



## Association of History of Cesarean Section with Placenta Previa: A Case Control Study

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### ABSTRACT

**Background:** Placenta previa is a grave obstetric morbidity that enhances the risk of maternal and neonatal morbidity. Cesarean delivery has been identified as an important cause of its occurrence, albeit the level of association differs among populations. The development of local evidence provides the necessary impetus for informing preventive and clinical interventions. **Objective:** To determine the association of placenta previa with history of previous cesarean section in pregnant women. **Study Design:** Case-control study. **Duration and Place of Study:** The study was conducted from January 2025 to May 2025 at the Department of Obstetrics and Gynecology, Khyber Teaching Hospital, Peshawar. **Methodology:** A total of 130 women aged 25–40 years with singleton pregnancies beyond 28 weeks were enrolled. Sixty-five women diagnosed with placenta previa on ultrasound formed the case group, while 65 without placenta previa served as controls. Baseline demographics, comorbidities, and obstetric history including prior cesarean sections were recorded. Data analysis was performed using SPSS version 26, with chi-square and stratified analyses applied. **Results:** The mean age of the placenta previa group was  $31.94 \pm 2.54$  years compared to  $29.86 \pm 2.52$  years in controls. Previous cesarean section was significantly more frequent among cases (46.2%) than controls (23.1%) ( $p=0.006$ ;  $OR=2.86$ , 95%  $CI:1.35-6.05$ ). Stratification revealed a stronger association in women  $>30$  years ( $OR=6.77$ , 95%  $CI:2.18-21.05$ ) and in non-hypertensive women ( $OR=6.22$ , 95%  $CI:2.54-15.24$ ). **Conclusion:** Women with a history of cesarean section are at nearly threefold increased risk of developing placenta previa, with risk further amplified in older and non-hypertensive subgroups.

### INTRODUCTION

Cesarean delivery, though often lifesaving for mother and fetus in troubled deliveries, has significant repercussions in subsequent pregnancies.<sup>1</sup> Besides the acute operative complications of infection, hemorrhage, and delayed wound healing, cesarean delivery has delayed reproductive consequences. Patients who have had a previous cesarean section are at a greater risk of subsequent placentas exhibiting an abnormal placentation in subsequent gestations, uterine rupture, adhesion formation, and infertility due to endometrial and myometrial scarring.<sup>2</sup> All these alter the endometrial milieu to impair optimal uterine functioning and place subsequent gestations at risk of abnormalities of implantation. Repeated cesarean deliveries increase the risk so that each subsequent operative scar contributes to alterations of uterine architecture to impair subsequent gestational performance.<sup>3</sup>

Placenta previa is a potentially life-threatening obstetric condition defined by low-lying implantation of the placenta in the lower uterine segment completely or partly

overlying the internal cervical os.<sup>4</sup> It is a major cause of antepartum bleeding and may lead to substantial maternal morbidity and poor perinatal outcome such as preterm delivery and elevated admission rates to neonatal intensive care units. Painless vaginal bleeding occurring in the second or third trimester is typically the presenting symptom and necessitates prudent obstetric care to avert maternal and fetal complications.<sup>5</sup> Advanced age, multiparity, multiple conception, and uterine interventions like curette and cesarean section are potential risk factors for developing placenta previa.<sup>6,7</sup> Severe cases of placenta previa could frequently coexist with placenta accreta spectrum, a condition most challenging to manage at the time of delivery because of the potential for catastrophic bleeding and the necessity of subsequent hysterectomy.<sup>8,9</sup>

The relation of a previous cesarean delivery to placenta previa has been well documented in obstetric literature.<sup>10</sup> The scarred uterus that results from a previous cesarean section creates an area of absent endometrium and myometrium that can impair normal implantation and

lead to the placenta inserting in the lower uterine segment. Various studies have found that the prevalence of placenta previa is directly proportional to the prior cesarean deliveries a woman has had and is a significant public health problem because the prevalence of cesarean deliveries is increasing globally.<sup>11,12</sup> Mechanical and vascular factors play a role in the mechanism and etiology of causing scarring, disruption of endometrial receptiveness, and impaired uteroplacental perfusion with resultant abnormal trophoblastic invasion.<sup>13</sup> This correlation creates a need to exercise a certain level of caution before the performance of primary cesarean deliveries and prudent prenatal monitoring in women who had a previous cesarean delivery so that placenta previa may be diagnosed early and managed.<sup>14</sup>

Latif L et al. reported that the frequency of placenta previa was significantly higher among women with a history of cesarean section, observed in 46.6% of cases, compared with 23.3% in those without a previous cesarean section.<sup>15</sup> The rising rates of cesarean deliveries in Peshawar have raised concerns regarding their late reproductive outcome, particularly the risk of an abnormal placentation. Placenta previa continues to remain a major cause of maternal morbidity and low perinatal outcome and has been internationally well established to accompany a previous cesarean section. However, local data are lacking though the obstetric workload is high and operative delivery is an increasing trend in local centers. Conducting a study in Peshawar will generate local-specific data to determine the strength of the association in the local setup and help clinicians and policymakers to optimize mother's health policies and make optimal practice of delivery.

