

Abnormally Invasive Placenta Diagnosed On Ultrasonography Among High-Risk Women With Placenta Previa

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Abstract

Objective: The main aim of the study was to find the frequency of abnormally invasive placentas diagnosed on ultrasonography among high-risk women with placenta previa and to assess the association of all three types of placental invasion with placenta previa in prior pregnancies, advanced maternal age and multiple gestations

Methods: This descriptive, cross-sectional study was conducted at CMH Medical College, Lahore, from September 2024 to January 2025 after the approval of the ethical review committee. The data analysis procedure was systematically executed using IBM SPSS 26.0. The Chi-square test was applied.

Results: The study included 165 participants, aged 26-40 years, with 74.5% (n=123) experiencing vaginal bleeding and 95.8% reporting pelvic pain. Among the cases analysed, 93.9% (n=155) were diagnosed with placenta accreta, while placenta increta was observed in 4.2% (n=7), and placenta percreta in 1.8% (n=3). All participants had a history of previous uterine surgery (100%), and 50.3% (n=83) had a prior history of placenta previa. Regarding placenta previa grades, Grade 1 was the most common (67.9%, n=112), followed by Grade 2 (25.5%, n=42), Grade 3 (4.8%, n=8), and Grade 4 (1.8%, n=3). A positive history of placenta previa was found in 32.7% of Grade 1 cases, 13.3% of Grade 2, and 3.0% of Grade 3. Notably, a positive history of placenta previa was linked to higher rates of placenta accreta, especially in women aged ≥ 35 years (4.2%).

Conclusion: Among high-risk women with placenta previa, abnormally invasive placenta (AIP) is a serious obstetric complication that poses significant feto-maternal risks. For the early and accurate diagnosis of AIP, Ultrasound is the modality of choice, as it is real-time, inexpensive and radiation-free, making timely interventions and improved perinatal outcomes.

Keywords: Placenta Previa, Placenta Accreta, Placenta Percreta, Placenta Increta, Pregnancy, High-Risk

Introduction

Placenta previa, a premature birth, has a yearly incidence of 4.8 per 1000 deliveries in the United States.¹ Overall, 30 to 65% of women who have had at least one previous caesarean birth and a low placenta, between ten and twelve weeks of pregnancy, are at risk of placenta accreta range. The mixture of these two factors has been recognised as a high-risk profile for Placenta Accreta Spectrum (PAS). Therefore, rather than examining all pregnant women for these illnesses, screening for pregnancy is usually done within this subgroup of women.² Placenta percreta occurs in approximately 5% of placenta accreta spectrum (PAS) cases and results in significant illness and death among mothers and fetuses during the peripartum period.³ Adverse conditions linked to placenta previa include bleeding before delivery, the requirement for a hysterectomy, morbid placenta adherence that is morbid, haemorrhage within the birth canal, haemorrhage after giving birth, transfusion of blood, thrombophlebitis and sepsis.⁴

Many clinical and research studies on epidemiology have reported a higher incidence of age-related placenta previa in women of the age, several parities, male Fetuses, a few pregnancies, previous C-section delivery, and previous abortion, either induced or spontaneous. However, the precise reason behind placenta previa is still largely unknown. Additionally, behavioural elements that have been connected to a developed frequency of placenta previa during expectancy include

Contributions:

F.W, F.B - Conception of study
- Experimentation/Study Conduction
F.W, A.R - Analysis/Interpretation/Discussion
F.W, F.B - Manuscript Writing
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maternal smoking also dependence on drugs.⁵ Placenta anterior to accreta is a significant predisposing factor for massive bleeding in pregnancy, which is the primary cause of mortality related to pregnancy.⁶ Placement of vascular holes in the placenta, unusual vascularity of the placenta, lack of non-resonant area, disruption of uterus and bladder serous tissue, visual representation of focal extending bulk, fast pulsed blood flow between the bladder and the placenta are sonographic indicators that may indicate placenta previa. However, because of the subjective character of their analysis, these indicators are difficult to identify in a therapeutic environment.⁷

The incidence of AIP has increased compared to the earlier 20 years, largely due to a rise in caesarean sections. AIP is characterised by an irregular connection of the placenta to the Uterine wall. The severity of this condition varies, and it is classified into three types based on how deeply the placenta invades the uterine tissue. In Placenta Accreta, it is attached firmly to the Uterine muscle but doesn't invade into it. Placenta Increta is more severe, with the placenta extending into the uterine muscle. A serious form of placenta previa is Placenta Percreta, where the placenta not only invades the uterine muscle but also penetrates through the uterine wall and can affect nearby organs such as the bladder or bowel.⁸

