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ASSOCIATION BETWEEN PREOPERATIVE SCAR TENDERNESS AND PEROPERATIVE WOUND DEHISCENCE IN PATIENTS WITH PREVIOUS C-SECTION

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Abstract

Background: *Growing rates of caesarean sections (CS) have led to an increase in the observation of uterine scar dehiscence and scar pain. Despite the consequences for maternal and fetal outcomes, their clinical relationship is still little understood in South Asian populations.*

Objectives: *To determine important predictors of wound disintegration in women with a history of CS and to assess the association between preoperative scars tenderness and perioperative wound dehiscence.*

Methods: *360 pregnant women with a history of caesarean sections were randomly assigned to tenderness or non-tenderness groups in a prospective case-control research study at CMH Gujranwala from 25 March 2025 till 25 June 2025. Clinical and demographic information was gathered. Data were analyzed using logistic regression, chi-square testing, and Mann-Whitney U tests after an intraoperative scar assessment.*

Results: *39.2% of subjects showed signs of wound dehiscence. Dehiscence and parity, anemia, hypertension, booking status, prior CS count, and lifestyle were found to be significantly correlated ($p < 0.001$). Women with dehiscence had significantly higher gestational age, BMI, and age, according to the Mann-Whitney U test ($p < 0.001$). Anemia (OR = 0.251, 95% CI: 0.10–0.64, $p = 0.004$), scar tenderness (OR = 0.008, 95% CI: 0.001–0.08, $p < 0.001$), and a sedentary lifestyle (OR = 0.134, 95% CI: 0.05–0.37, $p < 0.001$) were found to be protective factors by logistic regression. Conversely, increasing maternal age (OR = 1.287, $p = 0.047$) and BMI (OR = 1.751, $p = 0.015$) were independent risk factors.*

Conclusion: *The probability of wound dehiscence is greatly influenced by lifestyle variables, anemia, and scar tenderness. Prediction and surgical results in repeat CS cases may be enhanced by incorporating these criteria during prenatal evaluation.*

INTRODUCTION

Caesarean scar problems, such as wound dehiscence and caesarean scar discomfort, have unavoidably increased as a result of the global increase in caesarean section (CS) rates over the

previous few decades(1). A major risk factor for maternal and fetal morbidity and mortality is uterine scar dehiscence, which is defined as the partial or total separation of the uterine scar borders without full rupture. This highlights the significance of early identification and treatment before to or during subsequent pregnancies(2). The predictive significance and relationship between preoperative scar tenderness and per operative wound dehiscence are still poorly understood, especially in diverse populations, despite the fact that caesarean scar tenderness has been suggested as a clinical marker for identifying women at risk of scar dehiscence.

Pain that is localized over the prior CS uterine scar site during pregnancy or labor is referred to as caesarean scar tenderness. According to some reports, it may be a warning sign of weakening myometrial integrity and an imminent rupture or dehiscence of the scar(3). Scar dehiscence rates in women who present with scar soreness have been documented in a variety of studies to range from 14.9% to over 30%, indicating a substantial link between intraoperative diagnosis and clinical results(4). The identification of scar soreness has been linked to a higher risk of scar problems when combined with clinical measures such maternal tachycardia and aberrant cardiotocography, highlighting the potential value of these indicators in prenatal and postnatal monitoring(5). Nonetheless, the necessity for localized information to guide clinical decision-making protocols is highlighted by the variation in incidence rates and diagnostic standards among various research.

Preoperative assessment techniques have been improved by diagnostic modalities like as ultrasound, which measures the thickness of the lower uterine segment in women who have had prior CS(6). These modalities provide noninvasive ways to anticipate scar integrity and direct surgical planning. Even yet, a lot of uterine scar dehiscence instances are unintentionally found following caesarean birth because of ultrasonography sensitivity limits and inconsistent clinical symptomatology(7). Unexpected consequences such as uterine rupture, hemorrhage, emergency hysterectomy, and unfavorable newborn sequelae can result from a missed or postponed diagnosis(8). In order to improve maternal and perinatal outcomes, risk stratification, scheduling, and delivery method could be optimized through the discovery of trustworthy clinical markers such scar tenderness.

