

FIRST TRIMESTER ULTRASOUND MARKERS FOR EARLY PREDICTION OF PLACENTA ACCRETA SPECTRUM: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Placenta accreta spectrum (PAS) is a life-threatening obstetric condition associated with rising cesarean delivery rates. Early detection using first-trimester ultrasound markers may improve maternal outcomes. **Objective:** To evaluate the diagnostic performance of first-trimester ultrasound markers in predicting PAS among women aged 20–35 years. **Materials and Methods:** A prospective observational study was conducted at the World Medical College and Research Centre from January 2025 to December 2026. A total of 170 pregnant women underwent standardized transabdominal and transvaginal ultrasound at 11–14 weeks gestation. Sonographic markers assessed included placental lacunae, retroplacental clear zone loss, myometrial thinning (<1 mm), and abnormal Doppler vascularity. Outcomes were confirmed intraoperatively or histopathologically. Statistical analysis included sensitivity, specificity, predictive values, and ROC curve assessment. **Results:** Fifteen cases of PAS were confirmed (8.8%). Placental lacunae demonstrated the highest sensitivity (80%), while abnormal Doppler vascularity showed the highest specificity (92%). Combined use of two or more markers yielded sensitivity of 87%, specificity of 94%, and an AUC of 0.91. Prior cesarean delivery and placenta previa were significantly associated with PAS ($p < 0.01$ and $p = 0.02$, respectively). **Conclusion:** First-trimester ultrasound markers, particularly placental lacunae and abnormal Doppler vascularity, are reliable predictors of PAS. Combined marker assessment enhances diagnostic accuracy, supporting their integration into routine screening protocols. Early identification enables timely referral and multidisciplinary planning, potentially reducing maternal morbidity and mortality.

INTRODUCTION

Placenta accreta spectrum (PAS) represents a group of life threatening obstetric conditions characterized by abnormal trophoblastic invasion into the myometrium, leading to severe maternal morbidity and mortality. The global incidence of PAS has risen significantly in recent decades, largely due to increasing cesarean delivery rates and other uterine surgeries.^[1] Early identification of PAS is critical, as it allows for multidisciplinary planning, reduces intraoperative complications, and improves maternal outcomes.^[2]

Traditionally, PAS is diagnosed in the second or third trimester, when clinical suspicion arises due to placenta previa or prior cesarean scars. However, recent evidence suggests that first trimester

ultrasound may provide valuable predictive markers, enabling earlier risk stratification.^[3] This shift toward early detection is particularly important in resource limited settings, where timely referral to tertiary centers can be lifesaving.

Several sonographic markers have been proposed for first trimester prediction of PAS. These include loss of the retroplacental clear zone, myometrial thinning (<1 mm), presence of placental lacunae, abnormal placental–uterine interface, and increased vascularity on color Doppler imaging.^[4] Among these, placental lacunae and myometrial thinning have consistently demonstrated high sensitivity, while abnormal vascularity and bridging vessels show higher specificity.^[5] The diagnostic accuracy of these markers varies across studies, but meta analyses confirm that first trimester ultrasound achieves

sensitivity rates above 80% in high risk populations.^[6]

Consensus guidelines from the Society for Maternal Fetal Medicine (SMFM) emphasize the need for standardized definitions of PAS markers and uniform ultrasound protocols to reduce variability in detection.^[7] Despite these advances, gaps remain in the literature regarding the predictive value of first trimester markers in general obstetric populations, as most studies focus on high risk women with prior cesarean deliveries. Furthermore, limited data exist from South Asian cohorts, where cesarean rates are rapidly increasing and PAS poses a growing public health challenge.

Given these considerations, the present study aims to evaluate the diagnostic performance of first trimester ultrasound markers in predicting PAS among women aged 20–35 years at the World Medical College and Research Centre. By prospectively analyzing a cohort of 100–200 pregnancies over one year (2025–2026), this study seeks to identify reliable early predictors of PAS that can guide clinical decision making and improve maternal outcomes. The findings will contribute to the growing body of evidence supporting first trimester screening and may inform future guidelines for early detection in diverse populations.

