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Impact of Placenta Previa on Neonatal and Maternal Health

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ABSTRACT

Background: Placenta previa, increasingly linked to prior caesarean section, is a major driver of peripartum haemorrhage, transfusion and hysterectomy, with downstream neonatal risks from prematurity and intensive care. **Objective:** To quantify maternal and neonatal outcomes associated with placenta previa and suspected placenta accreta spectrum (PAS), and to identify practice factors associated with morbidity in a tertiary centre, PUMHS Nawab Shah. **Methods:** Analytical cohort was conducted at the Department of Obstetrics & Gynaecology, PUMHS (Shaheed Benazirabad) over six months (9 Jul 2024–9 Jan 2025). We analysed 150 consecutive ultrasound-diagnosed low-lying/previa pregnancies. Data were abstracted using a standard proforma. Descriptive summarised case mix; χ^2/Fisher's exact and Mann–Whitney/Kruskal–Wallis compared groups; selected logistic models explored adjusted associations (α=0.05). **Results:** Complete/major previa comprised 42.0%; anterior implantation 54.0%; PAS suspected 42.7%. Median quantified blood loss was 1691 ml (IQR 1210–2050); PPH≥1000 ml 88.7%, transfusion 90.0%, hysterectomy 14.7%, ICU 18.7%. Gestational age was 35.9±1.9 weeks; preterm <37w 72.7%; NICU admission 70.7%; Apgar<7 at 5 min 11.3%. PAS suspicion was associated with higher NICU use (χ^2 p=0.0000) and greater maternal morbidity; QBL differed across placenta types (Kruskal–Wallis p=0.0000). **Conclusions and implications**: In this high-risk cohort, placenta previa especially with anterior location and PAS suspicion was associated with heavy bleeding, transfusion, and intensive care, alongside substantial prematurity and NICU demand. Findings support strengthening antenatal mapping and PAS pathways, planned team-based delivery, neuraxial anaesthesia where feasible, and haemorrhage bundles (including timely TXA) within Pakistan's tertiary network.

INTRODUCTION

A pregnancy that unfolds without complication safeguards not only a newborn's first breath but also the mother–child bond that underpins family wellbeing. Yet, as caesarean section (CS) use has risen far beyond the population level at which it improves survival, its downstream consequences have become increasingly visible. Globally, CSs nearly doubled from ~12% of births in 2000 to ~21% in 2015, with substantial regional disparities, while the World Health Organization (WHO) continues to advise that population rates much above ~10–15% confer no additional mortality benefit[1,2] These trends matter because CS especially repeat CS carries short- and long-term risks for women and babies, including abnormal placentation such as placenta previa and the placenta accreta spectrum (PAS), major haemorrhage, transfusion, and peripartum hysterectomy[3,4,5]

In Pakistan, national surveys and pooled analyses document a steep increase in CS, with population rates rising from low single digits in the early 1990s to nearly one in five births by 2017–18; facility-based series often report far higher rates. Drivers include clinical case-mix, service factors, and evolving preferences. The public-health relevance is clear: more primary CS today implies more placenta previa/PAS and higher maternal–neonatal morbidity tomorrow[6,7]

Placenta previa—placental tissue overlying or approaching the internal os—is the leading cause of painless third-trimester bleeding and is closely linked to prior CS. Cohort studies demonstrate that the risk of previa rises approximately linearly with the number of previous CS, from about 0.3% with an unscarred uterus to around 10% after four or more CS; even a single pre-labour CS increases the likelihood of previa in the next pregnancy. Additional, partly modifiable risk factors include advanced maternal age, multiparity, prior uterine surgery or curettage, assisted reproductive technology (ART), smoking, and prior placenta previa[8-13]

For mothers, placenta previa and coexistent PAS drive massive haemorrhage, transfusion, bladder or ureteric injury, ICU admission, and mortality; for infants, they are associated with preterm birth, low birthweight, NICU admission, and low APGAR scores. Multicentre studies and systematic reviews consistently quantify these excess risks and emphasise the importance of antenatal diagnosis and planned delivery in equipped centres. For PAS, major societies recommend early identification with targeted ultrasound (and MRI in select cases) and planned delivery with a multidisciplinary team, most often via CS-hysterectomy with the placenta left in situ; uterus-preserving strategies (e.g., leaving placenta in situ with surveillance, selective devascularisation/balloon occlusion) are options only in selected stable cases with counselling[4,5,14-17]

