

Placenta accreta spectrum: A multidisciplinary approach for identifying risk factors and for better fetomaternal outcomes – A retrospective study.

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Page | 1

Abstract

Background

Aim: To identify the risk factors associated with Placenta Accreta Spectrum and to evaluate fetomaternal outcomes following multidisciplinary management in a tertiary care center.

Materials and methods

Antenatal PAS cases handled at Jubilee Mission Medical College, Kerala, between January 2020 and May 2026 were studied retrospectively in a cross-sectional analysis. Descriptive analysis was carried out for maternal, obstetric, diagnostic, operative, transfusion, complication, multidisciplinary, critical care, and fetal outcomes.

Results

The study included women diagnosed with Placenta Accreta Spectrum, the majority of whom had a history of previous cesarean delivery. Most patients were diagnosed antenatally through ultrasonography, while magnetic resonance imaging was utilized in selected cases with diagnostic uncertainty. Placenta accreta constituted the most common subtype, followed by placenta increta and placenta percreta. Placenta previa was frequently associated with abnormal placentation. Multidisciplinary management involved coordinated participation of obstetricians, anesthesiologists, radiologists, intensivists, neonatologists, urologists, surgeons, and transfusion medicine specialists.

Hysterectomy represented the predominant management strategy, whereas conservative uterine-preserving procedures were performed in selected patients. Maternal morbidity was primarily related to postpartum hemorrhage, multiple blood transfusions, disseminated intravascular coagulation, bladder injury, hemorrhagic shock, and intensive care admission. Significant utilization of packed red blood cells, fresh frozen plasma, platelets, and cryoprecipitate reflected the substantial hemorrhagic burden associated with PAS. Neonatal outcomes were mainly influenced by prematurity, low birth weight, and neonatal intensive care admission. Multidisciplinary management enhanced fetomaternal outcomes regardless of significant morbidity.

Conclusion

PAS, a serious obstetric complication related to prior caesarean delivery and placenta previa, poses a risk to the mother and fetus. The earlier the diagnosis and proper surgery planning with availability of blood products are vital for improving results in tertiary hospitals.

Recommendation

Women with previous cesarean sections and placenta previa should undergo targeted antenatal screening for Placenta Accreta Spectrum.

Keywords: Placenta Accreta Spectrum, Placenta Accreta, Placenta Increta, Placenta Percreta, Placenta Previa, Previous Cesarean Section, Multidisciplinary Management, Obstetric Hemorrhage, Peripartum Hysterectomy, Maternal Morbidity, Neonatal Outcome, High-Risk Pregnancy.

Submitted: August 05, 2026 **Accepted:** September 11, 2026 **Published:** September 30, 2026

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Introduction

Placenta Accreta Spectrum (PAS) is a serious obstetric condition characterized by abnormal adherence or invasion of placental villi into the uterine wall due to partial or complete absence of the decidua basalis and defective development of the Nitabuch layer. Depending on the depth of trophoblastic invasion, PAS is classified into placenta accreta, placenta increta, and placenta percreta. Placenta accreta refers to abnormal adherence of placental villi to the myometrium; placenta increta involves invasion into the myometrium, while placenta percreta represents the most severe form, extending through the uterine serosa and occasionally invading adjacent organs such as the urinary bladder. PAS is recognized as one of the most challenging conditions in modern obstetrics because of its association with severe maternal and neonatal morbidity and mortality.[1,2]

The incidence of PAS has risen dramatically over the past several decades, largely paralleling the global increase in cesarean section rates. Earlier studies estimated the incidence to be approximately 1 in 30,000 deliveries; however, contemporary reports indicate a prevalence approaching 1 in 500 pregnancies. This substantial increase has transformed PAS into a major public health concern and a significant contributor to maternal morbidity worldwide.[3,4]

Previous cesarean delivery remains the strongest risk factor for PAS. The risk increases progressively with the number of prior cesarean sections due to scar-related alterations in endometrial and myometrial integrity. Placenta previa, particularly when implanted over a previous cesarean scar, further amplifies the likelihood of abnormal placentation. Additional risk factors include advanced maternal age, multiparity, previous myomectomy, dilatation and curettage, hysteroscopic procedures, uterine artery embolization, and assisted reproductive techniques. These factors disrupt normal endometrial architecture and facilitate excessive trophoblastic invasion during subsequent pregnancies.[1,5]