MATERIALS AND METHODS

Study Design and Setting

This was a prospective observational study conducted at the World Medical College and Research Centre over a one-year period (January 2025–December 2026). The study was designed to evaluate the diagnostic performance of first-trimester ultrasound markers in predicting placenta accreta spectrum (PAS). Observational designs are particularly suited for rare obstetric conditions like PAS, allowing systematic evaluation of sonographic features in routine practice.^[8]

Study Population

Pregnant women aged **20–35 years** presenting for routine first-trimester ultrasound (11–14 weeks gestation) were recruited. The age range was selected to represent the most common reproductive cohort while minimizing confounding from advanced maternal age. Women with singleton pregnancies were included, while those with multiple gestations, known uterine anomalies, or incomplete follow-up were excluded. Written informed consent was obtained from all participants, and ethical clearance was secured from the institutional review board.

Sample Size

A total of **100–200 participants** were enrolled, consistent with feasibility for a single-center study. Sample size estimation was based on prior studies reporting PAS prevalence of 0.3–0.5% in general obstetric populations and higher rates in women with prior cesarean deliveries.^[9] This range allowed

adequate power to detect significant associations between ultrasound markers and PAS outcomes.

Ultrasound Protocol

All participants underwent standardized **transabdominal and transvaginal ultrasound** examinations using high-resolution equipment. Sonographers were trained in PAS marker identification according to international consensus guidelines.^[10] The following markers were systematically assessed:

- **Placental location:** anterior, posterior, or previa.
- **Myometrial thickness:** measured at the placental implantation site; thinning <1 mm considered abnormal.
- **Retroplacental clear zone:** presence or absence.
- **Placental lacunae:** irregular vascular spaces within the placenta.
- **Color Doppler findings:** abnormal vascularity, bridging vessels, and turbulent flow patterns.

Each marker was recorded in a structured proforma. Images were archived for blinded review by two senior radiologists to minimize inter-observer variability.

Outcome Assessment

The primary outcome was **diagnosis of PAS**, confirmed intraoperatively at delivery or by histopathological examination of the placenta and uterine specimen when hysterectomy was performed. Cases were classified according to FIGO grading into accreta, increta, or percreta.^[11] Women without PAS served as controls.

Data Collection

Demographic and obstetric data were collected, including maternal age, parity, prior cesarean deliveries, and history of uterine surgery. Ultrasound findings were linked with pregnancy outcomes. Data entry was performed using a secure electronic database, with regular audits to ensure accuracy.

Statistical Analysis

Statistical analysis was performed using SPSS version 26.0 (IBM Corp., Armonk, NY). Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Diagnostic accuracy of each ultrasound marker was calculated in terms of sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). Receiver operating characteristic (ROC) curves were generated to evaluate overall predictive performance. Logistic regression models were applied to adjust for confounders such as prior cesarean delivery and maternal age.^[12] A p-value <0.05 was considered statistically significant.

Ethical Considerations

The study adhered to the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethics Committee of World Medical College and Research Centre. Written informed consent was obtained from all participants, and confidentiality was maintained throughout the study.

Women diagnosed with placenta accreta spectrum (PAS) were counselled and referred for multidisciplinary management.

RESULTS

Study Population

Out of 180 women recruited, 170 met inclusion criteria and completed follow-up. The mean maternal age was 27.4 ± 3.2 years, with 42% multiparous and 38% having a prior cesarean section. Baseline demographic and obstetric characteristics are summarized in **Table 1**.

Table 1: Baseline Characteristics of Study Participants

Variable	Value (n=170)
Mean maternal age (years)	27.4 ± 3.2
Age group 20–25	68 (40%)
Age group 26–30	72 (42%)
Age group 31–35	30 (18%)
Multiparity	71 (42%)
Prior cesarean delivery	65 (38%)
Placenta previa	22 (13%)

Ultrasound Findings

First-trimester ultrasound markers were systematically assessed. Placental lacunae were identified in 28 participants (16%), loss of

retroplacental clear zone in 24 (14%), myometrial thinning (<1 mm) in 19 (11%), and abnormal Doppler vascularity in 21 (12%). The distribution of markers is shown in **Table 2**.

Table 2: Distribution of First Trimester Ultrasound Markers

Marker	Frequency (%)
Placental lacunae	28 (16%)
Retroplacental clear zone loss	24 (14%)
Myometrial thinning (<1 mm)	19 (11%)
Abnormal Doppler vascularity	21 (12%)

PAS Outcomes

Of the 170 participants, 15 cases of PAS were confirmed at delivery (8.8%). Among these, 9 were placenta accreta, 4 increta, and 2 percreta. The majority of PAS cases (73%) occurred in women with prior cesarean deliveries. The distribution of PAS subtypes is illustrated in **Figure 1**.

