

Research Article

Clinical Characteristics and Outcomes of Patients with Suspected Placenta Accreta Spectrum: A Retrospective Study (2022–2023)

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Abstract

Objectives: To describe the clinical characteristics, management strategies, and maternal and perinatal outcomes of patients evaluated for suspected Placenta Accreta Spectrum (PAS).

Methods: This retrospective descriptive study included 175 pregnant women evaluated for suspected PAS at Dr. Moewardi General Hospital between 2022 and 2023. The preoperative likelihood of PAS was assessed using the Morbidly Adherent Placenta (MAP) score, whereas the final diagnosis was established according to the International Federation of Gynecology and Obstetrics (FIGO) classification based on histopathological examination or intraoperative findings in patients managed conservatively.

Results: Most patients had Class I obesity (40.0%), a history of fewer than two previous caesarean sections (78.9%), and delivered at term (47.4%). Preoperative assessment showed that 52.6% of patients had low MAP scores, which was consistent with the final FIGO classification, as 73.1% of patients were classified as FIGO Grade 0 (normal placentation or placenta previa without invasion), indicating that true invasive PAS accounted for only a minority of cases. Consequently, conservative uterine-sparing management was feasible in most patients; 77.7% did not require hysterectomy, and 69.7% experienced an estimated blood loss of less than 1,000 mL. Perinatal outcomes were generally favorable, with 58.3% of neonates having a normal birth weight and 60.6% showing no signs of asphyxia.

Conclusion: Among patients evaluated for suspected PAS, the majority had low MAP scores and were ultimately classified as FIGO Grade 0, indicating the absence of invasive placental disease. Consequently, conservative uterine-sparing management was successfully implemented in most cases and was associated with favorable maternal and perinatal outcomes.

Keywords: cesarean section, maternal outcomes, perinatal outcomes, placenta accreta spectrum, uterine-sparing management.

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INTRODUCTION

Placenta Accreta Spectrum (PAS) refers to a group of disorders characterized by abnormal placental adherence to or invasion of the uterine wall, which may extend into adjacent organs in severe cases¹. According to the depth of trophoblastic invasion, PAS is classified as placenta accreta (abnormal adherence to the myometrium due to the absence of the decidua basalis), placenta increta (invasion into the myometrium), and placenta percreta

(penetration through the myometrium into adjacent organs)²⁻⁴. PAS is associated with severe maternal complications, including postpartum hemorrhage, massive blood transfusion, injury to adjacent organs, hysterectomy, preterm birth, and maternal morbidity and mortality²⁻⁴.

A multicenter cohort study conducted in the United States reported that among women with placenta previa and a history of previous Cesarean Section (CS), the risk of PAS increased progressively with the number of prior CSs, reaching 3%, 11%, 40%, 61%, and 67% after the

first, second, third, fourth, and fifth cesarean deliveries, respectively ². Likewise, a national case-control study from the United Kingdom demonstrated that the incidence of PAS increased from 1.7 per 10,000 births in the general obstetric population to 577 per 10,000 births among women with both placenta previa and a previous cesarean delivery ^{5,6}.

Although patients with PAS are frequently asymptomatic during pregnancy, the condition may result in life-threatening complications during delivery if not recognized antenatally. Therefore, accurate prenatal assessment is essential for optimizing delivery planning and reducing maternal and neonatal morbidity. Ultrasonography (US) remains the primary imaging modality for antenatal diagnosis, while Magnetic Resonance Imaging (MRI) serves as a complementary tool in selected cases, as recommended by international guidelines ⁷⁻⁹. In Indonesia, the reported incidence of PAS has increased over the past decade, reflecting the rising rate of cesarean deliveries. PAS has become an important contributor to maternal morbidity and mortality, particularly in tertiary referral centers¹⁰. Placenta previa in women with a previous CS remains the strongest risk factor for PAS, whereas advanced maternal age (≥ 35 years), high parity, previous uterine surgery other than CS, infertility, and assisted reproductive technologies are recognized as additional risk factors ^{9,11}.