Women with abnormally invasive placenta, in addition to low-set placenta, are at a high risk of requiring a peripartum hysterectomy. Our study explored the frequency of abnormally invasive placenta among high-risk women using ultrasound, as it is a radiation-safe modality and also cost-effective and an association was calculated between abnormally invasive placenta with placenta previa and high-risk factors like advanced maternal age and multiple gestations. Our study shows that more emphasis should be put on women with previous placenta previa and high-risk women, influencing pregnancy management decisions and subsequent outcomes such as preterm birth, blood loss, and hysterectomy. Existing studies focused solely on the placenta accreta index, whereas our study focused on all three types of abnormally invasive placenta.

Materials And Methods

This descriptive, cross-sectional study was conducted at CMH Medical College, Lahore, from September 2024 to January 2025 after the approval of the ethical review committee, case#.83/ERC/CMH/LMC. A consecutive type of non-probability sampling method was employed. The data was collected from three centres, including the Diagnostic Centre of CMH Lahore, Lady Willingdon Hospital Lahore and the Department of Radiology of Chughtai Lab after getting approval from the respective settings. The sample size was 165. The World Health Organisation Geneva Calculator Software version by KC Lun and Peter Chiam, National University of Singapore, was used to calculate the sample size.⁹ All patients who met the inclusion criteria (High risk women having one or more of the factors including Previous uterine surgery, History of placenta previa in prior pregnancy, Advanced maternal age, Multiple gestations and Pregnant females with diagnosed placenta previa on ultrasonography) and exclusion criteria (Females with incomplete medical reports, Females with confirmed diagnosis of another uterine conditions like fibroids, adenomyosis. Females having a previous diagnosis of invasive placenta and Females with an undetermined placental location) were enrolled. Informed consent was obtained from each patient.

Detailed history was taken from the patient including age, severe vaginal bleeding and associated symptoms. A proforma was designed that included a section for documenting presenting symptoms such as vaginal bleeding and pelvic pain. The ultrasound diagnosis section categorised placenta previa into four grades, ranging from Grade 1 to Grade 4, and also included specific classifications for abnormally invasive placenta, namely placenta accreta, increta, and percreta. In addition, the proforma recorded key high-risk factors, including previous uterine surgery, history of placenta previa in prior pregnancies or surgeries, advanced maternal age, and multiple gestations. The patients were then scanned with ultrasound to rule out placental invasion. All the examinations were conducted with 3-5 MHz curved linear array probes using Toshiba Xario (Japan's Toshiba Medical Systems business).

The data analysis procedure was systematically executed using SPSS version 26.0, with a P-value ≤ 0.05 considered as a significant value. Associations were also calculated between Abnormally Invasive Placenta types and placenta previa, advanced maternal age and multiple gestations. Associations were also calculated between placenta previa and advanced maternal age, placenta previa and multiple gestations. The chi-square test was applied. All results were calculated at a 95% confidence interval.

Results

The data were collected from a total of 165 female patients. Table 1 shows that out of 165 female patients, 74.5% (n = 123) were experiencing vaginal bleeding and 95.8% (n=158) were experiencing pelvic pain. Grade 1 placenta previa was the most common, with 112 cases (67.9%). Grade 2 was observed in 42 cases (25.5%), making it the second most frequent. Grade 3 was seen in 8 cases (4.8%), and Grade 4 was the least frequent, with only 3 cases (1.8%).

Table 1: Age, Clinical Symptoms and Distribution of Placenta Previa Grades of participants (n=)

Variables	n (%)
Age Range (Years)	
25 - 30	101 (61.2)
31 - 35	42 (25.4)
36 - 40	19 (11.5)
41 - 45	3 (1.8)
Clinical symptoms	
Vaginal bleeding	123 (74.55)
Pelvic pain	158 (95.76)
Distribution of Placenta Previa Grades	
Grade 1	112 (67.88)
Grade 2	42 (25.45)
Grade 3	8 (4.85)
Grade 4	3 (1.82)

Table 2: Frequency of High-Risk Women, Placenta Accreta, Placenta Increta and Placenta Per Creta.