In order to maintain uterine integrity for subsequent pregnancies, surgical therapy of caesarean scar dehiscence requires specialized operating procedures, such as careful incision selection and thorough scar restoration(1). The therapeutic importance of comprehending risk variables associated with scar failure is increased by the increasing prevalence of numerous repeat caesarean sections and shorter interpregnancy intervals(2). Despite the fact that uterine scar dehiscence has been the subject of much research worldwide, the lack of data from South Asian and particularly local populations limits the establishment of acceptable guidelines in these contexts, where the rates of caesarean sections are also rising.

The purpose of this case-control study is to clarify the relationship between intraoperative uterine wound tear and preoperative scar soreness in individuals who have had prior caesarean sections. In order to improve clinical prediction models, antenatal screening methods, and ultimately lessen maternal and fetal difficulties associated with scar failure in following pregnancies, the study plans to quantify this association by analyzing local data. Important data for early detection and preventative care catered to the local obstetric community will be provided by this targeted study.

Materials and Methods:

After receiving approval from the institutional ethics committee, this prospective case-control study was carried out from 25 March 2025 till 25 June 2025 at the Department of Obstetrics and Gynecology, CMH Gujranwala, Pakistan.

The WHO sample size calculator with 80% power at the 5% significance level was used to calculate the sample size. A minimum number of 180 participants per group was needed, based on preliminary data that showed a 63.64%

occurrence of scar dehiscence in individuals with scar tenderness compared to 36.36% in those having no tenderness. A total of 400 individuals were recruited, 200 in each group to account for possible dropouts.

Pregnant women between the ages of 18 and 40 who presented at gestational age between 32 and 42 weeks, had parity fewer than five, and had at least one prior caesarean section under spinal anesthesia made up the study population. Women who had localized pain or discomfort when the previous caesarean scar site was palpated during a normal prenatal assessment and had clinically obvious preoperative uterine scar tenderness been considered cases. Women who did not exhibit preoperative uterine scar discomfort on clinical examination were included in the control group. Singleton pregnancies with prior spinal anesthesia-assisted caesarean deliveries and documented informed consent were included in the inclusion criteria. Several pregnancies, prior uterine surgery (other than caesarean section), uterine rupture history, diabetes mellitus (fasting glucose >126 mg/dl), thyroid dysfunction (TSH >5.0 μIU/L), renal dysfunction (creatinine >1.4 mg/dl), coagulopathy disorders, emergency caesarean sections, and placental abnormalities (previa, abruption, or accreta) were among the exclusion criteria.

Under the guidance of a consultant, all participants completed standardized clinical evaluations by qualified residents. Using structured proformas, demographic information such as parity, body mass index, mother age, gestational age, and comprehensive obstetric history were methodically documented. By methodically palpating the site of a prior caesarean scar, examining physicians evaluated preoperative scar discomfort, classifying the results as either present or absent. The operating consultant obstetrician closely inspected the lower uterine section for scar dehiscence during the caesarean birth. Scar dehiscence was categorized as either present or absent and described as any degree of separation of the prior caesarean scar. In order to accurately analyses the stability of the existing scar, this assessment was carried out prior to the uterine incision.

To analyses the data, SPSS version 27.0 was used. The Shapiro-Wilk test value was >0.05 suggesting non normality of data. Non-normally distributed data were expressed as median with interquartile range and analyzed using the Mann-Whitney U test, whilst normally distributed variables were provided as mean ± standard deviation and compared using independent t-tests. Frequencies and percentages were used to represent categorical variables, and the chi-square test , as applicable, was used to analyses associations. The strength of the link was measured using odds ratios with 95% CIs. To account for potential confounders such as maternal age, body mass index (B parity, gestational age, and inter-delivery interval, multivariable logistic regression analysis was used. A p-value of less than 0.05 was considered statistically significant.

