comparable between the two groups. Similarly, gestational age, parity, body mass index (BMI), residence, educational status, and socioeconomic status were not significantly different, indicating that the baseline characteristics of both groups were comparable (Table 1).

Scar complications were identified intraoperatively in both study groups. Overall, uterine scar complications were observed more frequently among women with maternal tachycardia than among those without maternal tachycardia. Uterine scar dehiscence was more common than complete uterine rupture in both groups. The difference in the overall frequency of scar complications between cases and controls was statistically significant (Table 2).

The association between maternal tachycardia and uterine scar complications was further evaluated using odds ratio analysis. Women with maternal tachycardia had significantly higher odds of developing uterine scar complications than women without maternal tachycardia. Stratified analysis demonstrated that the association remained statistically significant across different age groups, parity, BMI categories, and gestational age, with no evidence of significant effect modification (Table 3).

Overall, maternal tachycardia was found to be significantly associated with uterine scar complications in women with one previous cesarean section undergoing repeat cesarean delivery.

Table 1. Baseline Characteristics of the Study Participants (n = 184)

Variable	Cases (Maternal Tachycardia) n=92	Controls (No Tachycardia) n=92	P-value
Age (years), Mean ± SD	29.8 ± 4.5	29.3 ± 4.2	0.462
Gestational Age (weeks), Mean ± SD	38.5 ± 0.9	38.4 ± 0.8	0.518
BMI (kg/m²), Mean ± SD	27.6 ± 3.4	27.2 ± 3.1	0.409
Parity 1	38 (41.3%)	41 (44.6%)	0.651
Parity 2	31 (33.7%)	29 (31.5%)	
Parity 3–4	23 (25.0%)	22 (23.9%)	
Rural Residence	57 (62.0%)	54 (58.7%)	0.648
Urban Residence	35 (38.0%)	38 (41.3%)	
Low Socioeconomic Status	49 (53.3%)	46 (50.0%)	0.664
Middle/High Socioeconomic Status	43 (46.7%)	46 (50.0%)	

Table 2. Comparison of Uterine Scar Complications Between Cases and Controls (n = 184)

Outcome	Cases (n=92)	Controls (n=92)	P-value
Any Scar Complication	30 (32.6%)	13 (14.1%)	0.003
No Scar Complication	62 (67.4%)	79 (85.9%)	
Uterine Scar Dehiscence	24 (26.1%)	11 (12.0%)	0.014
Complete Uterine Rupture	6 (6.5%)	2 (2.2%)	0.148

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ISSN: (e) 3007-1607 (p) 3007-1593

Table 3. Association Between Maternal Tachycardia and Uterine Scar Complications

Variable	Odds Ratio (OR)	95% Confidence Interval	P-value
Maternal Tachycardia	2.95	1.43 – 6.09	0.003
Age ≥30 years	1.18	0.61 – 2.30	0.622
BMI ≥30 kg/m²	1.42	0.69 – 2.92	0.338
Parity ≥3	1.27	0.63 – 2.58	0.506
Gestational Age ≥39 weeks	1.09	0.54 – 2.19	0.810

DISCUSSION

The current study investigated the relationship between maternal tachycardia and uterine scar complications in women with a history of one cesarean section who had repeat cesarean delivery. The result showed that maternal tachycardia was a significant factor for the occurrence of complications among uterine scar. Women who were born with maternal tachycardia were almost three times as likely as women without maternal tachycardia to experience complications related to uterine scars. Both uterine rupture and scar dehiscence were noted, but scar dehiscence occurred more often during surgery.

The demographics and obstetric data of the two groups were similar. No significant differences were found in age, gestational age, BMI, parity, residence or SES between women with and without maternal tachycardia. This comparability reduces the risk of confounding factors, and increases the strength of the association between maternal tachycardia and uterine scar problems.

Obstetricians continue to have a hard time recognizing uterine scar complications, and symptoms can be vague. Symptoms of classic abdominal pain, vaginal bleeding, tenderness of the scar, low blood pressure in the mother, and fetal distress can be delayed or non-specific and occur along with other obstetric complications. Therefore, the value of easily accessible bedside clinical parameters that may aid in earlier diagnosis is of great clinical significance especially in resource-limited health care delivery systems where advanced monitoring capabilities may not be available at all times [9–11].