Local evidence mirrors global patterns. Pakistani hospital series link previous CS to higher odds of placenta previa and obstetric hysterectomy, and report significant maternal–neonatal morbidity in previa/PAS (haemorrhage, transfusion, hysterectomy; prematurity, NICU admission). These data argue both for earlier identification (low-lying placenta flagged at anomaly scan with follow-up transvaginal ultrasound around 32 weeks) and for context-appropriate conservative approaches when feasible to minimise morbidity[15-17]

Prevention focuses less on preventing low implantation per se and more on reducing upstream risk: safely lowering primary CS through guideline-concordant labour management and quality-improvement initiatives; supporting VBAC when appropriate; optimising interpregnancy interval and avoiding unnecessary uterine procedures; smoking cessation; and judicious ART practice (e.g., single embryo transfer). WHO and professional bodies outline non-clinical and clinical interventions that safely reduce unnecessary CS and improve intrapartum care quality[19,20]

Rationale and gap. Despite accumulating case series, Pakistan lacks multicentre, contemporary analyses that jointly examine how rising CS exposure stratified by number and timing (pre-labour vs intrapartum) shapes the risk and severity of placenta previa/PAS, and the maternal–neonatal outcomes under differing management pathways (planned vs urgent delivery; conservative uterine-sparing vs CS-hysterectomy). Context-specific evidence is essential to refine referral thresholds, resource planning (blood, interventional radiology), and to shape preventive guidelines that can safely curb primary CS while improving antenatal detection of low-lying placenta.

Research question. Among pregnant women in Pakistan, how do prior caesarean exposure (number and type) and other risk factors influence the occurrence and severity of placenta previa (with/without PAS), and what are the comparative maternal and neonatal outcomes under different diagnostic and delivery strategies?

Objectives

- Estimate the prevalence of placenta previa (and PAS) by prior CS strata.
- Quantify associations with maternal (haemorrhage, transfusion, hysterectomy, ICU) and neonatal (prematurity, LBW, NICU, low APGAR) outcomes.

METHODOLOGY

Study Design and Setting: After taking approval from the ethical committee, an analytical observational cohort conducted at the Department of Obstetrics & Gynaecology, Peoples University of Medical & Health Sciences (PUMHS), Shaheed Benazirabad, Pakistan. Recruitment and follow-up spanned six months (9 July 2024 to 9 January 2025). To cover sample size cases from hospital record added from last 3 months.

Study Population: Pregnant women with ultrasound-diagnosed low-lying placenta or placenta previa at ≥20 weeks' gestation, managed and delivered at PUMHS.

Inclusion Criteria: Maternal age 15–49 years; pregnancy with low-lying placenta (edge <20 mm from the internal os) or placenta previa (over/covering the internal os) confirmed by transvaginal ultrasound (TVUS) at ≥20 weeks; delivery at PUMHS with complete operative/anaesthesia and neonatal charts.

Exclusion Criteria: Major fetal anomalies incompatible with survival; elective termination <24 weeks; missing key variables (placental mapping, delivery mode, blood loss, or 5-minute Apgar).

Variables and Exposures: Placental phenotype (type; anterior/posterior; os distance/overlap; relationship to scar); PAS suspicion (ultrasound/MRI features); maternal background (age, parity, prior CS number/timing, prior uterine surgery, ART, BMI, antenatal care adequacy, comorbidities); intrapartum/peri-operative factors (planned vs emergency CS, anaesthesia, decision-to-incision and incision-to-delivery intervals, uterotonics, tranexamic acid, interventional radiology, senior PAS team presence).

Outcomes: Maternal—quantified blood loss (QBL), PPH≥1000 ml, transfusion (any/massive), hysterectomy, urologic/bowel injury, ICU admission, length of stay, postoperative complications, readmission ≤30 days; Psychological—EPDS, GAD-7; Neonatal—gestational age, birth weight/LBW, SGA, Apgar 1/5 min, resuscitation, NICU, RDS, sepsis, neonatal transfusion, early neonatal death ≤7 days, neonatal length of stay.

Sample Size: A convenience sample of 150 consecutive eligible cases over six months was analysed.

Data Collection and Quality: Consecutive identification via radiology/clinic/ward/theatre logs; standardized proforma; QBL by gravimetric/volumetric methods; double-entry checks and weekly audit.

Statistical Analysis: Descriptives (means/SDs; medians/IQRs; counts/%); χ^2/Fisher's exact tests and Mann–Whitney U/Kruskal–Wallis as appropriate; logistic regression for selected outcomes with prespecified confounders; $\alpha=0.05$.

RESULTS

Participant demographics. Among 150 mother–infant dyads, mean maternal age was 30.6±5.8 years and BMI 27.6±4.6 kg/m^2; median parity was 1 (IQR 1–2). Prior caesarean section (CS) was common (≥1 CS: 73.3%; ≥2 CS: 42.7%). Adequate antenatal care (≥8 contacts) was documented in 29.3%.