Despite advances in prenatal imaging and standardized diagnostic criteria, distinguishing true invasive PAS from suspected cases remains a significant clinical challenge. Accurate preoperative assessment is essential for selecting the most appropriate surgical strategy, avoiding unnecessary hysterectomy, and ensuring optimal multidisciplinary management.

This study aimed to describe the clinical characteristics, preoperative Morbidly Adherent Placenta (MAP) scores, final Placenta Accreta Spectrum classification according to the International Federation of Gynecology and Obstetrics (FIGO), management strategies, and maternal and perinatal outcomes of women evaluated for suspected PAS at a tertiary referral hospital in Indonesia. The findings are expected to contribute to improved prenatal risk stratification and more appropriate management of patients with suspected PAS.

METHODS

This retrospective descriptive study was conducted to evaluate the clinical characteristics, management strategies, and maternal and perinatal outcomes of women evaluated for suspected Placenta Accreta Spectrum (PAS). The study was conducted at Dr. Moewardi General Hospital, a tertiary referral hospital in Surakarta, Indonesia. Medical records of eligible patients managed between January 2022 and December 2023 were retrospectively reviewed. This study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

The study population comprised all pregnant women evaluated for suspected PAS who underwent cesarean delivery during the study period. A total sampling approach was employed, whereby all eligible patients were included. Because the study included the entire accessible cohort within the predefined study period, no formal sample size calculation was performed. Eligible participants were pregnant women evaluated for suspected PAS based on antenatal imaging findings or intraoperative clinical suspicion and managed at Dr. Moewardi General Hospital between 2022 and 2023. Patients with multifetal pregnancies, incomplete medical records lacking essential diagnostic or outcome variables, or loss to follow-up were excluded. During the study period, 1,584 deliveries were recorded at the hospital, of which 175 women were evaluated and managed for suspected PAS. As none of these cases met the exclusion criteria, all 175 patients were included in the final analysis.

The primary study variables included maternal and perinatal clinical characteristics, preoperative PAS assessment, management strategies, and maternal and neonatal outcomes.

PAS diagnosis and classification

The preoperative likelihood of PAS was assessed using the Morbidly Adherent Placenta (MAP) score and categorized as low (≤ 5 points), moderate (6–7 points), or high (8–12 points)¹². The final PAS classification was established according to the International Federation of Gynecology and Obstetrics (FIGO) classification. In patients who underwent hysterectomy, the diagnosis was confirmed by postoperative histopathological examination. For patients managed conservatively with uterine preservation, the FIGO classification was assigned based on intraoperative surgical

findings. Placental invasion was classified as Grade 0 (normal placentation or placenta previa without invasion), Grade 1 (placenta accreta), Grade 2 (placenta increta), or Grade 3 (placenta percreta)¹³.

Maternal characteristics

Body mass index (BMI) was categorized according to the World Health Organization (WHO) Asia-Pacific classification. Maternal anemia was classified as mild, moderate, or severe according to hemoglobin concentration. Intraoperative blood loss was estimated using suction volume and the gravimetric method for surgical sponges and categorized as <1,000 mL, 1,100–1,700 mL, 1,800–2,400 mL, or ≥2,400 mL⁴. Additional maternal variables included gestational age at delivery (preterm, term, or post-term), history of previous cesarean section (<2 or ≥2), hemodynamic shock (defined as persistent hemodynamic instability), urinary tract injury, hysterectomy, Intensive Care Unit (ICU) admission, and length of hospital stay (<5 or ≥5 days).

Perinatal characteristics

Neonatal outcomes included birth weight categorized as extremely low birth weight, very low birth weight, low birth weight, normal birth weight, and macrosomia. Neonatal asphyxia was assessed using the 1-minute Apgar score and classified as no asphyxia (8–10), mild asphyxia (6–7), moderate asphyxia (4–5), or severe asphyxia (1–3 or a 5-minute Apgar score <5)¹⁴.

To enhance data reliability and minimize retrospective bias, medical records were independently reviewed by two investigators using a standardized electronic data collection form. Any discrepancies were resolved through discussion and consensus or, when necessary, through consultation with a senior obstetrician. Records with missing essential variables were excluded from the analysis according to the predefined exclusion criteria.