Maternal tachycardia was found to be associated with uterine scar complications in 32.6% of women with maternal tachycardia and 14.1% of women without maternal tachycardia. Results indicate that the boundary is statistically significant and agree with the hypothesis that maternal tachycardia could be an early clinical marker for underlying scar disease. These findings concur with those of previous studies where women with uterine scar complications were more likely to have tachycardia compared to women without scar complications [12,13]. Maternal tachycardia could be an early physiological reaction to undiagnosed hemorrhage, pain, hypovolemia or more likely early signs of developing uterine rupture before more recognizable signs of hemodynamic instability.

Complete uterine rupture was is rare than scar dehiscence in the present study. This is in line with previous studies showing that the rupture of the previous cesarean scar is incomplete in more cases than complete during the subsequent pregnancy. Though scar dehiscence is not as clinically apparent, however, if it isn't identified, it can progress to full uterine rupture with potentially fatal maternal and fetal consequences [14,15].

The odds ratio analysis also showed that maternal tachycardia was associated with about three times as many odds of complications with uterine scars. However, in the present study, maternal age, BMI, parity and gestational age were not independently related to scar complications. These findings indicate that maternal tachycardia may be used to generate more clinical information than routine demographic and obstetric data. However, this is not a diagnostic test alone, and should be viewed in conjunction with clinical, fetal heart rate and obstetric history [16].

The previous studies have concentrated mainly on fetal heart rate abnormalities and on cardiotocography as a means of predicting impending rupture of the uterus. While abnormal fetal heart rate patterns are the most consistently reported warning sign, maternal clinical findings still have a key role in identifying women who

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ISSN: (e) 3007-1607 (p) 3007-1593

need urgent assessment and intervention [17,18]. The current work joins the increasing body of literature that indicates that maternal tachycardia could be a valuable clinical indicator, especially in hospitals with less access to continuous electronic fetal monitoring or sophisticated diagnostic equipment.

The results of this study have implications in the clinical field. Monitoring maternal heart rate during labour and prior to repeat cesarean section is easy, cheap and available to all. The clinician should have a high index of suspicion for uterine scar complications when the mother has unexplained tachycardia, especially when it is accompanied by abdominal pain, tenderness at the scar, vaginal bleeding, or irregular fetal heart rate patterns and should proceed to prompt obstetric evaluation. Early recognition and intervention could decrease maternal morbidity, fetal compromise, emergency hysterectomy and perinatal mortality [19,20].

Limitations

The study may have some limitations. First, the case-control design showed an association of maternal tachycardia with complications of uterine scarring, but does not prove a causal connection. Second, the study was performed in one tertiary care center, which could affect the generalizability of the results to other health care centers. Third, because maternal tachycardia can be caused by many clinical conditions, not including common ones, such as fever, anemia, thyroid conditions, or medications with tachycardia effects, it is impossible to completely rule out residual confounding. Lastly, because the sample size was relatively small, the study might not have identified significant associations with less-common events like full uterine rupture. To confirm these results larger multicenter prospective studies are suggested to evaluate the diagnostic value of maternal tachycardia as well as other maternal and fetal monitoring parameters for early detection of uterine scar complications.

CONCLUSION

The maternal tachycardia was significantly linked to uterine scar complications in the women who were previously cesarean delivered who delivered again. Women in tachycardia group were more likely to have intraoperative uterine scar dehiscence or rupture than women in the non-tachycardia group. Since maternal heart rate is a simple, inexpensive and readily available bedside clinical parameter, its presence should alert the clinician to a higher risk of uterine scar complications, especially in the presence of other clinical factors during labor. Prompt identification of maternal tachycardia can help to ensure timely obstetric intervention and minimize adverse maternal and fetal outcomes. These data are preliminary and additional multicenter prospective trials with larger numbers of cases are recommended to confirm the results and to determine the diagnostic value of maternal tachycardia in predicting complications in the uterine scar.

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