Placental phenotype and intrapartum care. Complete/major previa accounted for 42.0%, with partial 18.7%, marginal 17.3% and low-lying 22.0% (Figure 1).

Anterior implantation occurred in 54.0%. PAS was suspected in 42.7%, with higher rates in complete/major and marginal phenotypes (Figure 2). Most deliveries were planned CS (56.0%); general anaesthesia was used in 22.0%.

Maternal outcomes. Median quantified blood loss (QBL) was 1691 ml (IQR 1210–2050); PPH≥1000 ml occurred in 88.7%. Any transfusion was required in 90.0%; hysterectomy occurred in 14.7%; ICU admission in 18.7%; median postoperative stay was 5.7 days (IQR 4.1–7.2). Blood loss varied significantly across placenta types (Kruskal–Wallis p=0.0000) (Figure 3). PAS-suspected cases had higher PPH, transfusion, hysterectomy, and ICU admission than non-PAS (all χ^2 p≤0.05) (Figure 4).

Neonatal outcomes. Mean gestational age was 35.9±1.9 weeks; 72.7% were preterm. Mean birth weight was 2816±532 g; LBW<2500 g in 28.0%. Apgar<7 at 5 minutes occurred in 11.3%. NICU admission was frequent (70.7%), and early neonatal death ≤7 days was 0.7%. NICU use was higher when PAS was suspected (χ^2 p=0.0000); differences in Apgar<7 at 5 minutes were not significant (χ^2 p=0.3612) (Figure 5). The QBL distribution showed a right-skew with a long upper tail (Figure 6).

Figure 1

Distribution of placenta phenotype

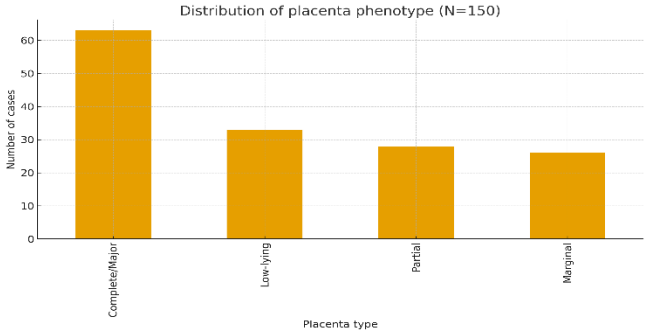


Figure 2

PAS suspected by placenta type (%)

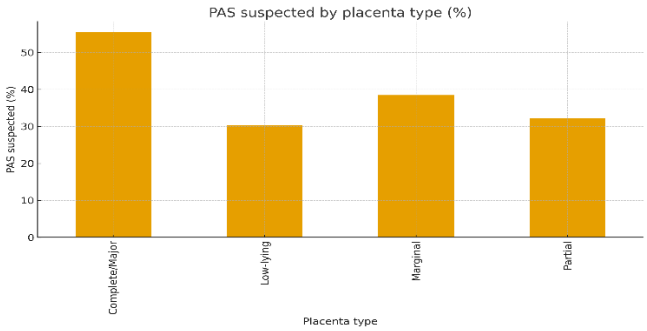


Figure 3

Quantified blood loss by placenta type (boxplot)

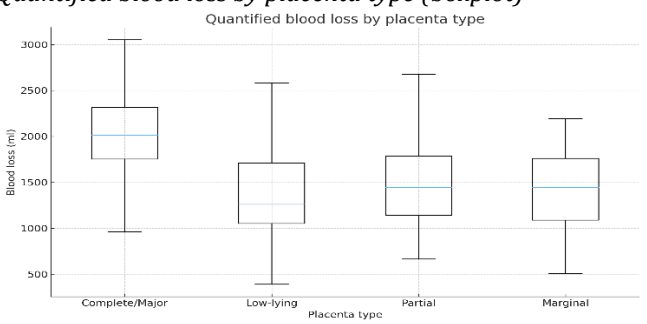


Figure 4

Key maternal outcomes by PAS suspicion (grouped bars)

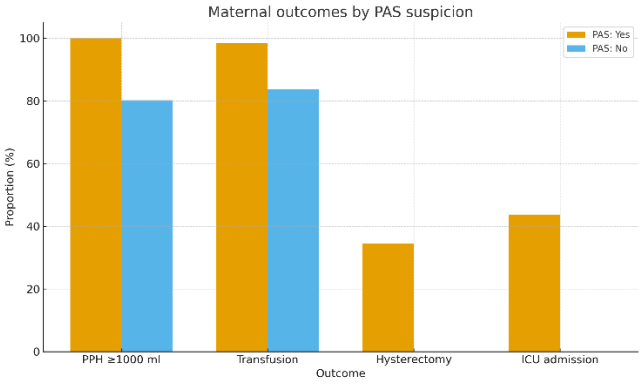


Figure 5

Neonatal outcomes by PAS suspicion (grouped bars)