Statistical analysis was performed using IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY, USA). Because the study was designed as a descriptive investigation, only descriptive analyses were performed. Categorical variables are presented as frequencies and percentages, whereas continuous variables are presented as means with standard deviations or medians with interquartile ranges, as appropriate.

ETHICAL CONSIDERATION

All research procedures were reviewed and formally approved by the Health Research Ethics Committee (HREC) of Dr. Moewardi General Hospital, Surakarta (Approval Number: 1.513/IV/HREC/2024). Due to the retrospective, observational nature of this study utilizing historical medical records, the requirement for individual informed consent was formally waived by the ethics committee.

RESULTS

Incidence and General Characteristics

During the study period (2022–2023), 1,584 deliveries were recorded at Dr. Moewardi General Hospital. Among these, 175 pregnant women were evaluated and managed for suspected Placenta Accreta Spectrum (PAS), yielding an estimated incidence of 11.05%.

The overall demographic and clinical characteristics of the study population (N = 175) are summarized in Table 1. The mean maternal age was 33.1 ± 4.9 years, and the mean gestational age at delivery was 36.0 ± 4.5 weeks. Most patients were classified as having Class I obesity (40.0%), and 78.9% had a history of fewer than two previous cesarean deliveries. Regarding gestational age at delivery, 47.4% delivered at term, whereas 41.7% delivered preterm.

Preoperative Assessment and PAS Classification

Preoperative assessment using the Morbidly Adherent Placenta (MAP) score demonstrated that 52.6% of patients had a low probability of PAS (score ≤5), 25.7% had moderate scores (6–7), and 21.7% had high scores (8–12).

The final diagnosis was established using the FIGO classification based on postoperative histopathological examination in patients who underwent hysterectomy or intraoperative surgical findings in patients managed conservatively. The majority of patients (73.1%) were classified as FIGO Grade 0, indicating normal placentation or placenta previa without placental invasion. Confirmed invasive PAS accounted for the remaining cases, including Grade 1 (18.3%), Grade 2 (4.0%), and Grade 3 (4.6%).

Maternal Management and Clinical Outcomes

Given the predominance of FIGO Grade 0 and Grade 1 disease, conservative uterine-sparing

management was successfully performed in 136 patients (77.7%), whereas 39 patients (22.3%) required hysterectomy.

The median estimated intraoperative blood loss was 500 mL (IQR, 300–1,500 mL), with a mean blood loss of $1,272.3 \pm 1,722.6$ mL. Most patients (69.7%) experienced blood loss of <1,000 mL. Admission to the intensive care unit (ICU) was required in 25.7% of patients, while 37.1% remained hospitalized for ≥ 5 days.

Major maternal complications were uncommon (Table 2). Urinary tract injury (bladder rupture) occurred in three patients (1.7%), and vascular injury involving the descending ramus artery occurred in one patient (0.6%). There was one maternal death (0.6%) due to severe hemorrhagic shock and two neonatal deaths (1.1%).

Perinatal Outcomes

The mean neonatal birth weight was $2,602.1 \pm 736.2$ g. Most neonates had a normal birth weight (58.3%), whereas 34.9% had low birth weight. Assessment using the 1-minute Apgar score showed that 60.6% of neonates had no evidence of asphyxia, 35.4% had mild asphyxia, 3.4% had moderate asphyxia, and 0.6% had severe asphyxia.

Table 1. Maternal Demographic and Clinical Characteristics (N=175)

Variable	Value
Maternal Age (years), mean $\pm$ SD	33.1 $\pm$ 4.9
Body Mass Index (BMI)	
Underweight	2 (1.2)
Normal	38 (21.7)
Overweight	24 (13.7)
Class I obesity	70 (40.0)
Class II obesity	41 (23.4)
Previous cesarean delivery (times)	
<2	138 (78.9)
≥ 2	37 (21.1)
Gestational age (weeks), Mean $\pm$ SD	36.0 $\pm$ 4.5
Gestational age Category	
Preterm	73 (41.7)
Term	83 (47.4)
Post-term	19 (10.9)
Preoperative MAP score	
Low (≤ 5)	92 (52.6)
Moderate (6-7)	45 (25.7)
High (8-12)	38 (21.7)
FIGO Classification	
Grade 0 (normal placentation/placenta previa)	128 (73.1)
Grade 1 (placenta accreta)	32 (18.7)
Grade 2 (placenta increta)	7 (4.0)
Grade 3 (placenta percreta)	8 (4.6)

