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Comparison of Fetomaternal Outcomes between Scarred and Unscarred Uterus in Placenta Previa Cases

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ABSTRACT

Background: Placenta previa remains a significant obstetric challenge, especially when compounded by a history of uterine scarring such as prior cesarean sections. A scarred uterus is increasingly recognized for its association with abnormal placentation, increased surgical complexity, and adverse fetal outcomes. With rising cesarean rates globally, understanding the comparative risks posed by scarred versus unscarred uteri in placenta previa is essential for optimizing clinical management and maternal-neonatal safety. **Objective:** To compare fetomaternal outcomes between scarred and unscarred uteri among women diagnosed with placenta previa. **Methodology:** This descriptive case series was conducted in the Department of Obstetrics and Gynaecology, Shalamar Hospital, Lahore, Pakistan, from November 2024 to April 2025. A total of 176 pregnant women (88 with scarred uteri and 88 with unscarred uteri) diagnosed with placenta previa beyond 28 weeks gestation was included using non-probability purposive sampling. Data were collected through structured proformas and analyzed using SPSS version 22. **Results:** Women with scarred uteri had significantly higher rates of postpartum hemorrhage (68.2% vs. 40.9%; p<0.001), morbidly adherent placenta (22.7% vs. 1.1%; p<0.001), and cesarean hysterectomy (59.1% vs. 4.5%; p<0.001) compared to those with unscarred uteri. They also exhibited increased total blood loss ≥1000ml (62.5% vs. 29.5%; p<0.001) and maternal shock (23.9% vs. 5.7%; p=0.001). Neonates born to mothers with scarred uteri experienced significantly more complications, including low birth weight (50.0% vs. 29.5%; p=0.006), respiratory distress syndrome (20.5% vs. 5.7%; p=0.005), premature birth <37 weeks (59.1% vs. 43.2%; p=0.039), and poor APGAR scores at 5 minutes (<7 in 27.3% vs. 6.8%; p=0.001). **Conclusion:** Placenta previa in women with a scarred uterus is associated with markedly increased risks of severe maternal and neonatal complications. These findings underscore the clinical importance of thorough obstetric history-taking, early identification of placenta previa, and vigilant intrapartum management in women with previous cesarean deliveries. Rationalizing cesarean use and improving antenatal surveillance may mitigate the burden of placenta previa-related morbidity in subsequent pregnancies.

INTRODUCTION

Placenta previa remains one of the most challenging obstetric complications, characterized by the abnormal implantation of the placenta over or near the internal cervical region, leading to antepartum hemorrhage and often necessitating cesarean delivery (Lailiyah et al., 2025). Globally, the incidence of placenta previa is estimated at approximately 0.3% to 0.5% of all pregnancies, although higher rates have been observed in low- and middle-income countries (Namagembe et al., 2022). The global rise in cesarean section rates—from 12% in 2000 to over 21% by 2020 has had unintended consequences on placental pathologies, particularly previa and its associated complications (Obaro & Heazell, 2023). In the Pakistani setting, the dual burden of high fertility rates and rising cesarean section prevalence now exceeding 40% in urban tertiary hospitals has created a fertile ground for placenta previa and its complications (Shah et al., 2024).

The placenta previa pathophysiology is complex and frequently linked to defective endometrial receptivity and adverse vascularization of the upper segment in the uterus, as well as a prior uterine injury (Akhtar et al., 2022). In the case of the placenta that implanted into a scarred lower horn segment, the usual process of decidualization will be distorted and the placenta will be prone to deviated adhesion or invasion (Sgayer et al., 2023). At a clinical level, the placenta previa condition is manifested through a painless vaginal bleeding during the 2-3 trimesters of the pregnancy, although more severe

consequences must be noted (massive hemorrhage after delivery, disruption of the uterus, and rising maternal and perinatal morbidity) (Wan et al., 2024). As a result, the condition is difficult to diagnose using ultrasonography and planning delivery needs to be planned carefully, in most cases early hospitalization and surgical delivery are happening (Pecorella et al., 2025).