The pathogenesis of PAS is believed to involve defective decidualization and abnormal remodeling at sites of previous uterine injury. In normal pregnancies, decidual tissue limits trophoblastic penetration into the myometrium. In PAS, this protective barrier is deficient, allowing placental villi to invade deeply into the uterine wall. Areas of previous uterine scarring provide favorable conditions for abnormal placental attachment because of altered vascularization and impaired tissue repair. Consequently, the increasing prevalence of cesarean delivery has been accompanied by a corresponding rise in PAS incidence worldwide.[2]

Antenatal diagnosis plays a pivotal role in improving outcomes among women with PAS. Ultrasonography is the

primary diagnostic modality and can identify characteristic features such as placental lacunae, loss of the retroplacental clear zone, myometrial thinning, increased vascularity, and extension of placental tissue beyond the uterine contour. Color Doppler imaging further enhances diagnostic accuracy. Magnetic resonance imaging serves as a valuable adjunct in selected cases, particularly when ultrasound findings are inconclusive or when extensive placental invasion is suspected.[6–10]

Failure to recognize PAS before delivery may result in catastrophic hemorrhage and life-threatening maternal complications. Women with PAS frequently require massive blood transfusions, cesarean hysterectomy, prolonged hospitalization, and critical care support. Maternal complications include postpartum hemorrhage, disseminated intravascular coagulation, hemorrhagic shock, bladder injury, ureteric injury, sepsis, relaparotomy, and maternal death. Neonatal complications are predominantly related to prematurity and include low birth weight, respiratory distress, NICU admission, and perinatal mortality.[11,12]

Advances in antenatal imaging and perioperative care have led to the development of multidisciplinary management strategies for PAS. Current recommendations advocate planned delivery in tertiary care centers equipped with experienced obstetricians, anesthesiologists, radiologists, intensivists, neonatologists, urologists, surgeons, and transfusion medicine specialists. Such coordinated management facilitates preoperative planning, optimization of maternal condition, availability of blood products, and prompt management of intraoperative and postoperative complications. Multidisciplinary care has been shown to significantly reduce maternal morbidity and improve neonatal outcomes.[13–15]

Despite growing awareness and advances in management, PAS continues to pose significant challenges in obstetric practice, particularly in resource-constrained settings. Understanding the clinical profile, risk factors, management strategies, and outcomes associated with PAS is essential for improving patient care and developing effective institutional protocols. Therefore, the present study was undertaken to identify the risk factors associated with Placenta Accreta Spectrum and to evaluate fetomaternal outcomes following multidisciplinary management at a tertiary care referral center.

Aim

To identify the risk factors associated with Placenta Accreta Spectrum and to evaluate fetomaternal outcomes following multidisciplinary management in a tertiary care center.

Specific objectives

- To identify the major maternal and obstetric risk factors associated with Placenta Accreta

Spectrum.

- To evaluate the clinical presentation, antenatal diagnosis, and spectrum of placental invasion among women diagnosed with PAS.
- To assess maternal outcomes in terms of hemorrhage, blood transfusion requirements, disseminated intravascular coagulation, bladder injury, intensive care admission, hysterectomy, and maternal mortality.
- To evaluate fetal and neonatal outcomes, including prematurity, low birth weight, NICU admission, neonatal morbidity, and perinatal mortality.
- To analyze the role of multidisciplinary management involving obstetricians, anesthesiologists, radiologists, intensivists, urologists, neonatologists, surgeons, and transfusion medicine specialists in improving fetomaternal outcomes.

Materials and methods

Study design

A retrospective cross-sectional study was conducted to evaluate the risk factors and fetomaternal outcomes associated with Placenta Accreta Spectrum.

Study setting

The study was carried out in the Department of Obstetrics and Gynaecology, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India, a tertiary care referral center managing high-risk obstetric cases and providing multidisciplinary services for complex pregnancies.

Study duration

The study included cases of Placenta Accreta Spectrum managed between January 2020 and May 2026 at Jubilee Mission Medical College and Research Institute, Thrissur, Kerala.

Study population

The study population consisted of pregnant women diagnosed antenatally with Placenta Accreta Spectrum and managed at Jubilee Mission Medical College and Research Institute during the study period.

Sample size

A total of 64 women diagnosed with Placenta Accreta Spectrum were identified from hospital records. Following review and validation of available records, eligible cases fulfilling the study criteria were included for analysis.

Sampling technique

Purposive sampling was employed, and all eligible cases diagnosed with PAS during the study period were included in the study.

Inclusion criteria

- Pregnant women with an antenatal diagnosis of Placenta Accreta Spectrum.
- Patients managed and delivered at Jubilee Mission Medical College and Research Institute during the study period.
- Availability of complete medical records for outcome assessment.