Abbreviations. BMI = Body Mass Index, FIGO = International Federation of Gynecology and Obstetrics, MAP = Morbidly Adherent Placenta

Table 2. Maternal, Surgical, and Perinatal Outcomes (N=175)

Variable	Value
Management strategy	
Conservative (uterine-sparing)	136 (77.7)
Hysterectomy	39 (22.3)
Estimated blood loss (mL), median (IQR)	500 (300 – 1500)
Estimated blood loss categories (mL)	
<1000	122 (69.7)
1100 - 1700	14 (8.0)
1800 - 2400	8 (4.6)
≥ 2400	31 (17.7)
ICU admission	
Yes	45 (25.7)
No	130 (74.3)
Length of hospital stay (days)	
<5	110 (62.9)
≥ 5	65 (37.1)
Maternal complication	
None	169 (96.6)
Urinary tract injury (bladder rupture)	3 (1.7)
Vascular injury (descending ramus artery)	1 (0.6)
Maternal death	1 (0.6)
Perinatal outcome	
Neonatal death	2 (1.1)
Birth weight (g), mean $\pm$ SD	2602.1 $\pm$ 736.2
Birth weight category	
Extremely low	5 (2.9)
Very low	4 (2.2)
Low	61 (34.9)
Normal	102 (58.3)
Macrosomia	3 (1.7)
1-minute APGAR score	
No asphyxia (8-10)	106 (60.6)
Mild asphyxia (6-7)	62 (35.4)
Moderate asphyxia (4-5)	6 (3.4)
Severe spphyxia	1 (0.6)

DISCUSSION

Principal Findings

Recent reports from Indonesia and Southeast Asia have identified Placenta Accreta Spectrum (PAS) as an increasingly important contributor to maternal morbidity, highlighting the need for region-specific clinical data and management strategies.^{10,15} This study described the clinical characteristics, management strategies, and maternal and perinatal outcomes of women evaluated for suspected PAS at a tertiary referral hospital in Central Java, Indonesia. The principal findings demonstrated that the cohort was predominantly composed of women with previous cesarean deliveries and maternal obesity. Most patients had low preoperative Morbidly Adherent Placenta (MAP) scores, which

corresponded well with the final diagnoses, as the majority were classified as FIGO Grade 0 (normal placentation or placenta previa without placental invasion). Consequently, conservative uterine-sparing management was successfully performed in most patients and was associated with favorable maternal and perinatal outcomes, including a low incidence of severe neonatal asphyxia and major maternal complications.¹⁴

Clinical Profile and Comparison with Previous Studies

Although this descriptive study was not designed to identify independent risk factors for PAS, the clinical characteristics of our cohort are consistent with previous epidemiological studies and current international guidelines. The American College of Obstetricians and Gynecologists (ACOG) and the Society for Maternal-Fetal Medicine (SMFM) recognize previous cesarean delivery, particularly when accompanied by placenta previa, as the strongest risk factor for PAS.^{5,6,9} Likewise, the high prevalence of Class I and Class II obesity observed in our cohort reflects contemporary obstetric trends. Although maternal obesity is not considered an independent determinant of PAS severity, it has been associated with increased surgical complexity and adverse obstetric outcomes.¹⁶

Current international guidelines, including those from the Royal College of Obstetricians and Gynaecologists (RCOG), recommend planned preterm delivery for women with confirmed severe PAS to reduce the risk of catastrophic hemorrhage.⁸ In contrast, most patients in our cohort delivered at term or late preterm. This difference is likely attributable to the relatively mild disease profile of our study population, in which most women were evaluated for suspected PAS but were ultimately classified as FIGO Grade 0 or Grade 1 rather than confirmed invasive PAS.^{1,13}

The FIGO Grade 0 Paradox and Conservative Management

One of the most important findings of this study is the high rate of successful conservative management (77.7%) accompanied by a relatively low rate of peripartum hysterectomy. These findings should be interpreted within the context of the study population. The favorable outcomes do not necessarily indicate that conservative management is appropriate for all PAS cases; instead, they primarily reflect the predominance

of patients with low MAP scores and FIGO Grade 0 or Grade 1 disease.