Prior cesarean section is one of the most relevant risk factors of placenta prevalence as it conditions the subsequent environment of the endometrium and predisposes the risk of the development of abnormal placentation in a new pregnancy (Matsuzaki et al., 2021). However, a population-based comparative study in China found that a women with a past cesarean delivery was over two times more likely to develop the placenta previa than a woman with unscarred uterus (Wan et al., 2022). This risk is even higher in terms of the previous surgeries observed within a woman, and it justifies the consideration of the accumulated obstetric risk with multiparous women. In addition, new evidence is being reported in South Asia, including Pakistan, with the same set of correlates, where the burden of placenta previa in women with uterine surgery history is increasing (Imtiaz et al., 2023).

The interplay between placental location, scar integrity, and obstetric management becomes especially critical in emergency presentations, where rapid decisions must be made to prevent maternal compromise (Kenea et al., 2025). Such complexities demand evidence-based differentiation in management strategies based on uterine history. Previous studies have also emphasized that antenatal bleeding and iatrogenic prematurity are key mediators of poor fetal prognosis in these cases (Hota et al., 2023). However, variability exists in outcomes depending on the healthcare setting, timing of diagnosis, and availability of neonatal care, highlighting the importance of contextualized research. Most existing literature focuses either on placenta accreta spectrum or broad outcomes without stratifying by uterine history (Dimitrova et al., 2022; Wan et al., 2022). Therefore, the primary aim of this study is to compare fetomaternal outcomes in women diagnosed with placenta previa who have a scarred uterus versus those with an unscarred uterus, within a tertiary care setting.

METHODOLOGY

Study Design and Setting

This descriptive case series was conducted in the Department of Obstetrics and Gynaecology at Shalamar Hospital, Lahore, Pakistan, over a period of six months, from November 2024 to April 2025.

Sampling Technique and Sample Size

A non-probability purposive sampling technique was used to recruit participants meeting the eligibility criteria. The sample size was calculated to be 176, based on a 95% confidence level, a 7% margin of error, and an anticipated frequency of 67.56% scarred uterus among placenta previa cases, as reported by Nair et al. (2022).

Inclusion and Exclusion Criteria

Pregnant women were included if they met the following criteria: aged between 20 to 40 years, carrying a singleton pregnancy beyond 28 weeks of gestation (as confirmed by ultrasound), and diagnosed with placenta previa according to the operational definition. Women presenting with bleeding per vaginum to the emergency department or those admitted for safe confinement with low-lying placenta were also included. Exclusion criteria were women with ultrasound-confirmed placental abruption, known hypertensive disorders or gestational diabetes (as per medical records), and primigravid women.

Data Collection

Upon admission, a detailed clinical history was obtained from each participant, including maternal education, gestational age, parity, history of previous cesarean sections, and grade of placenta previa. Clinical examination at admission involved the measurement of vital signs such as temperature and pulse, as well as maternal anthropometrics including height and weight. Obstetric examination included assessment of the height of the uterine fundus, fetal lie and presentation, engagement of the presenting part, uterine tone, and fetal heart sounds. Ultrasound was performed to confirm the diagnosis and grade of placenta previa. All patients underwent cesarean section in accordance with institutional protocols. Intraoperative and postoperative maternal outcomes were recorded, including estimated total blood loss within 24 hours (to diagnose postpartum hemorrhage), blood pressure trends (to identify maternal shock), and whether a cesarean hysterectomy was required. Neonatal outcomes assessed included gestational age at birth (preterm defined as <37 weeks), Apgar scores at one and five minutes (with poor Apgar defined as <7 at five minutes), birth weight (low if <2500 grams), and respiratory function. In cases of suspected respiratory distress, a chest X-ray was conducted to confirm the diagnosis. All newborns with complications were managed as per institutional NICU protocols.

Data Analysis

Data were entered and analyzed using SPSS version 28.0. Quantitative variables such as maternal age and gestational age were summarized using means and standard deviations. Categorical variables including parity, type of uterus (scarred or unscarred), grade of placenta previa, and maternal and fetal outcomes were described using frequencies and percentages. Comparisons of maternal and fetal outcomes between scarred and unscarred uterus groups were performed using the chi-square test. Furthermore, multivariable logistic regression analysis was employed to calculate adjusted odds ratios (ORs) for maternal and fetal complications, adjusting for confounders such as maternal age, parity, prior cesarean delivery, and grade of placenta previa. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Review Board (IRB) of Shalamar Medical and Dental College, Lahore. Written informed consent was obtained from all participants prior to inclusion in the study. Confidentiality and privacy of all participants were strictly maintained throughout the study period. No

intervention was performed beyond the standard clinical care provided by the hospital. Participants were assured of the right to withdraw from the study at any stage without any impact on their medical care.