Exclusion criteria

- Incomplete medical records with inadequate clinical information.
- Patients diagnosed with PAS but managed outside the study institution.

Data collection procedure

Institutional ethical approval was obtained before commencement of the study. Medical records of eligible patients were retrieved from the hospital database and reviewed in detail. Information was collected using a structured proforma specifically designed for the study.

Data collected included maternal age, gravidity, parity, abortion history, previous cesarean sections, previous uterine surgeries, gestational age at diagnosis, method of diagnosis, interval between diagnosis and surgery, gestational age at delivery, surgical techniques employed, duration of surgery, preoperative preparation, multidisciplinary team involvement, transfusion requirements, maternal complications, critical care utilization, postoperative management, and fetal outcomes.

Variables studied

- Maternal and Obstetric Variables
- Maternal age
- Gravidity
- Parity
- Previous cesarean sections
- Previous uterine surgery
- Assisted reproductive technology pregnancy
- Gestational age at diagnosis
- Gestational age at surgery
- Placenta previa
- PAS subtype
- Clinical presentation
- Perioperative Variables
- Diagnostic modality
- Surgical approach

- Duration of surgery
- Preoperative preparation
- Multidisciplinary team involvement
- Blood and blood product transfusion
- Ventilatory support
- MCCU admission
- Additional postoperative interventions
- Maternal Outcome Variables
- Postpartum hemorrhage
- Multiple blood transfusions
- Disseminated intravascular coagulation
- Hemorrhagic shock
- Bladder injury
- Relaparotomy
- Sepsis
- Surgical site infection
- Intensive care admission
- Maternal mortality
- Fetal and Neonatal Outcome Variables
- Prematurity
- Low birth weight
- Small for gestational age
- NICU admission
- Neonatal death
- Intrauterine death
- Perinatal outcome

Statistical analysis

Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software. Categorical variables were summarized using frequencies and percentages, while continuous variables were expressed

as mean and standard deviation wherever applicable. Results were presented using tables and descriptive statistical methods.

Ethical considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee of Jubilee Mission Medical College and Research Institute. Confidentiality and anonymity of patient information were strictly maintained throughout the study. All data were used solely for academic and research purposes.

Results

A total of 64 women diagnosed with Placenta Accreta Spectrum (PAS) and managed at Jubilee Mission Medical College and Research Institute between January 2020 and May 2026 were included in the study. Most women were in the late reproductive age group and had a history of previous cesarean delivery. Antenatal diagnosis was achieved in the vast majority of patients through ultrasonography, with magnetic resonance imaging being utilized in selected cases. Placenta accreta was the most frequently encountered form of PAS, although a substantial proportion had invasive disease in the form of increta and percreta. Multidisciplinary management involving obstetricians, anesthesiologists, radiologists, intensivists, neonatologists, transfusion medicine specialists, and urologists was widely employed. Maternal morbidity was primarily related to hemorrhage, blood transfusion requirements, and critical care utilization. Hysterectomy remained the definitive treatment in most women, while conservative uterine-preserving procedures were feasible in selected cases. Neonatal morbidity was predominantly related to prematurity and NICU admission, although overall neonatal survival was favorable.

Table 1: Age-wise distribution of women with placenta accreta spectrum

Age Group (Years)	Frequency (n=64)	Percentage (%)
20–25	5	7.8
26–30	24	37.5
31–35	23	35.9
36–40	8	12.5
>40	4	6.3

Table 1 demonstrates that the majority of women belonged to the 26–30 years age group (37.5%), followed closely by 31–35 years (35.9%). Nearly three-fourths of PAS cases occurred between 26 and 35 years of age.

Table 2: Distribution according to previous obstetric and surgical risk factors

Risk Factor	Frequency (n=64)	Percentage (%)
Previous 1 Cesarean Section	30	46.9
Previous 2 Cesarean Sections	23	35.9
Previous 3 Cesarean Sections	3	4.7
Previous 4 Cesarean Sections	1	1.6
Previous Myomectomy	1	1.6
IVF/ART Pregnancy	4	6.3
No Previous Surgery Documented	2	3.1

Table 2 shows that previous cesarean section was the predominant risk factor, present in 57 (89.1%) women. Nearly half had undergone one previous cesarean section.

Table 3: Booking status of study participants

Booking Status	Frequency (n=64)	Percentage (%)
Booked	38	59.4
Referred from Other Centers	23	35.9
Not Recorded	3	4.7

Table 3 shows that 59.4% of women were booked at the study institution, whereas over one-third were referred from outside hospitals.

