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Original Article

Comparison of Occurrence of Placenta Accreta Spectrum in Patients with Previously Operated Elective versus Emergency Lower Segment Caesarean Section: An Analytical Cross-Sectional Study

Farzana Sadiq[1*] and Shazia Naseeb[1]

[1]Department of Obstetrics and Gynecology, Jinnah Postgraduate Medical Centre, Karachi, Pakistan

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***Corresponding Author:**
Farzana Sadiq
Department of Obstetrics and Gynecology, Jinnah Postgraduate Medical Centre, Karachi, Pakistan
farzanasniazi@gmail.com

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ABSTRACT

Placenta accreta spectrum (PAS) is a serious obstetric condition characterised by abnormal placental invasion into the uterine wall, leading to severe maternal complications such as massive haemorrhage and hysterectomy. The rising rate of caesarean section has increased the burden of PAS worldwide. **Objective:** To compare the occurrence of PAS in women with a history of elective versus emergency lower segment caesarean section (LSCS). **Methods:** This analytical cross-sectional study enrolled 105 women at Jinnah Postgraduate Medical Centre, Karachi, from March to September 2025. Women aged 25–45 years with parity >1, gestation >24 weeks, and a previous caesarean section were recruited by non-probability consecutive sampling and grouped by the mode of the previous LSCS (elective or emergency) as the two primary comparison groups. PAS occurrence was compared between the groups using the chi-square or Fisher's exact test ($p \leq 0.05$). **Results:** Of 105 women, 24 had a previous elective and 81 a previous emergency LSCS. PAS occurred in 23 of 24 (95.8%) elective versus 70 of 81 (86.4%) emergency cases, a non-significant difference (Fisher's exact p=0.289). Overall PAS frequency was 88.6%, with percreta predominating (42.9%). Mean maternal age was significantly higher among women with PAS (32.83 ± 3.97 vs 29.19 ± 4.93 years; p=0.001). **Conclusions:** PAS occurred with high frequency after prior caesarean section, with no significant difference between elective and emergency LSCS. As the study was underpowered for this comparison, the finding is hypothesis-generating; advanced maternal age was significantly associated with PAS, underscoring the primacy of uterine scar burden.

INTRODUCTION

Placenta accreta spectrum (PAS) is a term that includes varying combinations of abnormal placental implantation that may be accompanied by deficiency of uterine wall integrity [1]. Depending on the degree of adherence to or invasion of the uterine wall and beyond, PAS disorders can be classified as placenta accreta, increta, or percreta. An expert consensus grading classification system was proposed by the International Federation of Gynaecology and Obstetrics (FIGO) that describes PAS disorders according to the degree of uterine and parametrial invasion, and includes clinical and histologic criteria for each grade and subtype [2]. The higher the number of previous uterine procedures, especially caesarean section (CS), the higher the risk of developing PAS, and this danger is even greater when placenta previa occurs. Over the past decades, the increase in the number of CS deliveries worldwide has played a significant role in the growing number of cases of PAS. Statistics on more than 2.7 million CS deliveries reveal that PAS rates have been increasing by about 2.1% per quarter, mirroring the global trend in CS rates [3-5]. Placenta previa, prior CS, advanced maternal age, and increased parity were found to be some of the

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most important independent risk factors for PAS in a systematic review and meta-analysis [6]. Likewise, prenatal screening initiatives have shown that higher parity, numerous prior CSs, and maternal age are strongly linked to PAS [7, 8]. A recent 10-year retrospective analysis by AlQasem *et al.* similarly identified high parity, advanced maternal age, and previous caesarean deliveries as principal contributory factors for PAS [9]. The presence of placenta previa among women with PAS is linked to considerably higher chances of adverse outcomes, such as premature birth, intraoperative haemorrhage, hysterectomy, and admission to intensive care [10]. Wang *et al.* also found that antepartum bleeding increases the probability of emergency delivery 2.4-fold [11]. The pathogenesis of PAS is not fully understood; nevertheless, contributory factors such as previous CS, endometrial damage and placenta previa have been identified. CS is an independent risk factor for PAS, with the risk proportional to the number of previous CS deliveries [12]. Low- and middle-income countries experience higher rates of CS, indicating that the rising rate is largely driven by planned, non-medically indicated surgeries dictated by sociodemographic and institutional factors [13, 14]. A study by Alavi *et al.* reported a higher frequency of placenta increta in patients with elective LSCS than emergency LSCS (94.37% vs 86.31%), while the frequencies of accreta and percreta were 12.5% vs 6.31% and 4.37% vs 7.36%, respectively [15]. Direct comparative data on how the urgency of a previous caesarean (elective versus emergency) relates to the occurrence of PAS remain limited; available studies have largely compared peripartum and neonatal outcomes between planned and emergent delivery in established PAS, rather than the occurrence of PAS itself [7, 14]. The FIGO consensus provides the grading framework on which such comparisons rest [16]. The rising incidence of PAS worldwide has largely been attributed to the increase in caesarean section rates and uterine scarring [17].

Various studies have assessed the frequency of PAS; however, very limited data are available on the effect of the type of LSCS on PAS at both local and international levels. This study aimed to compare the occurrence of PAS in women with a history of previous elective versus emergency LSCS. It was hypothesised that the frequency of PAS would differ significantly between women with a history of a previous elective versus emergency LSCS. The findings were expected to help assess the local magnitude of this problem and to assist in the risk stratification of patients.