RESULTS

Maternal Characteristics

Table I illustrates the baseline maternal characteristics between the scarred and unscarred uterus groups. A statistically significant difference was observed in maternal age distribution, with a higher proportion of women over 30 years of age in the scarred uterus group (85.2%) compared to the unscarred group (53.4%) (p=0.009), reflecting the cumulative obstetric exposure associated with uterine scarring. Parity distribution also differed significantly (p=0.004), with a notably higher proportion of multiparas (para 1–5) in the scarred group (94.3%) versus the unscarred group (69.3%), and no nulliparous women in the scarred group. While gestational age distribution was statistically similar between the groups (p=0.94), history of uterine curettage was significantly more common among women with unscarred uteri (23.9% vs. 5.7%, p=0.001). Mode of delivery also differed, with elective cesarean sections more frequently performed in the scarred uterus group (72.7%) compared to the unscarred group (56.8%) (p=0.032), indicating a higher risk profile warranting planned surgical intervention in scarred uteri.

Table 1

Maternal Characteristics of the Two Groups (N = 176)

Maternal Characteristics	Unscarred Uterus Group A (n=88)	Scarred Uterus Group B (n=88)	P value
Age in years			
< 25 yrs	18 (20.5%)	0 (0%)	**0.009** (S)
25–30 yrs	23 (26.1%)	13 (14.8%)	
31–35 yrs	23 (26.1%)	39 (44.3%)	
> 35 yrs	24 (27.3%)	36 (40.9%)	
Parity			
Para 0	16 (18.2%)	0 (0%)	**0.004** (S)
Para 1–5	61 (69.3%)	83 (94.3%)	
Para ≥6	11 (12.5%)	5 (5.7%)	
Gestational Age			
28–37 weeks	45 (51.1%)	45 (51.1%)	**0.94** (NS)
>37 weeks	43 (48.9%)	43 (48.9%)	
Previous history of uterine curettage	21 (23.9%)	5 (5.7%)	**0.001** (S)
Mode of Delivery			
Elective C-section	50 (56.8%)	64 (72.7%)	**0.032** (S)
Emergency C-section	38 (43.2%)	24 (27.3%)	

Type and Grading of Placenta Previa

Table 2 compares the anatomical location and grading of placenta previa between the two groups. The anterior location of placenta previa was significantly more common in women with a scarred uterus (62.5%) compared to those with an unscarred uterus (45.5%) (p=0.012), likely due to the association between prior cesarean scars and abnormal placentation over the lower uterine segment. Conversely, posterior placentation was more frequent in the unscarred group (43.2% vs. 19.3%). Central placenta previa was slightly more common in the scarred group (18.2%) but did not reach statistical significance on its own. Grading analysis revealed a higher frequency of severe placenta previa (Grade IV) in the scarred uterus group (59.1%) versus the unscarred group (31.8%), though the overall difference in grading distribution was not statistically significant (p=0.072). These findings underscore the clinical tendency for more complex and anteriorly positioned placenta previa in women with prior uterine surgery.

Table 2

Comparison of Type and Grading of Placenta Previa (N = 176)

Variable	Unscarred Uterus Group A (n=88)	Scarred Uterus Group B (n=88)	P value
Type of Placenta Previa			
Anterior	40 (45.5%)	55 (62.5%)	**0.012** (S)
Posterior	38 (43.2%)	17 (19.3%)	
Central	10 (11.4%)	16 (18.2%)	
Grading of Previa			
Grade I	4 (4.5%)	2 (2.3%)	**0.072** (NS)
Grade II	18 (20.5%)	10 (11.4%)	
Grade III	38 (43.2%)	24 (27.3%)	
Grade IV	28 (31.8%)	52 (59.1%)	