Table 4: Method of Antenatal Diagnosis

Diagnostic Modality	Frequency (n=64)	Percentage (%)
Ultrasonography (USG)	37	57.8
MRI after Suspicious USG	26	40.6
Diagnosed Intraoperatively	1	1.6

Table 4 demonstrates that ultrasonography was the primary diagnostic modality, while MRI was used as an adjunct in 40.6% of women.

Table 5: Gestational age at surgery

Gestational Age at Surgery	Frequency (n=64)	Percentage (%)
<28 Weeks	3	4.7
28–32 Weeks	11	17.2
32–34 Weeks	22	34.4
34–36 Weeks	21	32.8
≥36 Weeks	7	10.9

Table 5 shows that most women underwent surgery between 32 and 36 weeks of gestation (67.2%).

Table 6: Presenting Complaints at Admission

Presenting Complaint	Frequency (n=64)	Percentage (%)
Asymptomatic / Diagnosed During Surveillance	41	64.1
Antepartum Hemorrhage (APH)	19	29.7
Post-Surgery Bleeding Following Placenta Previa Surgery	1	1.6
Elective Cesarean Section	1	1.6
Elective Surgery	1	1.6
Safe Confinement	1	1.6

Table 6 demonstrates that most women were diagnosed during routine antenatal surveillance, while APH was the most common presenting symptom.

Table 7: Association of placenta previa with PAS

Placenta Previa Status	Frequency (n=64)	Percentage (%)
Present	15	23.4
Absent	49	76.6

Table 7 demonstrates that placenta previa was present in 23.4% of PAS cases and represented an important associated obstetric risk factor.

Table 8: Distribution of placenta accreta spectrum subtypes

PAS Subtype	Frequency (n=64)	Percentage (%)
Placenta Accreta	31	48.4
Placenta Increta	18	28.1
Placenta Percreta	13	20.3
Increta with Focal Percreta	2	3.1

Table 8 shows that placenta accreta was the most common subtype, followed by placenta increta and placenta percreta. Advanced invasive disease was observed in a substantial proportion of women.

Table 9: Surgical Techniques and Intraoperative Vascular Control Methods

Surgical Technique	Frequency (n=64)	Percentage (%)
Aortic Clamp	28	43.8
Internal Iliac Ligation	13	20.3
Common Iliac Clamp	11	17.2
Uterine Artery Ligation	7	10.9
Aortic Balloon Occlusion	3	4.7
Other / Not Recorded	2	3.1

Table 9 demonstrates that aortic clamping was the most frequently employed vascular control strategy.

Table 10: Multidisciplinary Team Involvement

Specialty Involved	Frequency (n=64)	Percentage (%)
Obstetrician	64	100.0
Radiologist	49	76.6
Anesthesiologist	42	65.6
Transfusion Medicine Specialist	32	50.0
Neonatologist	31	48.4
Intensivist	26	40.6
Urologist	12	18.8
Cardiac Anesthesiologist	2	3.1
Surgeon	1	1.6

Table 10 highlights the extensive multidisciplinary participation in the management of PAS.

Table 11: Maternal Complications and Outcomes

Maternal Outcome	Frequency (n=64)	Percentage (%)
ICU/MCCU Admission	22	34.4
Multiple Blood Transfusions	20	31.3
Postpartum Hemorrhage (PPH)	9	14.1
Disseminated Intravascular Coagulation (DIC)	8	12.5
Bladder Injury	4	6.3
Relaparotomy	4	6.3
Hemorrhagic Shock	1	1.6
Sepsis	0	0
Surgical Site Infection	0	0
Maternal Mortality	0	0

Table 11 demonstrates that ICU/MCCU admission and multiple blood transfusions were the most common maternal complications. Postpartum hemorrhage and disseminated intravascular coagulation were also observed. No cases of sepsis, surgical site infection, or maternal mortality were recorded.

Table 12: Definitive surgical management

Management Strategy	Frequency (n=64)	Percentage (%)
Hysterectomy	42	65.6
Conservative Surgery	19	29.7
Not Documented	3	4.7

Table 12 demonstrates that hysterectomy remained the primary treatment modality in nearly two-thirds of women.

Table 13: Fetal and Neonatal Outcomes

Fetal / Neonatal Outcome	Frequency (n=64)	Percentage (%)
No Major Adverse Outcome Documented	33	51.6
NICU Admission	20	31.3
NICU Admission with Low Birth Weight	9	14.1
NICU Admission with SGA	1	1.6
Neonatal Death	1	1.6

Table 13 demonstrates that NICU admission was the most frequent neonatal outcome. Despite prematurity-related morbidity, neonatal survival was excellent, with only one neonatal death recorded.