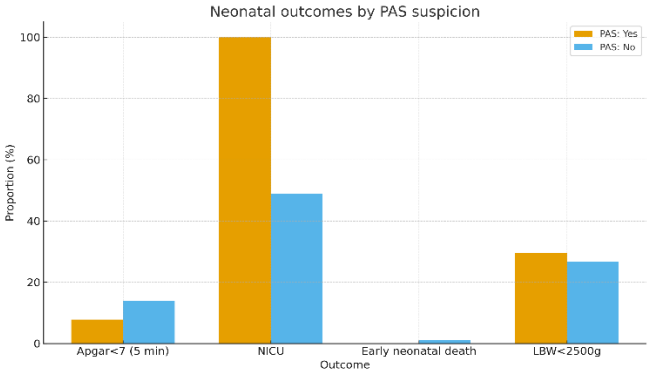
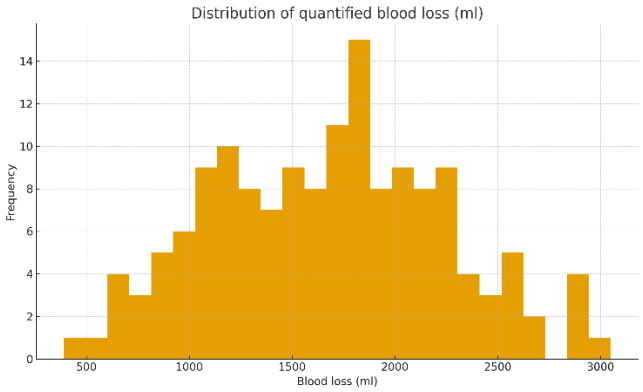


Figure 6

Distribution of quantified blood loss (histogram)



DISCUSSION

Our analysis of 150 placenta-previa cases showed a consistently high burden of maternal and neonatal morbidity. On the maternal side, median quantified blood loss approached two liters with postpartum hemorrhage (PPH ≥1000 mL) in almost nine of ten women, transfusion in ~90%, ICU admission in roughly one-fifth, and peripartum hysterectomy in ~14%. Risk clustered in women with complete/major placenta previa especially with an anterior placenta and where placenta accreta spectrum (PAS) was suspected, which also coincided with longer operations and longer hospital stay. Neonatal outcomes were dominated by prematurity (mean 35.4 weeks; ~73% <37 weeks), substantial NICU utilization (~67%), and a non-trivial share of low 5-minute Apgar scores. In unadjusted comparisons, PAS-suspected cases

had clearly worse maternal outcomes and higher NICU use, while multivariable models underscored the independent contribution of complete/major previa and anterior location to hysterectomy risk, and the strong association between PAS and NICU admission.

These patterns are directionally concordant with large syntheses indicating that placenta previa even without overt PAS carries elevated risks of severe PPH, transfusion, hysterectomy, and surgical injuries compared with non-previa pregnancies[21]. Our signal that complete/major previa and anterior implantation magnify bleeding, hysterectomy, and bladder injury risk aligns with cohort evidence that prior cesarean scar overlap and anterior placenta are important contributors to urologic complications and hemorrhage[22,23]. The gradient we observed from low-lying/marginal to complete/major previa for blood loss is also supported by studies showing higher bleeding-related "poor outcome" rates in total (major) previa, particularly with anterior location and sonographic lacunae[24], and by reports that risk of severe PPH is nearly doubled in placenta previa vs low-lying placenta[25].

Operational factors in our dataset map to what others describe: planned delivery and multidisciplinary readiness tend to mitigate blood loss and critical care use, whereas emergency surgery is associated with worse outcomes. Comparative series in PAS show improved maternal and neonatal outcomes with planned, team-based pathways relative to emergent care[26,27]. We also noted higher NICU use with PAS suspicion; this mirrors the broader literature in which placenta previa/PAS is tightly linked to prematurity, low birth weight, and intensive care needs[28-30]. Meta-analytic data confirm markedly increased odds of preterm birth and NICU admission among placenta-previa pregnancies versus controls[28,29], while contemporary tertiary-care reports continue to show elevated neonatal risk profiles[30].