Frequency of High-Risk Women		
Variable		n (%)
Previous Uterine Surgery	Positive	165(100%)
History of Placenta Previa in Prior Pregnancy	Negative	82(49.7%)
	Positive	83(50.3%)
Advanced Maternal Age	No (<35 years)	135(81.8%)
	Yes (>35 years)	30(18.2%)
Multiple Gestations	Positive	165(100%)
Frequency of Placenta Accreta, Placenta Increta and Placenta Per Creta		
Placenta Accreta	Negative	10(6.1%)
	Positive	155(93.9%)
Placenta Increta	Negative	158(95.8%)
	Positive	7(4.2%)
Placenta Percreta	Negative	162(98.2%)
	Positive	3(1.8%)

Table 2 shows that Out of total 165 cases, 165 (100%) were positive for previous uterine surgery, 83 (50.3%) were positive for placenta previa in prior pregnancy, 135 (81.8%) were below 35 years, while 30 (18.2%) were aged 35 years or older, 165 (100%) were positive for multiple gestations. Among the 165 total cases analysed, 155 (93.9%) were positive for placenta accreta, and 7 (4.2%) were positive for placenta increta. And only 3 (1.8%) were positive for placenta per Creta.

Table 3: Association of Placenta Accreta with placenta previa in prior pregnancies, advanced maternal age and multiple gestations

Placenta Accreta	Placenta previa in prior pregnancy		Chi-square value	p-value	Advanced maternal age		Chi-square value	p-value	Multiple gestations positive
	Negative	Positive			No (<35 years)	Yes (> 35year)			
Negative	4(4.90%)	6(7.20%)	0.4	0.527	3(2.20%)	7(23.30%)	19.215	0	10 (6.10%)
Positive	78(95.20%)	77(92.80%)			132(97.80%)	23(76.70%)			155 (93.90%)
Total	82	83			135	30			165

Table 3 shows that among women without a history of placenta previa, 4.90% had placenta accreta, while 7.20% of women with a history of placenta previa were diagnosed with placenta accreta. The Chi-Square value was 0.4 with a p-value of 0.527, indicating that the presence of a history of placenta previa in prior pregnancies did not significantly influence the occurrence of placenta accreta. In association between placenta accreta and advanced maternal age among women under 35 years, 97.80% had a positive diagnosis of placenta accreta, while only 2.20% had a negative diagnosis. In contrast, among women over 35 years, 76.70% had a positive diagnosis of placenta accreta, and 23.30% had a negative diagnosis. The Chi-Square value was 19.215 with a p-value of

0, indicating that advanced maternal age was significantly associated with a higher likelihood of placenta accreta. And in association with placenta accreta and multiple gestations. Among 165 (93.90%) cases of placenta accreta, all were positive for multiple gestations.

Table 4: Association of Placenta Increta with Placenta Previa in Prior Pregnancies, advanced maternal age and multiple gestations

Placenta Increta	Placenta previa in prior pregnancy		Chi-square value	p-value	Advanced maternal age		Chi-square value	p-value	Multiple gestations positive
	Negative	Positive			No (<35 years)	Yes (> 35 years)			
Negative	79(96.30%)	79(95.20%)	0.137	0.711	132(97.80%)	26(86.70%)	7.459	0.006	158(95.80%)
Positive	3(3.70%)	4(4.80%)			3(2.20%)	4(13.30%)			7(4.20%)

Table 4 shows that in association between Placenta Increta and Placenta Previa in Prior Pregnancies among women without a history of placenta previa, 96.30% had a negative diagnosis of placenta increta, and 3.70% had a positive diagnosis. Among women with a history of placenta previa, 95.20% had a negative diagnosis, while 4.80% had a positive diagnosis. The Chi-Square value was 0.137 with a p-value of 0.711, indicating that a history of placenta previa in prior pregnancies did not significantly influence the occurrence of placenta increta. In association between Placenta Increta and Advanced Maternal Age among women under 35 years, 97.80% had a negative diagnosis of placenta increta, while 2.20% had a positive diagnosis. In contrast, among women over 35 years, 86.70% had a negative diagnosis, and 13.30% had a positive diagnosis of placenta increta. The Chi-Square value was 7.459 with a p-value of 0.006, indicating that advanced maternal age was significantly associated with a higher likelihood of placenta increta and Among 7 (4.20%) cases of placenta increta, all were positive for multiple gestations.

Table 5: Association of Placenta Percreta with Placenta Previa in Prior Pregnancy, advanced maternal age and multiple gestations.