Tables summary

The study demonstrated that PAS predominantly affected women aged 26–35 years, with previous cesarean section identified as the principal risk factor in 89.1% of cases. Most patients were diagnosed antenatally through ultrasonography, supplemented by MRI when necessary. Surgery was most commonly performed between 32 and 36 weeks of gestation. A substantial proportion of women had associated placenta previa, and placenta accreta represented the most common PAS subtype. Advanced hemorrhage-control techniques, particularly aortic clamping and internal iliac ligation, were frequently utilized. Management involved a coordinated multidisciplinary team including obstetricians, radiologists, anesthesiologists, neonatologists, intensivists, transfusion medicine specialists, and urologists. Maternal morbidity was primarily related to ICU admission, blood transfusion requirements, postpartum hemorrhage, and disseminated intravascular coagulation, although no maternal mortality occurred. Hysterectomy remained the definitive treatment in most women. Neonatal outcomes were largely influenced by prematurity and NICU admission; however, overall neonatal survival was favorable, reflecting the benefits of planned delivery and multidisciplinary management in a tertiary care setting.

Discussion

Placenta Accreta Spectrum (PAS) is a severe obstetric disorder characterized by abnormal placental adherence and invasion into the uterine wall, leading to substantial maternal and neonatal morbidity [1]. The increasing incidence of PAS worldwide parallels the rising rate of cesarean deliveries and other uterine surgical procedures [2]. Early diagnosis and multidisciplinary management have become the cornerstone of modern PAS care because timely intervention can significantly reduce catastrophic maternal complications and improve neonatal outcomes [3].

The present study demonstrated that PAS predominantly affected women between 26 and 35 years of age, with the majority being multiparous and having a history of previous cesarean delivery. Previous cesarean section emerged as the most important risk factor, with nearly nine out of ten women having undergone one or more prior cesarean deliveries [4]. Furthermore, women with multiple previous cesarean sections constituted a substantial proportion of the study population. These findings support the well-established association between uterine scar formation and abnormal placental implantation. Progressive disruption of the endometrial-myometrial interface following repeated cesarean deliveries likely contributes to increased trophoblastic invasion and subsequent development of PAS [5].

Placenta previa was identified in 15 (23.4%) women and

remained an important associated risk factor for PAS. The coexistence of placenta previa and previous cesarean delivery is recognized as one of the strongest predictors of abnormal placentation. The coexistence of placenta previa and previous cesarean delivery is recognized as one of the strongest predictors of abnormal placentation. Implantation of the placenta over a scarred lower uterine segment facilitates abnormal adherence and invasion into the myometrium [6]. The high frequency of women referred from other healthcare facilities further highlights the importance of early antenatal identification and timely referral of suspected PAS cases to tertiary centers equipped for advanced obstetric management [7].

Antenatal diagnosis was achieved predominantly through ultrasonography, while magnetic resonance imaging was utilized in selected cases with diagnostic uncertainty or suspected extensive placental invasion. These findings emphasize the critical role of prenatal imaging in the management of PAS [8]. Early diagnosis allows adequate counseling, optimization of maternal condition, planning of surgery, arrangement of blood products, and assembly of a multidisciplinary team. Consequently, antenatal detection reduces emergency interventions and contributes to improved maternal and neonatal outcomes [9].

The majority of women underwent planned surgery between 32 and 36 weeks of gestation. Planned preterm delivery is often recommended in PAS to balance fetal maturity against the risk of spontaneous hemorrhage and emergency surgery [10]. Delivery within this gestational window enabled adequate preparation and facilitated controlled operative management. Such planned interventions are associated with lower maternal blood loss and reduced perioperative complications compared with emergency procedures [11].

Placenta accreta was the most frequently encountered subtype, followed by placenta increta and placenta percreta. Although placenta accreta represented the largest proportion of cases, advanced invasive forms including increta and percreta accounted for a significant percentage of patients [12]. These severe forms are associated with increased operative complexity, greater blood loss, higher transfusion requirements, and increased risk of injury to adjacent pelvic organs. The presence of advanced disease in a considerable number of patients underscores the importance of comprehensive preoperative planning and specialist involvement [13].

One of the notable findings of the study was the extensive utilization of vascular control techniques. Aortic clamping, common iliac clamping, internal iliac ligation, uterine artery ligation, and balloon occlusion were employed to minimize intraoperative blood loss [14]. Such procedures have gained increasing acceptance in PAS management because they reduce pelvic blood flow and facilitate surgical dissection.

The frequent use of these techniques in the present study reflects the institution's emphasis on hemorrhage control and multidisciplinary surgical planning [15].