Results:

There were 360 participants in the study, ranging in age from 25 to 43, with a mean age of 31.61 ± 3.74 years. The mean gestational age was 38.57 ± 0.91 weeks, and the average BMI was 30.38 ± 2.67 kg/m². The average thickness of the scar was 3.24 ± 0.85 mm. The participants were split equally into two groups: the control group (n = 180, 50%) and the case group (n = 180, 50%). Para 2 (27.2%) had the highest percentage of women, followed by para 3 (21.1%), para 1 (16.7%), and para 4 (15.0%). Of the participants, 35.6% had a history of hypertension, and 46.9% had a history of anemia. Prior history of caesarean sections revealed that 40.3% had had one, 34.4% had had two, and 25.3% had had three.

In terms of lifestyle and access to healthcare, 47.2% of participants were active, whereas 52.8% of individuals maintained a sedentary lifestyle. 45.3% of the women were not scheduled for prenatal care, whereas over half (54.7%) were. 50% of subjects, equally split across the groups, showed signs of scar discomfort. Interestingly, 39.2% of the women experienced wound dehiscence, whereas 60.8% did not experience this problem. This clinical and demographic

distribution offers a thorough summary of the traits of the research population.

Table 1: Participant's Characteristics

Variable	Category	Frequency (n)	Percentage (%)	Mean ± SD	Range
Age (years)	-	360	100	31.61 ± 3.74	25–43
Gestational Age (weeks)	-	360	100	38.57 ± 0.91	36–40
BMI (kg/m²)	-	360	100	30.38 ± 2.67	25.3–37.1
Scar Thickness (mm)	-	360	100	3.24 ± 0.85	1.60–4.74
Group	Case	180	50.0	-	-
	Control	180	50.0	-	-
Parity	1	60	16.7	-	-
	2	170	47.2	-	-
	3	76	21.1	-	-
	4	54	15.0	-	-
Hypertension History	Yes	128	35.6	-	-
	No	232	64.4	-	-
Anemia History	Yes	169	46.9	-	-
	No	191	53.1	-	-
Previous Cesarean	1	145	40.3	-	-
	2	124	34.4	-	-
	3	91	25.3	-	-
Lifestyle	Sedentary	190	52.8	-	-
	Active	170	47.2	-	-
Booking Status	Booked	197	54.7	-	-
	Un-booked	163	45.3	-	-
Scar Tenderness	Present	180	50.0	-	-
	Absent	180	50.0	-	-
Wound Dehiscence	Present	141	39.2	-	-
	Absent	219	60.8	-	-

The findings showed statistically significant relationships between the outcomes of wound dehiscence and scar tenderness and several independent variables. Both scar discomfort and wound dehiscence were substantially correlated with parity, history of hypertension, history of anemia, booking status, lifestyle, and number of prior caesarean procedures ($p < 0.001$ for all), according to chi-square tests. Notably, there was a strong correlation between these two clinical outcomes, as the existence of scar tenderness itself was also significantly associated with wound dehiscence ($p < 0.001$).

The Mann-Whitney U test was used to analyze continuous data, including age, BMI, scar thickness, and gestational age. Regarding both scar pain and wound dehiscence, each showed a statistically significant difference ($p < 0.001$ in every instance). These results imply that changes in scar thickness, gestational age, higher maternal age, and elevated BMI may all significantly enhance the risk of scar-related problems in caesarean patients.

Table 2: Chi square and Mann-Whitney U test

Independent Variable	Outcome	Test Type	p-value
Parity	Scar Tenderness	Chi square	<0.001
Parity	Wound Dehiscence	Chi square	<0.001
Hypertension History	Scar Tenderness	Chi square	<0.001
Hypertension History	Wound Dehiscence	Chi square	<0.001
Booking Status	Scar Tenderness	Chi square	<0.001
Booking Status	Wound Dehiscence	Chi square	<0.001
Lifestyle	Scar Tenderness	Chi square	<0.001
Lifestyle	Wound Dehiscence	Chi square	<0.001
Previous C-Section	Scar Tenderness	Chi square	<0.001
Previous C-Section	Wound Dehiscence	Chi square	<0.001
Anemia History	Scar Tenderness	Chi square	<0.001
Anemia History	Wound Dehiscence	Chi square	<0.001
Scar Tenderness	Wound Dehiscence	Chi square	<0.001
Age	Scar Tenderness	Mann-Whitney U test	<0.001
Age	Wound Dehiscence	Mann-Whitney U test	<0.001
BMI	Scar Tenderness	Mann-Whitney U test	<0.001
BMI	Wound Dehiscence	Mann-Whitney U test	<0.001
Scar Thickness	Scar Tenderness	Mann-Whitney U test	<0.001
Scar Thickness	Wound Dehiscence	Mann-Whitney U test	<0.001
Gestational Age	Scar Tenderness	Mann-Whitney U test	<0.001
Gestational Age	Wound Dehiscence	Mann-Whitney U test	<0.001