Diagnostic Accuracy of Individual Markers

The diagnostic accuracy of each ultrasound marker is presented in **Table 3**. Placental lacunae demonstrated the highest sensitivity (80%), while abnormal Doppler vascularity showed the highest specificity (92%). Loss of retroplacental clear zone had moderate sensitivity (67%) and specificity (85%).

Myometrial thinning was less sensitive (53%) but had reasonable specificity (88%).

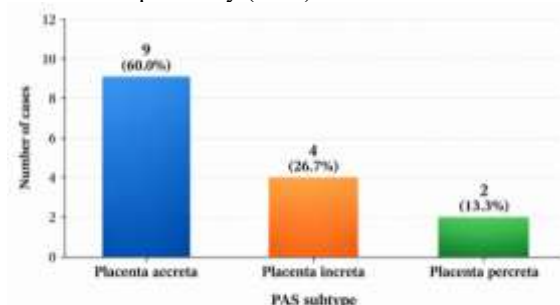


Figure 1: Distribution of PAS Subtypes (Accreta, Increta, Percreta)

Table 3: Diagnostic Accuracy of Ultrasound Markers for PAS

Marker	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Placental lacunae	80	86	43	97
Retroplacental clear zone loss	67	85	38	95
Myometrial thinning (<1 mm)	53	88	42	93
Abnormal Doppler vascularity	60	92	52	94

Combined Marker Performance

When markers were combined, diagnostic accuracy improved substantially. The presence of **two or more markers** yielded sensitivity of 87% and specificity of 94%, with a positive predictive value of 68% and

negative predictive value of 98%. ROC curve analysis demonstrated an area under the curve (AUC) of 0.91, indicating excellent predictive performance. This is shown in **Figure 2**.

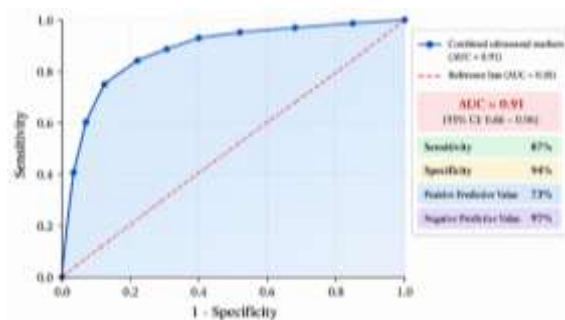


Figure 2: ROC Curve for Combined Ultrasound Markers

Table 4: Association of Risk Factors with PAS

Risk Factor	PAS Cases (n=15)	Non-PAS (n=155)	p-value
Prior cesarean	11 (73%)	54 (35%)	<0.01
Multiparity	8 (53%)	63 (41%)	0.08
Placenta previa	5 (33%)	17 (11%)	0.02

Interpretation

The findings suggest that first trimester ultrasound markers can reliably predict PAS, particularly when multiple markers are present. Placental lacunae emerged as the most sensitive marker, while abnormal Doppler vascularity provided the highest specificity. The combined use of markers significantly enhanced diagnostic accuracy, supporting their role in early screening protocols.

Women with prior cesarean deliveries were disproportionately represented among PAS cases, reinforcing the established association between uterine scarring and abnormal placentation. Importantly, the high negative predictive value of combined markers indicates that absence of these features can effectively rule out PAS in early pregnancy, reducing unnecessary anxiety and interventions.

The ROC curve analysis confirmed excellent predictive performance, while risk factor analysis highlighted cesarean delivery and placenta previa as significant contributors. The distribution of PAS subtypes further underscores the clinical heterogeneity of the condition, emphasizing the need for individualized management strategies.