Management of PAS required substantial multidisciplinary involvement. Obstetricians, radiologists, anesthesiologists, intensivists, neonatologists, transfusion medicine specialists, urologists, and surgeons participated in patient care according to disease severity and anticipated complications. Multidisciplinary management allowed early recognition of operative challenges, optimization of perioperative care, rapid availability of blood products, and prompt management of complications. This collaborative approach has become the recommended standard of care for PAS and likely contributed to the favorable outcomes observed in the present study [13].

Maternal morbidity remained considerable despite specialized care. Multiple blood transfusions represented the most common complication, reflecting the hemorrhagic nature of PAS. Postpartum hemorrhage, disseminated intravascular coagulation, bladder injury, hemorrhagic shock, and relaparotomy were also observed [14]. These complications are consistent with the invasive pathology of PAS and the technical complexity of surgical management. Nevertheless, the absence of maternal mortality in the study population highlights the effectiveness of early diagnosis, multidisciplinary planning, availability of blood products, and critical care support [15].

Critical care utilization formed an important component of management. A substantial proportion of women required ICU or MCCU admission for postoperative monitoring and management. A substantial proportion of women required ICU or MCCU admission for postoperative monitoring and management. The availability of intensive care services likely contributed significantly to the successful management of hemorrhage, coagulopathy, metabolic disturbances, and hemodynamic instability. The availability of intensive care services likely contributed significantly to the successful management of hemorrhage, coagulopathy, metabolic disturbances, and hemodynamic instability [16].

Hysterectomy remained the predominant management strategy and was performed in nearly two-thirds of women. Cesarean hysterectomy is widely regarded as the definitive treatment for extensive PAS because attempts at placental removal may precipitate uncontrollable hemorrhage [17]. However, conservative uterine-preserving surgery was successfully performed in selected women, particularly those with less extensive invasion and a desire for future fertility. The ability to individualize treatment according to disease severity and patient characteristics represents an important aspect of modern PAS management [18].

Neonatal outcomes were primarily influenced by prematurity and the need for planned preterm delivery. NICU admission constituted the most common neonatal

outcome, followed by low birth weight and small-for-gestational-age status [19]. Despite these complications, neonatal mortality was rare. The presence of dedicated neonatal services and planned delivery in a tertiary care center likely contributed to favorable neonatal survival. Early neonatal support remains essential because many infants born to mothers with PAS require specialized care related to prematurity [20].

The findings of the present study reinforce the importance of identifying women at risk for PAS during routine antenatal care. Previous cesarean section, placenta previa, multiparity, assisted reproductive techniques, and prior uterine surgery should prompt careful evaluation for abnormal placentation. Early diagnosis, referral to specialized centers, multidisciplinary planning, and availability of blood products are critical components for reducing maternal and neonatal morbidity.

Despite the valuable findings, the study had certain limitations. Its retrospective design depended on the completeness and accuracy of medical records. Some clinical variables were incompletely documented, and the study was conducted at a single tertiary care center, which may limit generalizability. In addition, long-term maternal reproductive outcomes and neonatal developmental outcomes were not assessed. Future prospective multicenter studies involving larger patient populations are warranted to further refine management protocols and improve long-term outcomes in women with Placenta Accreta Spectrum.

Generalizability

The results can be extrapolated primarily to centers providing care for high-risk obstetric cases in tertiary facilities. Such trends might be witnessed in centers with high caesarean rates and multidisciplinary PAS services. Nonetheless, generalizability of the results is restricted by the retrospective nature, single center, and sample size of 64 patients.

Conclusion

Placenta Accreta Spectrum is a major obstetric challenge associated with significant maternal and neonatal morbidity. The present study identified previous cesarean section as the most important risk factor for PAS, with the majority of affected women having a history of prior uterine surgery. Placenta previa and multiparity were important associated risk factors contributing to abnormal placentation, emphasizing the cumulative effect of uterine scarring and repeated pregnancies on the development of PAS.

Antenatal diagnosis using ultrasonography and magnetic resonance imaging facilitated timely referral, comprehensive preoperative planning, and multidisciplinary management. Placenta accreta was the most common subtype encountered, although a substantial proportion of

women presented with advanced invasive disease, including placenta increta and placenta percreta. The use of specialized vascular control techniques and coordinated multidisciplinary care contributed significantly to the management of complex cases.