Placenta Percreta	History of placenta previa in prior pregnancy		Chi-square value	p-value	Advanced maternal age		Chi-square value	p-value	Multiple gestations positive
	Negative	Positive			No (<35 years)	Yes (> 35year)			
Negative	81(98.80%)	81(97.60%)	0.327	0.567	135(100.0%)	27(90.00%)	13.75	0	162(98.20%)
Positive	1(1.20%)	2(2.40%)			0(0.00%)	3(10.00%)			3(1.80%)

Table 5 shows that in association between placenta percreta and history of placenta previa in prior pregnancy among women without a history of placenta previa, 98.80% had a negative diagnosis of placenta percreta, and 1.20% had a positive diagnosis. Among women with a history of placenta previa, 97.60% had a negative diagnosis, and 2.40% had a positive diagnosis. The Chi-Square value was 0.327 with a p-value of 0.567, indicating that a history of placenta previa in prior pregnancies did not significantly influence the occurrence of placenta percreta. In association between placenta percreta and advanced maternal age among all 3 cases of placenta percreta were positive for advanced maternal age. The Chi-Square value was 13.75 with a p-value of 0, indicating that advanced maternal age was significantly associated with a higher likelihood of placenta percreta. And among all 3 (1.80%) cases of placenta percreta, all were positive for multiple gestations.

Discussion

Disorders like placenta accreta, increta, and percreta are examples of abnormally invasive placentas, in which the placenta invades deeper into the uterine wall or beyond. These disorders can result in significant haemorrhage, preterm birth, and delivery problems. A 2020 study by S. K. Happe and M. W. Rac assessed the risk of placenta accreta spectrum (PAS) in 68 women. Forty (59%) of these individuals had previously undergone a caesarean birth (CD). Eight of these ladies had a previous CD and required a hysterectomy. It is noteworthy that 7 of these 8 ladies (88%) exhibited PAS ultrasonography signs.¹⁰ In contrast, 83 (50.3%) of the 165 patients in our study had placenta previa in a previous pregnancy, and 100% of the patients tested positive for prior uterine surgery, including caesarean birth. In patients who had previously undergone uterine surgery, placenta previa was found in all 165 cases examined, highlighting its substantial correlation with PAS. Overall, both trials highlight the significance of close monitoring, risk assessment, and early diagnosis for women with a history of placenta previa and uterine surgery. Our findings strengthen the link between previous uterine surgery and the likelihood of PAS, presenting a strong justification for preventive therapy in these high-risk patients, even though Happe and Rac's study offers comprehensive ultrasound diagnostic criteria.

In our study of 165 high-risk women with placenta previa, we found a high rate of abnormal placentation, with placenta accreta being the most common (93.9%). We also saw significant links between abnormal placentation and advanced maternal age, as well

as multiple pregnancies. A similar study by Khan et al. reported placenta increta in 12.9% of 62 cases, with most diagnoses occurring after 35 weeks. While both studies used ultrasound for detection, our study showed a higher prevalence of abnormal placentation, likely due to the inclusion of more high-risk factors. Overall, both studies highlight the need for early ultrasound screening, but our findings provide additional insights into the risk factors, particularly in women with prior uterine surgery or multiple pregnancies.¹¹ In 2020, Antonio I., Marco L., et al. conducted another study in which 46 were part of the thorough evaluation. Smoking was not associated with an increased risk of abnormally invasive placenta (AIP), although maternal obesity (odds ratio, OR: 1.4, 95% CI), maternal age (OR: 3.1, 95% CI), and parity (OR: 2.5, 95% CI) were. Compared to controls, women with a PP and at least one prior caesarean delivery were more likely to have AIP (odds ratio of 12.0, 95% CI). The number of previous caesarean sections also increased the risk of AIP (OR of 2.6 and 5.4 for 2 and 3 prior Cæsarian Sections).¹² In our study, of the 165 women who were screened for placenta previa, 50.3% had a history of the condition, 100% had undergone uterine surgery, including a caesarean delivery, and 100% had more than one pregnancy. An increased risk of abnormally invasive placenta (AIP) was substantially linked to these factors. In contrast, only 18.2% of the individuals had an advanced maternal age (≥ 35 years). These results are in line with earlier research, especially when it comes to the importance of multiple gestations and uterine surgery as risk factors for AIP. The low impact of advanced maternal age on AIP risk in our study, however, might be the result of variations in the study's design or sample demographics.

Conclusions

Ultrasound is a critical, harmless diagnostic tool that is frequently utilised in medicine due to its ability to produce real-time, high-quality pictures without the use of potentially hazardous radiation. Its inexpensiveness, versatility, and safety make it an easily accessible diagnostic tool in both routine and crisis situations. Due to the heightened risk of placental anomalies, especially in younger women, there is a need for thorough monitoring and management in individuals with a history of uterine surgery, multiple pregnancies, or placenta previa. Clinical practice and early intervention tactics for high-risk pregnancies may benefit from the insightful information this study provides about the clinical and demographic characteristics linked to these placental disorders.

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