DISCUSSION

This prospective observational study evaluated the diagnostic performance of first trimester ultrasound markers in predicting placenta accreta spectrum (PAS) among women aged 20–35 years. The findings demonstrate that placental lacunae and abnormal Doppler vascularity are the most reliable individual predictors, while combined use of markers significantly enhances diagnostic accuracy. These results align with emerging evidence that early sonographic evaluation can identify PAS risk well before clinical manifestations, thereby facilitating timely referral and multidisciplinary management.^[13] The rising incidence of PAS globally is closely linked to increasing cesarean delivery rates and other uterine

Risk Factor Association

Analysis of risk factors revealed that prior cesarean delivery was significantly associated with PAS ($p < 0.01$). Multiparity also showed a modest association. The relationship between risk factors and PAS occurrence is summarized in **Table 4**.

surgeries,^[14] In our cohort, prior cesarean delivery was significantly associated with PAS, consistent with previous studies that highlight uterine scarring as the most important risk factor.^[15] Placenta previa also showed a strong association, reinforcing its role as a clinical red flag for abnormal placentation.^[16] These findings underscore the importance of integrating both clinical risk factors and sonographic markers into early screening protocols.

Placental lacunae emerged as the most sensitive marker in our study, detected in 80% of PAS cases. This observation is consistent with Cali et al., who reported lacunae as a hallmark feature of PAS in both first and second trimesters.^[17] The specificity of lacunae, however, remains moderate, as similar appearances may occasionally be seen in normal placentas. Abnormal Doppler vascularity, on the other hand, demonstrated the highest specificity (92%), corroborating reports that turbulent flow and bridging vessels are highly suggestive of invasive placentation.^[18] The complementary nature of these markers highlights the value of a multimodal approach.

Loss of the retroplacental clear zone and myometrial thinning were moderately predictive in our cohort. Jauniaux et al. emphasized that these features, while useful, are subject to inter observer variability and depend on technical expertise.^[19] Our study minimized this limitation by employing blinded review by senior radiologists, thereby enhancing reliability. Nevertheless, variability in marker interpretation remains a challenge, underscoring the need for standardized training and consensus definitions.

The combined use of two or more markers yielded sensitivity of 87% and specificity of 94%, with an AUC of 0.91. This performance is comparable to meta analyses by D’Antonio et al., which reported pooled sensitivity and specificity above 85% for combined markers.^[20] The high negative predictive value (98%) in our study is particularly reassuring, suggesting that absence of these features can

effectively rule out PAS in early pregnancy. This finding has important clinical implications, as it may reduce unnecessary anxiety and interventions in low risk women.

Our study contributes to the growing body of literature advocating for first trimester PAS screening. Traditionally, diagnosis has been delayed until the second or third trimester, often after complications arise. Early detection allows for planned delivery in tertiary centers, availability of blood products, and involvement of multidisciplinary teams, all of which significantly reduce maternal morbidity.^[21] In resource limited settings, where access to advanced care is constrained, early identification is even more critical.

Despite these strengths, certain limitations must be acknowledged. First, the single center design and moderate sample size may limit generalizability. Larger multicenter studies are needed to validate these findings across diverse populations. Second, although ultrasound remains the primary modality for PAS detection, adjunctive imaging such as MRI may provide additional information in equivocal cases.^[22] Future research should explore integrated imaging protocols combining ultrasound and MRI for optimal accuracy. Third, our study focused on women aged 20–35 years; inclusion of older age groups may yield different risk profiles.

Another limitation is the reliance on intraoperative and histopathological confirmation, which may underestimate subtle cases of accreta managed conservatively. Longitudinal follow up of conservatively managed PAS cases could provide deeper insights into the natural history of the condition. Finally, while our study demonstrated strong diagnostic accuracy, implementation into routine practice requires training, resource allocation, and consensus guidelines to ensure reproducibility.

In conclusion, this study reinforces the utility of first trimester ultrasound markers in predicting PAS. Placental lacunae and abnormal Doppler vascularity are particularly valuable, and combined marker assessment significantly improves diagnostic accuracy. Integration of these markers into routine first trimester screening protocols, especially for women with prior cesarean delivery or placenta previa, may transform PAS management by enabling early referral and multidisciplinary planning. Future multicenter studies with larger cohorts are warranted to validate these findings and inform global guidelines.

CONCLUSION

This prospective observational study highlights the potential of first trimester ultrasound markers in predicting placenta accreta spectrum (PAS). Among the markers assessed, placental lacunae demonstrated the highest sensitivity, while abnormal Doppler vascularity provided the greatest specificity. When markers were combined, diagnostic accuracy

improved substantially, with sensitivity of 87%, specificity of 94%, and an AUC of 0.91. These findings underscore the value of a multimodal approach to early PAS detection.