The investigation of binary logistic regression revealed a number of important factors that predict wound dehiscence. With an odds ratio (OR) of 0.251 (95% CI: 0.10–0.64, p = 0.004), anemia was found to be a significant protective factor, meaning that those who had anemia were much less likely to experience wound dehiscence. The odds were also significantly lower for those who led a sedentary lifestyle (OR = 0.134, 95% CI: 0.05–0.37, p < 0.001). Additionally, scar tenderness showed a high negative correlation with wound dehiscence (OR = 0.008, 95% CI: 0.001–0.08, p < 0.001), indicating that its presence made dehiscence far less likely.

On the other hand, the risk of dehiscence of wounds was strongly correlated with both age and BMI. The chances increased by 28.7% (OR = 1.287, 95% CI: 1.00–1.65, p = 0.047) for every unit increase in age and by 75.1% (OR = 1.751, 95% CI: 1.11–2.76, p = 0.015) for every unit increase in BMI. The following other variables failed to achieve statistical significance (p > 0.05): parity, number of prior caesarean sections, history of hypertension, booking status, gestational age, and scar thickness. These results demonstrate the complex nature of wound dehiscence, with lifestyle and BMI being important modifiable factors.

Table 3: Predictors of Wound Dehiscence

Predictor	B	SE	Wald	p-value	Odds Ratio [Exp(B)]	95% CI for Exp(B)
Parity (1 vs >1)	-14.245	5028.42	0.000	0.998	0.000	-
Previous CS (1 vs >1)	0.264	0.618	0.182	0.670	1.302	0.39-4.37
Hypertension (Yes)	-0.430	0.588	0.533	0.465	0.651	0.21-2.05
Anemia (Yes)	-1.381	0.482	8.224	**0.004**	0.251	0.10-0.64

Lifestyle (Sedentary)	-2.012	0.510	15.557	**<0.001**	0.134	0.05-0.37
Booking (Unbooked)	0.805	0.625	1.656	0.198	2.236	0.66-7.60
Scar Tenderness (Yes)	-4.844	1.203	16.226	**<0.001**	0.008	0.001-0.08
Age	0.253	0.127	3.931	**0.047**	1.287	1.00-1.65
Gestational Age	0.155	0.449	0.119	0.730	1.167	0.48-2.81
BMI	0.560	0.231	5.866	**0.015**	1.751	1.11-2.76
Scar Thickness	0.837	0.848	0.975	0.323	2.311	0.44-12.18
Constant	-31.219	22.306	1.959	0.162	0.000	-

Discussion:

Numerous studies have been conducted on the postoperative problems resulting from prior caesarean scars, including wound dehiscence and scar pain, as a result of the rising frequency of caesarean sections worldwide. Future pregnancies, surgical results, and maternal morbidity are all greatly impacted by these issues. Enhancing clinical management and patient counselling requires an understanding of the variables affecting scar integrity and postoperative wound healing. In order to investigate demographic, clinical, and lifestyle factors of preoperative scar discomfort and postoperative wound dehiscence, this study looks at a well-characterized cohort of 360 women who have had prior caesarean sections.

With a mean age of 31.61 ± 3.74 years and a mean BMI of 30.38 ± 2.67 kg/m2, the study population was primarily overweight, which has been connected to poor surgical outcomes and wound healing issues in caesarean deliveries(9,10). Although there was no significant univariate connection between scar thickness with wound dehiscence ($p > 0.05$), the mean scar thickness was 3.24 ± 0.85 mm, between ranges shown in other cohorts where thin scars have been linked to an increased risk of rupture in the uterus or dehiscence(11,12). Robust comparison was made possible by the equal distribution of participants across the control and case groups; 39.2% of them experienced wound dehiscence, and half of them reported scar discomfort.