The FIGO consensus guidelines distinguish clinical, imaging, intraoperative, and histopathological classifications of PAS and acknowledge that conservative management is most appropriate when deep trophoblastic invasion is absent.¹³ Similarly, recent Indonesian literature has demonstrated that uterine-preserving techniques, including focal placental excision, uterine tamponade, and vascular ligation, can be effective in carefully selected patients with non-invasive or minimally invasive PAS.¹² Preservation of the uterus may also improve long-term quality of life and sexual function in women undergoing treatment for PAS.¹⁷ Furthermore, because most patients in this cohort were ultimately diagnosed with FIGO Grade 0, the relatively low estimated blood loss and favorable surgical outcomes were expected and should not be generalized to patients with severe invasive PAS.

Clinical Implications for Multidisciplinary PAS Care

The findings of this study have several important implications for clinical practice. First, the discrepancy between suspected PAS and confirmed invasive PAS underscores the importance of accurate prenatal diagnosis. Standardized antenatal assessment using validated ultrasound markers, including the Placenta Accreta Index (PAI) and MAP score, may improve preoperative risk stratification and facilitate appropriate referral to tertiary referral centers.^{7,9,18}

Second, accurate disease stratification enables multidisciplinary management according to disease severity. Women with confirmed invasive PAS should be managed by an experienced multidisciplinary team comprising maternal-fetal medicine specialists, gynecologic surgeons, anesthesiologists, urologists, interventional radiologists when available, and well-prepared blood bank services. Conversely, patients with milder disease may benefit from conservative uterine-sparing approaches, thereby avoiding unnecessary radical surgery and preserving future reproductive potential whenever clinically appropriate.^{1,8,9,19}

Strengths and Limitations

This study has several strengths. It represents one of the larger single-center series

evaluating suspected PAS in Central Java and applied internationally recognized diagnostic frameworks, including the MAP score and FIGO classification. Furthermore, the study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement.²⁰, enhancing the transparency and quality of reporting.

Nevertheless, several limitations should be acknowledged. First, the retrospective design is inherently dependent on the completeness and accuracy of medical records, introducing the potential for information bias. Second, the absence of a comparison group limits the study to descriptive analyses and precludes the identification of independent risk factors. Third, as a tertiary referral center, referral bias is unavoidable because more complex cases are preferentially referred. However, the predominance of FIGO Grade 0 cases also suggests a relatively low threshold for referral of suspected PAS. Finally, because most patients underwent conservative management without hysterectomy, definitive histopathological confirmation was unavailable in these cases. Consequently, FIGO classification was based on intraoperative surgical assessment rather than examination of the complete uteroplacental interface, introducing the possibility of disease misclassification¹³.

CONCLUSION

In this single-center retrospective study of pregnant women evaluated for suspected Placenta Accreta Spectrum (PAS), the majority of cases presented with low Morbidly Adherent Placenta (MAP) scores and were ultimately classified as FIGO Grade 0 or 1. This indicates that true, deep invasive PAS was less common within this cohort. Due to this milder disease severity profile, conservative, uterine-sparing management was frequently and successfully utilized, resulting in uncommon severe maternal and perinatal complications. However, these favorable outcomes must be interpreted cautiously, properly accounting for baseline disease severity and the inherent limitations of surgical diagnostic classification.

To improve local clinical practice and maternal care, these findings highlight the critical importance of avoiding over-intervention in mild cases while maintaining high vigilance. Moving forward, the implementation of

standardized antenatal ultrasound diagnostics, severity-stratified reporting, and comprehensive multidisciplinary team (MDT) planning are strongly recommended to optimize resource allocation and refine future PAS surveillance and management.

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CONFLICT of INTEREST

The authors declare that there is no actual or potential conflict of interest in relation to this article.

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