Maternal morbidity was predominantly related to hemorrhage, blood transfusion requirements, postpartum hemorrhage, disseminated intravascular coagulation, bladder injury, and intensive care admission. Despite the high-risk nature of PAS, no maternal mortality was observed, highlighting the effectiveness of early diagnosis, adequate preparation, availability of blood products, and specialized perioperative care. Hysterectomy remained the primary management strategy, while conservative surgery was feasible in selected patients.

Neonatal outcomes were mainly influenced by prematurity, with NICU admission and low birth weight being the most common complications. Nevertheless, neonatal survival was favorable, reflecting the benefits of planned delivery in a tertiary care center with dedicated neonatal support services. The findings of the study emphasize that successful management of Placenta Accreta Spectrum requires early antenatal recognition, meticulous surgical planning, availability of blood products, advanced critical care facilities, and a coordinated multidisciplinary team approach. Strengthening antenatal screening programs and reducing unnecessary primary cesarean sections may help decrease the future burden of PAS and further improve fetomaternal outcomes.

Limitations of the study

- The study was retrospective in design and depended on the completeness and accuracy of available medical records.
- It was conducted at a single tertiary care referral center, which may limit the generalizability of the findings.
- Some clinical variables and follow-up information were incompletely documented in a few records.
- Long-term maternal reproductive outcomes and long-term neonatal developmental outcomes were not evaluated.
- The relatively limited sample size may have influenced the precision of outcome estimates.

Recommendations

- Women with previous cesarean sections and placenta previa should undergo targeted antenatal screening for Placenta Accreta Spectrum.
- Suspected PAS cases should be referred early to specialized tertiary care centers with multidisciplinary expertise.

List of abbreviations

PAS	Placenta Accreta Spectrum
OBG	Obstetrics and Gynaecology
USG	Ultrasonography
MRI	Magnetic Resonance Imaging
APH	Antepartum Haemorrhage
IVF	In Vitro Fertilization
ART	Assisted Reproductive Technology
MCCU	Medical Critical Care Unit
NICU	Neonatal Intensive Care Unit
DIC	Disseminated Intravascular Coagulation
PPH	Postpartum Haemorrhage
SPSS	Statistical Package for the Social Sciences

Ethical approval

The study was conducted after obtaining approval from the Institutional Ethics Committee of Jubilee Mission Medical College and Research Institute, Thrissur, Kerala.

Informed consent

As this was a retrospective record-based study, the requirement for individual informed consent was waived by the Institutional Ethics Committee in accordance with institutional guidelines.

Funding

No external funding was received for this study.

Conflict of Interest

The authors declare that there are no conflicts of interest related to this study.

Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request and subject to institutional policies.

Author Contributions

Dr. Kanjoor Deepthi Damodaran Nair contributed to study conception, design, data collection, analysis, interpretation of results, and manuscript preparation. Dr. Briji S. Panicker contributed to study supervision, critical review of the manuscript, interpretation of findings, and final approval of the manuscript.

Acknowledgements

The authors sincerely acknowledge the Department of Obstetrics and Gynaecology, Department of Radiology, Department of Anaesthesiology, Department of Neonatology, Department of Transfusion Medicine, Intensive Care Unit staff, Medical Records Department, and

the hospital administration of Jubilee Mission Medical College and Research Institute, Thrissur, for their support and assistance during the conduct of this study.