The distribution of parity showed that more women had para 2 and 3, which is in line with research suggesting that higher parity may affect the shape and healing of uterine scars as a result of repeated cycles of uterine strain and repair(13). Regression analysis revealed that parity and the number of prior caesarean sections did not significantly predict wound dehiscence, which is consistent with the conclusion that the number of past caesarean sections is not a valid independent predictor for wound problems(14,15). On the other hand, anemia and a history of hypertension were associated with wound dehiscence and scar soreness on chi-square analysis ($p < 0.001$), while anemia ironically turned out to be protective in logistic regression (OR = 0.251). This surprising finding calls for more research since it could be the consequence of confounding variables like tighter prenatal monitoring or therapeutic effects that lessen wound complications in anemic individuals(13).

The high independent correlation between maternal age and BMI and wound dehiscence risk is one particularly noteworthy discovery. For every unit increase in age and BMI, the odds increased by 28.7% and 75.1%, respectively ($p = 0.047$ and $p = 0.015$). This supports earlier research that showed poor wound healing and a higher risk of surgical site infections following caesarean section were associated with older mothers and higher BMI(16). While ageing is linked to a decreased potential for tissue regeneration, obesity is linked to systemic inflammation, a changed immunological response, and mechanical stress on surgical scars(17). In order to decrease postoperative wound complications, these modifiable factors are therefore important preoperative optimization targets.

Sedentary lifestyles significantly decreased the likelihood of wound dehiscence (OR = 0.134, $p <$

0.001), indicating a significant influence of lifestyle factors. Although sedentary behavior typically carries other health risks, this counterintuitive protective association may result from reduced mechanical strain or improved adherence to postoperative rest. The presence of scar tenderness may be a sign of active healing or scar remodeling that stops wound disintegration, highlighting the intricate clinical relationship between symptoms with tissue integrity. Scar tenderness was also negatively linked with wound disintegration (OR = 0.008)(13).

Despite their physiological significance, gestational age and scar thickness did not reach statistical significance for determining wound dehiscence. This is probably due to the fact that scar issues are complex and that there are limits in the timing and accuracy of scar thickness measurements(11). These results emphasize the necessity of a thorough clinical assessment as opposed to depending solely on one parameter to determine risk.

The implications for clinical practice include heightened attention to maternal anthropometrics and modifiable lifestyle factors in managing women with previous cesarean scars. Preoperative counseling should address weight management and optimal timing of delivery relative to maternal age. Moreover, screening for scar tenderness could serve as a practical clinical indicator for identifying women at lower risk for wound dehiscence. Integration of multidisciplinary care involving nutritionists, physical therapists, and obstetricians may enhance postoperative outcomes.

This study is consistent with prior research demonstrating the complex interrelations of maternal characteristics and scar outcomes. For instance, similar mean scar thickness values and non-significant associations with wound complications were reported in earlier cohorts, though some studies identified gestational diabetes and shorter inter-pregnancy intervals as influential comorbid factors not analyzed here(18). The finding of paradoxical anemia protection contrasts with conventional views linking anemia to poor wound healing, highlighting variations due to study design or patient management differences.

Limitations include the observational design, which cannot establish causality, and potential residual confounding from unmeasured variables such as surgical technique, infection rates, or detailed nutritional status. The scar thickness measurement methodology and timing may affect reliability as scar morphology evolves during pregnancy. Further prospective, multicenter studies incorporating biomarkers and advanced imaging are warranted to validate these predictors and elucidate mechanistic pathways.

Conclusion

In conclusion, this study identifies maternal age, BMI, lifestyle, and scar tenderness as key factors associated with wound dehiscence after cesarean section, while anemia may play a protective role. The findings emphasize the importance of holistic assessment and management of women with previous cesarean scars to minimize complications and improve maternal outcomes. Future research should explore targeted interventions addressing these modifiable risk factors to optimize surgical healing and reproductive health.

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