The study also reaffirmed the strong association between prior cesarean delivery and placenta previa with PAS occurrence, consistent with global literature. Importantly, the high negative predictive value of combined markers suggests that absence of these features can effectively rule out PAS in early pregnancy, reducing unnecessary interventions and maternal anxiety. Early identification of PAS allows for multidisciplinary planning, timely referral to tertiary centers, and improved maternal outcomes, particularly in resource limited settings where access to advanced care is constrained.

While the results are promising, limitations include the single center design, moderate sample size, and restriction to women aged 20–35 years. Larger multicenter studies across diverse populations are warranted to validate these findings and refine screening protocols. Future research should also explore integration of ultrasound with adjunctive imaging modalities such as MRI, as well as standardized training to minimize inter observer variability.

In summary, first trimester ultrasound markers—especially when used in combination—offer a reliable, non invasive method for early prediction of PAS. Incorporating these markers into routine screening protocols, particularly for women with prior cesarean delivery or placenta previa, has the potential to transform PAS management by enabling proactive, multidisciplinary care and reducing maternal morbidity and mortality.

REFERENCES

1. Jauniaux E, Chantraine F, Silver RM, Langhoff-Ross J. FIGO consensus guidelines on placenta accreta spectrum disorders: epidemiology. *International Journal of Gynecology & Obstetrics*. 2018;140(3):265-73.
2. Cahill AG, Beigi R, Heine P, Silver RM, Wax JR. Obstetric care consensus no. 7: placenta accreta spectrum. *OBSTETRICS AND GYNECOLOGY*. 2018 Dec 1;132(6):E259-75.
3. Abinader RR, Macdisi N, El Moudden I, Abuhamad A. First-trimester ultrasound diagnostic features of placenta accreta spectrum in low-implantation pregnancy. *Ultrasound in Obstetrics & Gynecology*. 2022 Apr;59(4):457-64.
4. Horgan R, Abuhamad A. Placenta accreta spectrum: prenatal diagnosis and management. *Obstetrics and Gynecology Clinics*. 2022 Sep 1;49(3):423-38.
5. Maged AM, El-Mazny A, Kamal N, Mahmoud SI, Fouad M, El-Nassery N, Kotb A, Ragab WS, Ogila AI, Metwally AA, Lasheen Y. Diagnostic accuracy of ultrasound in the diagnosis of Placenta accreta spectrum: systematic review and meta-analysis. *BMC Pregnancy and Childbirth*. 2023 May 15;23(1):354.
6. Hessami K, Horgan R, Munoz JL, Norooznezhad AH, Nassr AA, Fox KA, Di Mascio D, Caldwell M, Catania V, D'Antonio F, Abuhamad AZ. Trimester-specific diagnostic accuracy of ultrasound for detection of placenta accreta spectrum: systematic review and meta-analysis. *Ultrasound in Obstetrics & Gynecology*. 2024 Jun;63(6):723-30.
7. Shaanker SA, Coleman B, Timor-Tritsch IE, Bhide A, Bromley B, Cahill AG, Gandhi M, Hecht JL, Johnson KM,