Maternal Complications

Table 3 presents a comparative overview of maternal complications, demonstrating significantly higher risks in the scarred uterus group across multiple parameters. Women with scarred uteri experienced substantially greater total blood loss within 24 hours (≥1000 ml in 62.5% vs. 29.5%, p=0.001), more hypotensive episodes (31.8% vs. 10.2%, p=0.003), and lower mean arterial pressures (27.3% vs. 6.8%, p=0.002). Shock occurred more frequently in the scarred group (23.9% vs. 5.7%, p=0.001). Postpartum hemorrhage was also significantly more prevalent (68.2% vs. 40.9%, p=0.007). Critically, morbidly adherent placenta (22.7% vs. 1.1%, p<0.001) and cesarean hysterectomy (59.1% vs. 4.5%, p<0.001) were strikingly more common in the scarred group, highlighting the increased surgical complexity in these patients. Although uterine artery ligation rates were similar (p=0.78), internal iliac artery ligation was significantly more often required in scarred cases (5.7% vs. 1.1%, p=0.049). Maternal mortality occurred in one case (1.1%) in the scarred group, though not statistically significant (p=0.187). These findings emphasize the elevated maternal risk profile associated with uterine scarring in placenta previa.

Table 3

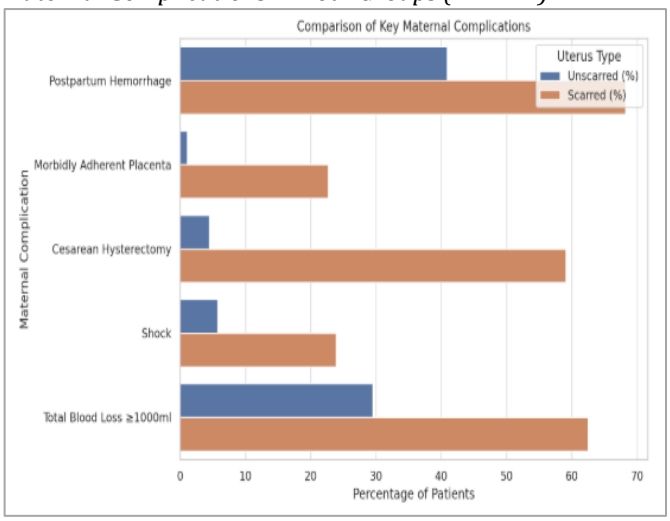
Maternal Complications in Both Groups (N = 176)

Complication	Unscarred Uterus Group A (n=88)	Scarred Uterus Group B (n=88)	P value
Total blood loss ≥1000 ml within 24 hrs	26 (29.5%)	55 (62.5%)	0.001 (S)
Hypotension (SBP <90 mmHg)	9 (10.2%)	28 (31.8%)	0.003 (S)
Mean Arterial Pressure <65 mmHg	6 (6.8%)	24 (27.3%)	0.002 (S)
Shock (as per operational definition)	5 (5.7%)	21 (23.9%)	0.001 (S)
Postpartum hemorrhage	36 (40.9%)	60 (68.2%)	0.007 (S)

Morbidly adherent placenta	1 (1.1%)	20 (22.7%)	0.000 (S)
Cesarean hysterectomy	4 (4.5%)	52 (59.1%)	0.000 (S)
C-section with uterine artery ligation	52 (59.1%)	53 (60.2%)	0.78 (NS)
C-section with internal iliac artery ligation	1 (1.1%)	5 (5.7%)	0.049 (S)
Maternal mortality	0 (0%)	1 (1.1%)	0.187 (NS)

Figure 1

Maternal Complications in Both Groups (N = 176)



Fetal Complications

As shown in Table 4, fetal complications were notably higher in the scarred uterus group. Low birth weight (<2500 g) was significantly more frequent among neonates born to women with scarred uteri (50.0% vs. 29.5%, p=0.008), reflecting intrauterine growth compromise or early delivery. The incidence of respiratory distress syndrome (RDS) was significantly elevated in the scarred group (20.5% vs. 5.7%, p=0.006), possibly related to prematurity or placental insufficiency. Premature birth before 37 weeks occurred more commonly in the scarred group (59.1% vs. 43.2%, p=0.035), indicating a higher risk of preterm delivery in these patients. Furthermore, poor Apgar scores at 5 minutes (<7) were significantly more frequent in the scarred group (27.3% vs. 6.8%, p=0.001), suggesting increased perinatal compromise. Collectively, these results demonstrate that uterine scarring in placenta previa cases is associated with adverse neonatal outcomes, necessitating heightened fetal surveillance and preparedness for neonatal resuscitation and intensive care.