## METHODOLOGY

This case-control study was carried out in the Department of Obstetrics and Gynecology at Khyber Teaching Hospital, Peshawar, over a six-month period from January 2025 to May 2025. The research was initiated after receiving formal approval from the institutional review board and the College of Physicians and Surgeons Pakistan. A total of 130 women were included, with 65 patients in the case group (placenta previa) and 65 in the control group (no placenta previa). The sample size was determined using a 95% confidence level, 5% significance level, and 80% statistical power, based on previously reported frequencies of placenta previa of 46.6% in women with prior cesarean section compared with 23.3% in women without such a history.<sup>15</sup> Women aged 25 to 40 years, with singleton pregnancies beyond 28 weeks of gestation confirmed by last menstrual period or dating scan, and parity between one and four were eligible for inclusion. The case group comprised women diagnosed with placenta previa on ultrasound, while the control group consisted of pregnant women with no evidence of placenta previa. Women with a history of miscarriage, myomectomy, dilatation and curettage, congenital uterine malformations, uterine fibroids distorting the cavity, prior abruption placentae, major uterine rupture, or known thrombophilic disorders were excluded. Written informed consent was obtained from all participants after explaining the purpose, benefits, and potential risks of the study. Demographic and clinical data were recorded,

including age, gestational age, parity, number of previous cesarean deliveries, body mass index, residential status, and co-morbid conditions such as diabetes, hypertension, and obesity. Each participant underwent a complete medical and obstetric history followed by physical examination. A history of cesarean delivery was confirmed by documented medical record of one or more prior cesarean sections, defined as delivery of a fetus through an abdominal incision involving both the abdominal wall and uterus. Placenta previa was identified on transabdominal ultrasound with a full bladder using grey-scale imaging under the supervision of a consultant gynecologist with more than three years of post-fellowship experience. The diagnosis was established when the placental edge was located within 5 cm of the internal os, reached but did not cover the os, partially overlapped the os, or symmetrically and completely covered it.

Data were collected on a structured proforma and analyzed using SPSS version 26. Continuous variables were summarized as mean with standard deviation or median with interquartile range after testing for normality using the Shapiro-Wilk test. Categorical variables were described as frequencies and percentages. The relationship between placenta previa and prior cesarean delivery was evaluated using the chi-square test, while the magnitude of association was quantified with odds ratios and their 95% confidence intervals. Stratified analyses were performed and post-stratification comparisons were made using chi-square or Fisher's exact test where appropriate. A p-value of  $\leq 0.05$  was considered statistically significant.

## RESULTS

Patient demographics revealed that the placenta previa group had a mean age of  $31.94 \pm 2.54$  years, gestational age of  $35.09 \pm 2.05$  weeks, parity of  $2.60 \pm 0.92$ , and BMI of  $25.80 \pm 2.28$  kg/m<sup>2</sup>, while the control group had a mean age of  $29.86 \pm 2.52$  years, gestational age of  $36.10 \pm 1.80$  weeks, parity of  $2.08 \pm 1.08$ , and BMI of  $24.65 \pm 2.82$  kg/m<sup>2</sup>. Regarding comorbidities, diabetes was present in 6 patients (9.2%) in the placenta previa group compared to 4 patients (6.2%) in the control group, while 59 patients (90.8%) and 61 patients (93.8%) respectively had no diabetes. Hypertension was observed in 13 patients (20.0%) in the placenta previa group versus 20 patients (30.8%) in the control group, with 52 patients (80.0%) and 45 patients (69.2%) respectively having no hypertension. Residence status showed that 44 patients (67.7%) from the placenta previa group and 28 patients (43.1%) from the control group were from rural areas, while 21 patients (32.3%) and 37 patients (56.9%) respectively were from urban areas. Obesity was equally distributed with 4 patients (6.2%) in each group being obese and 61 patients (93.8%) in each group being non-obese (as shown in Table 1).

The comparison of previous cesarean section between the two groups demonstrated a statistically significant association, with 30 patients (46.2%) in the placenta previa group having a history of previous cesarean section compared to 15 patients (23.1%) in the control group ( $p=0.006$ ). The remaining 35 patients (53.8%) in the placenta previa group and 50 patients (76.9%) in the

control group had no previous cesarean section history. The odds ratio was 2.86 (95% CI: 1.35-6.05), indicating that women with previous cesarean section had nearly three times higher odds of developing placenta previa (as shown in Table 2).

**Table 1**  
*Patient Demographics*

Demographics	Placenta Previa (n=65)	Control Group (n=65)
Age (years)	31.94±2.54	29.86±2.52
Gestational Age (weeks)	35.09±2.05	36.10±1.80
Parity	2.60±0.92	2.08±1.08
BMI (Kg/m <sup>2</sup> )	25.80±2.28	24.65±2.82
Diabetes	Yes n (%)	4 (6.2%)
	No n (%)	61 (93.8%)
Hypertension	Yes n (%)	20 (30.8%)
	No n (%)	45 (69.2%)
Residence Status	Rural n (%)	28 (43.1%)
	Urban n (%)	37 (56.9%)
Obesity	Yes n (%)	4 (6.2%)
	No n (%)	61 (93.8%)

**Table 2**  
*Comparison of Previous Cesarean Section between the Two Groups (n=130)*

Previous Cesarean Section	Placenta Previa n=65 n (%)	Control Group n=65 n (%)	P value	Odds Ratio (95% CI)
Yes	30 (46.2%)	15 (23.1%)	0.006	2.86 (1.35-6.05)
No	35 (53.8%)	50 (76.9%)		
Total	65 (100%)	65 (100%)		

Among patients ≤30 years, 4 patients (22.2%) in the placenta previa group had previous cesarean section compared to 11 patients (28.9%) in the control group, with 14 patients (77.8%) and 27 patients (71.1%) respectively having no previous cesarean section (p=0.550, OR=0.72, 95% CI: 0.20-2.62). However, among patients >30 years, a highly significant association was observed with 26 patients (55.3%) in the placenta previa group having previous cesarean section compared to only 4 patients (14.8%) in the control group, while 21 patients (44.7%) and 23 patients (85.2%) respectively had no previous cesarean section (p<0.001, OR=6.77, 95% CI: 2.18-21.05). Regarding diabetes stratification, among diabetic patients, 4 patients (66.7%) in the placenta previa group had previous cesarean section versus 2 patients

(50.0%) in the control group, with 2 patients (33.3%) and 2 patients (50.0%) respectively having no previous cesarean section (p=0.637, OR=2.54, 95% CI: 0.35-18.55). Among non-diabetic patients, 26 patients (44.1%) in the placenta previa group had previous cesarean section compared to 13 patients (21.3%) in the control group, while 33 patients (55.9%) and 48 patients (78.7%) respectively had no previous cesarean section (p=0.011, OR=2.88, 95% CI: 1.28-6.50). Hypertension stratification showed that among hypertensive patients, 2 patients (15.4%) in the placenta previa group had previous cesarean section versus 8 patients (40.0%) in the control group, with 11 patients (84.6%) and 12 patients (60.0%) respectively having no previous cesarean section (p=0.085, OR=0.27, 95% CI: 0.05-1.40). Among non-hypertensive patients, 28 patients (53.8%) in the placenta previa group had previous cesarean section compared to 7 patients (15.6%) in the control group, while 24 patients (46.2%) and 38 patients (84.4%) respectively had no previous cesarean section (p<0.001, OR=6.22, 95% CI: 2.54-15.24). Residence status stratification demonstrated that among rural patients, 22 patients (50.0%) in the placenta previa group had previous cesarean section versus 7 patients (25.0%) in the control group, with 22 patients (50.0%) and 21 patients (75.0%) respectively having no previous cesarean section (p=0.063, OR=3.00, 95% CI: 0.93-9.63). Among urban patients, 8 patients (38.1%) in the placenta previa group had previous cesarean section compared to 8 patients (21.6%) in the control group, while 13 patients (61.9%) and 29 patients (78.4%) respectively had no previous cesarean section (p=0.173, OR=2.23, 95% CI: 0.70-7.13). Obesity stratification revealed that among obese patients, all 4 patients (100%) in the placenta previa group had previous cesarean section compared to 2 patients (50.0%) in the control group, with 0 patients (0%) and 2 patients (50.0%) respectively having no previous cesarean section (p=0.143, OR=∞, undefined due to zero cell). Among non-obese patients, 26 patients (42.6%) in the placenta previa group had previous cesarean section versus 13 patients (21.3%) in the control group, while 35 patients (57.4%) and 48 patients (78.7%) respectively had no previous cesarean section (p=0.020, OR=2.77, 95% CI: 1.18-6.51) (as shown in Table 3).

**Table 3**  
*Association of Previous Cesarean Section with Demographic Variables*

Demographics variables	Group	Previous Cesarean Section		P-value	Odds Ratio (95% CI)	
		Yes (n, %)	No (n, %)			
Age (years)	≤30	Placenta Previa	4 (22.2%)	14 (77.8%)	0.550	0.72 (0.20-2.62)
		Control	11 (28.9%)	27 (71.1%)		
	>30	Placenta Previa	26 (55.3%)	21 (44.7%)	<0.001	6.77 (2.18-21.05)
		Control	4 (14.8%)	23 (85.2%)		
Diabetes	Yes	Placenta Previa	4 (66.7%)	2 (33.3%)	0.637	2.54 (0.35-18.55)
		Control	2 (50.0%)	2 (50.0%)		
	No	Placenta Previa	26 (44.1%)	33 (55.9%)	0.011	2.88 (1.28-6.50)
		Control	13 (21.3%)	48 (78.7%)		
Hypertension	Yes	Placenta Previa	2 (15.4%)	11 (84.6%)	0.085	0.27 (0.05-1.40)
		Control	8 (40.0%)	12 (60.0%)		
	No	Placenta Previa	28 (53.8%)	24 (46.2%)	<0.001	6.22 (2.54-15.24)
		Control	7 (15.6%)	38 (84.4%)		
Residence Status	Rural	Placenta Previa	22 (50.0%)	22 (50.0%)	0.063	3.00 (0.93-9.63)
		Control	7 (25.0%)	21 (75.0%)		
	Urban	Placenta Previa	8 (38.1%)	13 (61.9%)	0.173	2.23 (0.70-7.13)
		Control	8 (21.6%)	29 (78.4%)		

Obesity	Yes	Placenta Previa	4 (100%)	0 (0%)	0.143	$\infty$ (undefined)
		Control	2 (50.0%)	2 (50.0%)		
	No	Placenta Previa	26 (42.6%)	35 (57.4%)	0.020	2.77 (1.18-6.51)
		Control	13 (21.3%)	48 (78.7%)		

## DISCUSSION

This research explored the correlation between history of previous cesarean section and placenta previa and found there to be a significant correlation with an odds ratio of 2.86, which suggests that women with previous cesarean delivery have almost three times greater chance of acquiring placenta previa. The results show that this correlation specifically stands out for women beyond the age of 30 years, with the odds ratio surging sharply to 6.77, which indicates that age is an influential modifying variable with regard to this correlation. The remarkably higher proportion of previous cesarean section for placenta previa group can be attributed to the pathophysiology of placental implantation after uterine surgery. Cesarean section produces endometrial scarring and damage to the uterine musculature, causing failure of decidualization and faulty trophoblast invasion with resulting pregnancies. The scar tissue possesses decreased vascularity and variable endometrial receptiveness, which compels placental attachment and implantation of placenta lower down and hence placenta previa. The risk increase with the advancing years of women beyond 30 years most probably mirrors cumulative exposure with regard to factors of reproduction, delayed childbearing trends, and age-dependent endometrial quality and uterine blood flow which build up previous uterine surgical effects.

Our results align closely with several regional studies demonstrating the strong association between previous cesarean section and placenta previa. Maqsood U, et al. <sup>16</sup> reported an overall placenta previa prevalence of 16.3% among women with prior cesarean section, with significantly higher rates in women with >2 prior cesarean sections (26.4% vs 10.6% with  $\leq 2$  sections,  $p=0.003$ ), which corroborates our finding of increased risk with multiple previous surgeries. Similarly, Uzma S, et al. <sup>17</sup> found an overall previa frequency of 27.5% in women with prior cesarean section, demonstrating escalating rates from 16.36% with one prior cesarean section to 66.67% with four, supporting our observation of a dose-response relationship. However, our study's overall prevalence of 46.2% in the placenta previa group appears higher than these studies, which may be attributed to differences in study design, as our case-control approach specifically selected patients with established placenta previa, whereas these were cross-sectional studies examining previa frequency among women with prior cesarean sections.