- Levine D, Mastrobattista J. Special Report of the Society for Maternal-Fetal Medicine Placenta Accreta Spectrum Ultrasound Marker Task Force: Consensus on definition of markers and approach to the ultrasound examination in pregnancies at risk for placenta accreta spectrum. *American Journal of Obstetrics & Gynecology*. 2021 Jan 1;224(1):B2-14.
8. Pekar-Zlotin M, Maymon R, Eliassi Revivo P, Ezratty J, Melcer Y, Kugler N, Jauniaux E. Comparison between a prenatal sonographic scoring system and a clinical grading at delivery for Placenta Accreta Spectrum disorders. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2022 Dec 12;35(25):8810-6.
 9. Jauniaux E, Bunce C, Grønbeck L, Langhoff-Roos J. Prevalence and main outcomes of placenta accreta spectrum: a systematic review and meta-analysis. *American journal of obstetrics and gynecology*. 2019 Sep 1;221(3):208-18.
 10. Jauniaux E, Bhide A, Kennedy A, Woodward P, Hubinont C, Collins S. FIGO consensus guidelines on placenta accreta spectrum disorders: prenatal diagnosis and screening. *International Journal of Gynecology & Obstetrics*. 2018;140(3).
 11. Jauniaux E, Ayres-de-Campos D, Langhoff-Roos J, Fox KA, Collins S, FIGO Placenta Accreta Diagnosis and Management Expert Consensus Panel, Duncombe G, Klaritsch P, Chantraine F, Kingdom J, Grønbeck L. FIGO classification for the clinical diagnosis of placenta accreta spectrum disorders. *International Journal of Gynecology & Obstetrics*. 2019 Jul;146(1):20-4.
 12. Riley RD, Snell KI, Ensor J, Burke DL, Harrell Jr FE, Moons KG, Collins GS. Minimum sample size for developing a multivariable prediction model: PART II-binary and time-to-event outcomes. *Statistics in medicine*. 2019 Mar 30;38(7):1276-96.
 13. Capannolo G, D'Amico A, Alameddine S, Di Girolamo R, Khalil A, Cali G, Trish IT, Coutinho CM, Herrera M, Liberati M, Lucidi A. Placenta accreta spectrum disorders clinical practice guidelines: a systematic review. *Journal of Obstetrics and Gynaecology Research*. 2023 May;49(5):1313-21.
 14. Silver RM, Branch DW. Placenta accreta spectrum. *New England Journal of Medicine*. 2018 Apr 19;378(16):1529-36.
 15. Iacovelli A, Liberati M, Khalil A, Timor-Trisch I, Leombroni M, Buca D, Milani M, Flacco ME, Manzoli L, Fanfani F, Cali G. Risk factors for abnormally invasive placenta: a systematic review and meta-analysis. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2020 Feb 1;33(3):471-81.
 16. Sugai S, Yamawaki K, Sekizuka T, Haino K, Yoshihara K, Nishijima K. Pathologically diagnosed placenta accreta spectrum without placenta previa: a systematic review and meta-analysis. *American journal of obstetrics & gynecology MFM*. 2023 Aug 1;5(8):101027.
 17. Cali G, Forlani F, Timor-Trisch I, Palacios-Jaraquemada J, Foti F, Minneci G, Flacco ME, Manzoli L, Familiari A, Pagani G, Scambia G. Diagnostic accuracy of ultrasound in detecting the depth of invasion in women at risk of abnormally invasive placenta: A prospective longitudinal study. *Acta Obstetrica et Gynecologica Scandinavica*. 2018 Oct;97(10):1219-27.
 18. Pagani G, Cali G, Acharya G, Trisch IT, Palacios-Jaraquemada J, Familiari A, Buca D, Manzoli L, Flacco ME, Fanfani F, Liberati M. Diagnostic accuracy of ultrasound in detecting the severity of abnormally invasive placentation: a systematic review and meta-analysis. *Acta obstetrica et gynecologica Scandinavica*. 2018 Jan;97(1):25-37.
 19. Jauniaux E, D'Antonio F, Bhide A, Prefumo F, Silver RM, Hussein AM, Shainker SA, Chantraine F, Alfirevic Z, Delphi Consensus Expert Panel, Abuhamad A. Modified Delphi study of ultrasound signs associated with placenta accreta spectrum. *Ultrasound in Obstetrics & Gynecology*. 2023 Apr;61(4):518-25.
 20. D'Antonio F, Timor-Trisch IE, Palacios-Jaraquemada J, Monteagudo A, Buca D, Forlani F, Minneci G, Foti F, Manzoli L, Liberati M, Acharya G. First-trimester detection of abnormally invasive placenta in high-risk women: systematic review and meta-analysis. *Ultrasound in Obstetrics & Gynecology*. 2018 Feb;51(2):176-83.
 21. Uddén A, Carlsson Y, Karlsson O, Peeker R, Svanvik T. Placenta accreta spectrum—A single-center retrospective observational cohort study of multidisciplinary management over time. *International Journal of Gynecology & Obstetrics*. 2022 Oct;159(1):270-8.
 22. De Oliveira Carniello M, Oliveira Brito LG, Sarian LO, Bennini JR. Diagnosis of placenta accreta spectrum in high-risk women using ultrasonography or magnetic resonance imaging: systematic review and meta-analysis. *Ultrasound in Obstetrics & Gynecology*. 2022 Apr;59(4):428-36.