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Bibliographical references

1. Silver RM, Barbour KD. et al. *Obstet Gynecol Clin North Am.* 2015;42(2):381-402. [PMID: 26002176]
<https://doi.org/10.1016/j.ogc.2015.01.014> PMID: 26002174 PMCID: PMC13455863
2. American College of Obstetricians and Gynecologists; Society for Maternal-Fetal Medicine. et al. *Obstet Gynecol.* 2018;132(6):e259-e275. [PMID: 30461695]
3. Hecht JL, Baergen R, Ernst LM, Katzman PJ, Jacques SM, Jauniaux E, Khong TY, Metlay LA, Poder L, Qureshi F, Rabban JT, Roberts DJ, Shainker S, Heller DS. et al. *Mod Pathol.* 2020;33(12):2382-2396. [PMID: 32636463]
<https://doi.org/10.1038/s41379-020-0569-1> PMID:32415266
4. Khong TY. et al. *J Clin Pathol.* 2008;61(12):1243-1246. [PMID: 18641411]
<https://doi.org/10.1136/jcp.2008.055202> PMID:18641410
5. Silver RM, Landon MB, Rouse DJ, Leveno KJ, Spong CY, Thom EA, Moawad AH, Caritis SN, Harper M, Wapner RJ, Sorokin Y, Miodovnik M, Carpenter M, Peaceman AM, O'Sullivan MJ, Sibai B, Langer O, Thorp JM, Ramin SM, Mercer BM. et al. *Obstet Gynecol.* 2006;107(6):1226-1232. [PMID: 16738145]
<https://doi.org/10.1097/01.AOG.0000219750.794.80.84> PMID:16738145
6. Japaraj RP, Mimin TS, Mukudan K, et al. *J Obstet Gynaecol Res.* 2007;33(4):431-437. [PMID: 17688639]
<https://doi.org/10.1111/j.1447-0756.2007.00549.x> PMID:17688608
7. Riteau AS, Tassin M, Chambon G, Le Vaillant C, de Laveaucoupet J, Quéré MP, Joubert M, Prevot S, Philippe HJ, Benachi A. et al. *PLoS One.* 2014;9(4):e94866.
<https://doi.org/10.1371/journal.pone.0094866> PMID:24733409 PMCID:PMC3986371
8. Bowman ZS, Eller AG, Kennedy AM, Richards DS, Winter TC, Woodward PJ, Silver RM. et al. *Am J Obstet Gynecol.* 2014;211(2):177.e1-177.e7. [PMID: 24631709]
<https://doi.org/10.1016/j.ajog.2014.03.029> PMID:24631709
9. D'Antonio F, Iacovella C, Bhide A, et al. *Ultrasound Obstet Gynecol.* 2013;42(5):509-517. [PMID: 23620112]
<https://doi.org/10.1002/uog.13194> PMID:23943408
10. Mulla BM, Weatherford R, Redhunt AM, Modest AM, Hacker MR, Hecht JL, Spiel MH, Shainker SA. et al. *Arch Gynecol Obstet.* 2019;300(6):1601-1606. [PMID: 31512047; PMCID: PMC6861800]
<https://doi.org/10.1007/s00404-019-05338-y> PMID:31691015 PMCID:PMC6907737
11. D'Antonio F, Iacovella C, Palacios-Jaraquemada J, Bruno CH, Manzoli L, Bhide A, et al. *Ultrasound Obstet Gynecol.* 2014;44(1):8-16. [PMID: 24615913]
<https://doi.org/10.1002/uog.13327> PMID:24515654
12. WOMAN Trial Collaborators. et al. *Lancet.* 2017;389(10084):2105-2116. [PMID: 28456509; PMCID: PMC5406615]
13. Lee PS, Kempner S, Miller M, Dominguez J, Grotegut C, Ehrisman J, Previs R, Havrilesky LJ, Broadwater G, Ellestad SC, Secord AA. et al. *Gynecol Oncol Res Pract.* 2017;4:11.
<https://doi.org/10.1186/s40661-017-0049-6> PMID:28852530 PMCID:PMC5567476
14. Pala Ş, Atilgan R, Başpınar M, Kavak EÇ, Yavuzkır Ş, Akyol A, Kavak B. et al. *J Obstet Gynaecol.* 2018;38(2):194-199.
<https://doi.org/10.1080/01443615.2017.1340440> PMID:28903630
15. Sentilhes L, Ambroselli C, Kayem G, Provansal M, Fernandez H, Perrotin F, Winer N, Pierre F, Benachi A, Dreyfus M, Bauville E, Mahieu-Caputo D, Marpeau L, Descamps P, Goffinet F, Bretelle F. et al. *Obstet Gynecol.* 2010;115(3):526-534.
<https://doi.org/10.1097/AOG.0b013e3181d066d4> PMID:20177283
16. Jauniaux E, Ayres-de-Campos D, Langhoff-Roos J, Fox KA, Collins S. et al. *Int J Gynaecol Obstet.* 2019;146(1):20-24.

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- <https://doi.org/10.1002/ijgo.12761>
PMid:31173360
17. Belfort MA. et al. Obstet Gynecol Clin North Am. 2010;37(2):345-357. [PMID: 20685559] Eller AG, Porter TF, Soisson P, Silver RM. et al. Obstet Gynecol. 2009;113(2 Pt 1):331-337. [PMID: 19155874]
18. Eller AG, Porter TF, Soisson P, Silver RM. et al. Obstet Gynecol. 2009;113(2 Pt 1):331-337. [PMID: 19155874]
19. Collins SL, Alemdar B, van Beekhuizen HJ, et al. Ultrasound Obstet Gynecol. 2019;53(1):35-43. [PMID: 30027657]
20. Jauniaux E, Chantraine F, Silver RM, Langhoff-Roos J. et al. Am J Obstet Gynecol. 2018;219(1):75-87. [PMID: 29573820].

PUBLISHER DETAILS

Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
(ISSN 3006-1059) Print
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256 775 434 261
Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa