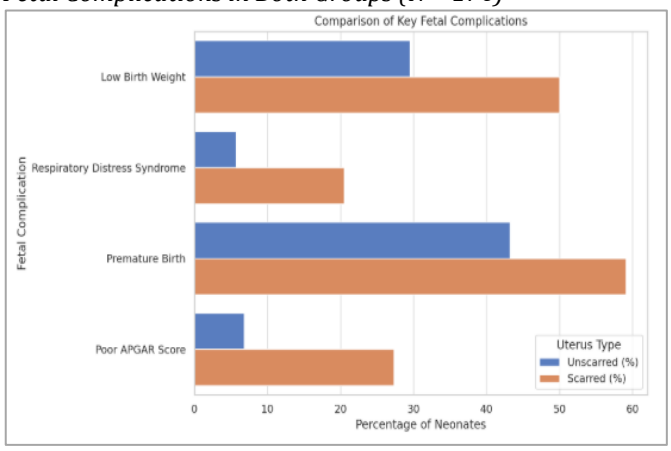
Table 4

Fetal Complications in Both Groups (N = 176)

Complication	Unscarred Uterus Group A (n=88)	Scarred Uterus Group B (n=88)	P value
Low birth weight (<2500 g)	26 (29.5%)	44 (50.0%)	0.008 (S)
Respiratory distress syndrome (RDS)	5 (5.7%)	18 (20.5%)	0.006 (S)
Premature birth (<37 weeks)	38 (43.2%)	52 (59.1%)	0.035 (S)
Poor APGAR score at 5 minutes (<7)	6 (6.8%)	24 (27.3%)	0.001 (S)

Figure 2

Fetal Complications in Both Groups (N = 176)



DISCUSSION

In the present study, where fetomaternal outcomes were compared in scarred and non-scarred uterus with placenta previa, the occurrence of maternal complications was significantly higher in the scarred uterus group. The rates of postpartum hemorrhage (PPH) were found to be 68.2% and 40.9%, which is significant, and in line with the findings of the tool used by Junejo et al., (2023), who discovered that the rates of PPH were 66.7% in the scarred and 38.9% in their unscarred uteri. This increased risk may be attributed to abnormal aspect of placental implant and weak uterine briskness in scarred myometrium. This finding is further conducive with the observation by the present study that rates of cesarean hysterectomy was remarkably higher in scarred women (59.1%) as compared to unscarred women (4.5%). This observation lends credence to that of Khan et al., (2023) who had reported higher rates of cesarean hysterectomy with 54.8% being the rate among women with prior uterine surgeries. Such statistics indicate the importance of extensive surgical planning and the presence of high-dependency services in cases of patients whose uterine scars have been identified (Junejo et al., 2023; Khan et al., 2023).

This research recorded a high prevalence of morbidly adherent placenta (22.7% in scarred versus 1.1% in unscarred group). The result can be heard among the findings of Imtiaz et al., (2023), who proved that placenta accreta spectrum disorders are prevalent in scarred uterus patients (21%) against less than 3% in unscarred uteri. The presence of scar tissue due to previous cesarean births does not allow normal implantation of the placenta and this facilitates more invasion. The present data also confirms this relation as preoperative ultrasound or MRI is clinically significant to predict adherent placenta in patients having a background of surgery of the uterus. High standings of cesarean hysterectomy and vascular ligation operation in scar-affected cases pose a complex situation in the operating theatre, hence involvement of the multidisciplinary team in the early phase (Imtiaz et al., 2023).

Regarding maternal hemodynamic outcomes, hypotension and shock were considerably more frequent in the scarred group (31.8% and 23.9%, respectively) than in the unscarred group (10.2% and 5.7%). These values

are statistically aligned with those reported by Taye et al., (2023), who found shock rates up to 20% in placenta previa patients with prior cesarean delivery. The associated blood loss ≥1000ml, reported in 62.5% of scarred cases versus 29.5% in unscarred, is indicative of more extensive vascular disruption and less responsive uterine muscle contraction (Taye et al., 2023). Such findings reinforce the predictive value of scarred uterus for intraoperative hemorrhage and adverse maternal outcomes, echoing the recommendations of the American College of Obstetricians and Gynaecologists (ACOG, 2019) for thorough antenatal risk assessment in placenta previa with uterine scarring (Madhuri et al., 2023).

With respect to placentation and placenta grading, the study found more cases of the anterior placenta (62.5%) and Grade IV previa (59.1%) in the scarred uterus group, which was statistically significant as compared to the unscarred group (45.5% and 31.8%, respectively). These findings are associated with the study conducted by Utalo et al., (2025) who underlined the relationship between anterior low-lying placenta and previous scar makes in the uterus caused by iatrogenic destruction of the endometrium. Moreover, placenta previa anteriorly placed in scarred uterus predisposes one to experience adherent placental tissue with high chances of bleeding during the procedure and injuring the bladder (Utalo et al., 2025). Central placenta previa was also more frequent in scarred uteri (18.2% vs 11.4%). This tendency is consistent with the fact that previa here was more related to the use of surgical interventions and blood transfusion (Pun & Singh, 2022).

The fetal outcomes of the scarred uterus group were comparatively much worse in all the parameters. It was noted that 50% of scarred cases had low birth weight as opposed to 29.5 cases in the unscarred group. The same trend is reflected in the study conducted by Shah et al., (2024), stating that the risk of intrauterine growth restriction and preterm delivery is high in placenta previa when complicated by scarring of the uterus. This trend is also supported by the fact that the scarred uterus group was more likely to give birth prematurely (59.1%) and this trend was probably caused by iatrogenic delivery in the effected mothers because some fell victim to maternal hemorrhage or fetal distress and their deliveries were cut short as also reported by Shams and Ghani (2024). Uterine scarring has been found to adversely affect the survival of the newborn infant and its long-term health besides compromising the safety of maternal (Shah et al., 2024; Shams & Ghani, 2024).

Respiratory distress syndrome (RDS) in neonates occurred in 20.5% of scarred group deliveries, a substantial rise compared to 5.7% in the unscarred group. This difference is indicative of the earlier gestational age at delivery, coupled with potential effects of intrauterine hypoxia. Similar RDS rates were observed in the retrospective analysis by Govindaraju et al., (2024), where the incidence of neonatal intensive care admission and RDS were directly proportional to the number of previous cesareans in placenta previa cases. Moreover, poor APGAR scores at 5 minutes were recorded in 27.3% of neonates in the scarred group, significantly higher than the 6.8% in the unscarred group. These statistics are reflective of both prematurity and compromised intrauterine oxygenation, reinforcing the association between maternal uterine condition and neonatal adaptation post-delivery (Govindaraju et al., 2024).

The mode of delivery also demonstrated a marked divergence between the groups, with 72.7% of scarred cases undergoing elective cesarean section, compared to 56.8% in unscarred cases. Although cesarean is the recommended mode in placenta previa to prevent catastrophic hemorrhage, the increased proportion of elective procedures in the scarred group may reflect planned interventions based on risk stratification. This pattern is consistent with ACOG guidelines and supported by a prospective study by Arain et al., (2025), which advocated scheduled cesarean in cases with prior uterine surgery and previa to minimize emergency conversions and optimize neonatal outcomes. Nonetheless, the higher proportion of emergency procedures in the unscarred group (43.2%) also underlines the unpredictable nature of placenta previa presentation in primiparous women without antenatal care or prior surgical history (Arain et al., 2025).

CONCLUSION

This research offered clear indications that a scarred uterus also worsens fetomaternal morbidity to the extent of placenta previa, highlighting the risk-additive effects of having undergone previous uterine surgical procedures. It showed an increased incidence of postpartum hemorrhage, morbidly adherent placenta, cesarean hysterectomy, maternal shock and blood loss (loss = 1000ml) that revealed the surgical and hemodynamic dilemmas during the management of placenta previa in the scenario of uterine scarring. Also, the statistical increase in adverse neonatal outcomes, such as low birth weight, prematurity, respiratory distress syndrome, and low APGAR scores, point out to the transgenerational effect of such maternal complications. Besides, the association of high-grade previa and anterior placenta with a previous cesarean scar is high, indicating that the risk stratification of these conditions is required by early antenatal ultrasonography and surgical history. Comprehensively, the above findings propose increased clinical awareness, personalized delivery schedule as well as institutional readiness in the treatment of placenta previa especially multiparous women who have had past cesarean births.

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