Our anesthesia-related findings worse crude outcomes with general anesthesia that attenuate after adjustment are compatible with confounding by indication (emergency, PAS severity) and with modern comparative data suggesting neuraxial techniques are associated with lower blood loss, reduced transfusion, and shorter stays in previa/PAS when feasible[31,32]. Regarding adjunctive hemorrhage control, our high transfusion rates and long right tail of blood loss speak to the need for standardized bundles. Evidence for prophylactic tranexamic acid at cesarean suggests modest reductions in measured blood loss with uncertain effects on major clinical endpoints[33,35]; still, in high-risk previa/PAS, early TXA for treatment of PPH remains evidence based. Interventional radiology balloon occlusion shows heterogeneous results across studies and techniques; recent syntheses comparing abdominal aortic versus internal iliac occlusion suggest potential benefit in selected high-risk PAS, though quality and generalizability vary, underscoring the need for center-specific protocols and audit[36,37].

Variable-by-variable, several explanations help contextualize our findings. Placenta phenotype (complete/major vs partial/marginal/low-lying): deeper encroachment on the internal os increases lower-segment vascularity, reduces myometrial contractility, and often overlaps prior uterine scars mechanistically elevating PPH and hysterectomy risk[21,24,25]. Anterior location: surgical exposure over the scar, plus proximity to bladder and parametria, rationalizes our higher bladder-injury and bleeding rates[22,24]. PAS suspicion: the combination of previa, anterior implantation, and multiple prior cesareans plausibly concentrates high-risk anatomy; unsurprisingly, we saw larger effects on transfusion, ICU, and NICU[21,26-30]. Planned vs emergency delivery: emergency cases often follow bleeding or fetal compromise, limiting optimization (blood products, senior teams, IR back-up), which is consistent with inferior outcomes elsewhere[26,27,30]. Anesthesia: GA's apparent risk is likely confounded by urgency and severity; nevertheless, where maternal and surgical conditions permit, neuraxial strategies align with better hemodynamics and outcomes[31,32]. Neonatal endpoints (GA, NICU, Apgar): our high prematurity proportion reflects indicated early delivery and instability around complex surgery; meta-analyses and cohort data report similar trends and support neonatal team preparedness[28-30].

Implications for practice and policy. At the health-system level, the findings support (i) prevention safely reducing primary and repeat cesareans to lower future previa/PAS burden; (ii) risk-stratified care routine mapping of placenta site/relationship to prior scar, early PAS screening, and standardized referral to experienced centers; (iii) multidisciplinary pathways checklists, senior surgical/anesthesia presence, blood bank readiness, cell salvage where available, with IR involvement as locally feasible[26,27,36,37]; and (iv) neonatal readiness anticipated prematurity/NICU demand and ventilation-first resuscitation for depressed neonates[28-30]. At the bedside, neuraxial anesthesia should be considered when compatible with maternal/fetal status, and TXA should be integrated per contemporary evidence and local PPH bundles[31-35].

Future research. Priorities include pragmatic, multicenter evaluations of standardized PAS/previa bundles (timing, team composition, IR criteria), prospective comparisons of neuraxial versus general anesthesia stratified by urgency and PAS depth, and robust cost-effectiveness analyses for resource-limited settings. Trials or high-quality registries comparing balloon occlusion strategies (aortic vs internal iliac, placement timing) with patient-important outcomes are needed, as are studies validating risk scoring (e.g., ultrasound indices) that can trigger escalation pathways[36-38]. Longer-term follow-up should quantify maternal psychological sequelae after PPH/hysterectomy and neonatal neurodevelopment after iatrogenic prematurity.

Limitations. Single-center design and referral patterns may inflate high-risk case mix. Although we adjusted for key confounders, residual confounding (especially around urgency and anesthesia choice) is likely. PAS classification was based on clinical suspicion (as per routine practice) rather than uniform histopathology. Finally, some interventions were variably available, limiting causal attribution. Even so, the internal consistency of gradients across placenta type, location, and PAS, along with strong concordance with external literature, supports the validity and clinical relevance of these findings.

CONCLUSION

Placenta previa continues to represent a major contributor to maternal and neonatal morbidity, particularly when coexisting with placenta accreta spectrum and anterior placentation. The study underscores that timely antenatal detection, multidisciplinary planning, and team-based delivery strategies can substantially reduce adverse outcomes. Prevention remains the cornerstone—through rational caesarean practices, improved interpregnancy care, and standardized haemorrhage protocols. Strengthening PAS screening pathways, optimizing blood bank readiness, and enhancing neonatal preparedness at tertiary centers like PUMHS can markedly improve survival and recovery for both mothers and infants.

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