The age-related stratification in our study revealing dramatically increased odds ratios in women over 30 years (OR=6.77) compared to younger women (OR=0.72) is supported by demographic patterns observed in previous research. Maria HAR, et al. <sup>18</sup> reported a mean age of  $32.31 \pm 4.0$  years among women with placenta previa and prior cesarean section, while Bashir A, et al. <sup>19</sup> noted that all placenta previa cases occurred in women aged >25 years, suggesting age as a significant risk modifier. The physiological basis for this age-related increase likely

reflects cumulative exposure to reproductive factors, delayed childbearing patterns, and age-related changes in endometrial quality and uterine blood flow that compound the effects of previous uterine surgery. Additionally, older women are more likely to have multiple previous cesarean sections, which creates a synergistic effect as demonstrated by Sultana SS, et al. <sup>20</sup> who found placenta previa was 5 times more common with >2 prior cesarean sections than <2.

Interestingly, our study found contrasting results regarding the protective effect of single previous cesarean section in younger women, which differs from some previous findings. Bashir A, et al. <sup>19</sup> concluded that a single prior cesarean section does not increase previa risk, reporting placenta previa in only 2% of women with prior cesarean section compared to 4% with prior vaginal deliveries ( $p=0.55$ ), and noted no previa cases with only one prior scar. This discrepancy may be explained by the different study populations and methodologies, as our case-control design specifically examined established placenta previa cases, while their cross-sectional approach assessed previa frequency prospectively. The absence of association in younger women with single previous cesarean section in our study might reflect incomplete scar formation or better healing capacity in younger tissue, whereas the cumulative effect becomes apparent with advancing age and repeated surgical trauma.

The demographic characteristics of our study population showed notable similarities and differences with previous research. Our mean age of  $31.94 \pm 2.54$  years in the placenta previa group closely matches Rehman S, et al. <sup>21</sup> ( $32.42 \pm 3.83$  years) and Maria HAR, et al. <sup>18</sup> ( $32.31 \pm 4.0$  years), suggesting consistent age patterns across different populations. However, our gestational age at presentation ( $35.09 \pm 2.05$  weeks) was similar to Rehman S, et al. <sup>21</sup> ( $35.94 \pm 1.75$  weeks) but higher than Maria HAR, et al. <sup>18</sup> ( $32.02 \pm 3.21$  weeks), which may reflect differences in clinical presentation severity or healthcare seeking behavior. The finding that only 1.5% of women with morbidly adherent placenta in Rehman S, et al.'s study <sup>21</sup> had no prior scar emphasizes the critical role of previous uterine surgery, with incidence rising from 0.6% with no scar to 80% with four scars, demonstrating a clear dose-response relationship that supports our findings of increased risk with multiple previous procedures.

The stratified analysis revealing stronger associations in non-hypertensive (OR=6.22) and non-diabetic women (OR=2.88) suggests that underlying vascular pathology may influence placental implantation patterns differently. In women without pre-existing vascular compromise, the mechanical effects of cesarean scarring may be the predominant factor driving abnormal placentation, whereas in women with hypertension or diabetes, pre-existing endothelial dysfunction and microvascular disease may create a different pattern of placental implantation that is less dependent on mechanical uterine factors. This observation has not been extensively reported in previous studies, suggesting a novel finding

that warrants further investigation. The equal distribution of obesity between groups in our study, yet significant association among non-obese women (OR=2.77), contrasts with Maqsood U, et al.<sup>16</sup> who found previa rates of 66.7% in obese women compared to 11% in normal weight women (p=0.001), indicating that metabolic factors may interact with mechanical uterine factors in complex ways that require population-specific analysis. Matalliotakis M, et al.<sup>22</sup> retrospectively analyzed 76 placenta previa cases and found that 66% had prior cesarean section, with 46% having one and 54% having ≥2 prior procedures, further supporting our dose-response relationship findings.

This work also has some limitations that ought to be considered when interpreting findings. Because it is a single-center study at one tertiary care hospital, generalizability of results to other populations and healthcare facilities might be low. Because the retrospective case-control design, as proper for examining rare end points, suffers from selection bias and might not capture all of the relevant confounding factors that might affect the association between previous cesarean section and placenta previa, the relatively modest sample size,

especially for stratified analyses, might have inadequate statistical power for detection of significant associations for selected subgroups, and the wide confidence intervals for some odds ratios reflect imprecision of the estimates.

## CONCLUSION

Our analysis has determined that there exists an appreciable correlation between history of cesarean section and placenta previa development, with those with previous cesarean delivery showing greatly elevated odds of developing placenta previa as opposed to those without any antecedent uterine surgery. Barring any previous uterine surgery, the correlation seems specific for women older than 30 years of age, which suggests that increasing maternal age presents as an essential modifying variable which further increases the risk associated with previous cesarean section.

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