METHODS

This analytical cross-sectional study was conducted after approval from the Ethical Review Committee (No. F.2-81/2025-GENL/234/JPMC, dated 1 March 2025) and the Research Evaluation Unit, and written informed consent was obtained from all participants before enrolment. The study included 105 women at the Department of Obstetrics and Gynaecology, Jinnah Postgraduate Medical Centre, Karachi, from March to September 2025. A non-probability consecutive technique was used to recruit pregnant women aged 25–45 years with parity greater than one, gestational age above 24 weeks, and a history of previous caesarean section presenting with features suggestive of PAS, while patients with a history of dilatation and evacuation, myomectomy or primigravida, and those refusing consent, were excluded. The two prospectively defined comparison groups were women whose most recent LSCS had been performed electively and those whose most recent LSCS had been performed as an emergency; group allocation was ascertained from documented operative records. PAS was defined as abnormal placental adherence or invasion on transabdominal and transvaginal ultrasound using grey-scale and colour Doppler findings such as multiple placental lacunae, loss of the hypoechoic zone, decreased retroplacental thickness, and abnormal uterine and parametrial vascularity. The sample size was estimated a priori for the primary objective of comparing PAS occurrence between women with a previous elective versus emergency LSCS. Assuming PAS occurrence of 94.4% in the elective group and 86.3% in the emergency group [15], a two-sided significance level of 5% and a power of 80%, the two-proportion formula yielded approximately 210 women per group (about 420 in total). Within the available study period, 105 women (24 elective and 81 emergency) could be enrolled by non-probability consecutive sampling; the achieved sample therefore provided only about 31% power for this comparison, and the study should be regarded as underpowered to detect a between-group difference of the assumed magnitude. This is acknowledged as a principal limitation. Data were collected by the principal investigator, an FCPS Part-II trainee in Obstetrics and Gynaecology with supervised clinical experience, using a predesigned structured proforma after detailed clinical assessment and Doppler ultrasound examination; the variables of interest (maternal age, gestational age, parity, gravidity, body mass index, number of previous caesarean sections, type of placenta, mode of admission, booking status and estimated blood loss) were recorded. No follow-up was required, as assessment was based on presentation and intraoperative findings where appropriate.

Data were analysed using SPSS version 26.0. The distribution of continuous variables was assessed with the Shapiro-Wilk test; normally distributed variables were summarised as mean ± SD and non-normally distributed

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variables as median (IQR), while categorical variables were summarised as frequencies and percentages. The primary analysis compared the occurrence of PAS between the elective and emergency LSCS groups using the chi-square test, with Fisher's exact test substituted where any expected cell count was below five. The independent-samples t-test was used to compare continuous variables between women with and without PAS. A two-sided p≤0.05 was considered statistically significant.

RESULTS

A total of 105 patients were included. The mean maternal age was 30.02 ± 4.96 years, and the mean gestational age at presentation was 34.61 ± 2.61 weeks. The mean parity and gravidity were 2.64 ± 1.30 and 3.82 ± 1.54, respectively, and the mean BMI was 28.72 ± 4.66 kg/m^2. Regarding categorical variables, 56 (53.3%) patients were booked, and most belonged to urban areas (85, 81.0%). The predominant placental subtype was percreta (45, 42.9%), followed by increta (34, 32.4%) and accreta (26, 24.8%), and PAS was diagnosed antenatally in 99 (94.3%) patients. The mode of the previous LSCS was elective in 24 (22.9%) women and emergency in 81 (77.1%). Overall, PAS was present in 93 (88.6%) patients. Detailed baseline characteristics are presented (Table 1).

Table 1: Baseline Demographic and Clinical Characteristics of the Study Participants (n=105)

Variables	Mean ± SD / n (%)	95% CI
Age (years)	30.02 ± 4.96	29.06–30.98
Gestational Age (weeks)	34.61 ± 2.61	34.10–35.12
Parity	2.64 ± 1.30	2.38–2.89
Gravidity	3.82 ± 1.54	3.53–4.12
BMI (kg/m^2)	28.72 ± 4.66	27.81–29.62
Family Monthly Income (PKR)	42352.38 ± 7639.70	40873–43830
No. of Previous C-Sections	2.27 ± 0.98	2.08–2.46
Estimated Blood Loss (ml)	2464.77 ± 3240.89	1837.57–3091.96
Booking Status – Booked	56 (53.3%)	–
Booking Status – Un-Booked	49 (46.7%)	–
Residential Status – Urban	85 (81.0%)	–
Residential Status – Rural	20 (19.0%)	–
Mode of Admission – OPD	44 (41.9%)	–
Mode Of Admission – Emergency	61 (58.1%)	–
Maternal Education – Primary	7 (6.7%)	–
Maternal Education – Secondary	11 (10.5%)	–
Maternal Education – Matric	38 (36.2%)	–
Maternal Education – Intermediate	38 (36.2%)	–
Maternal Education – Graduate	10 (9.5%)	–
Type of Placenta – Accreta	26 (24.8%)	–
Type of Placenta – Increta	34 (32.4%)	–
Type of Placenta – Percreta	45 (42.9%)	–
Time of Diagnosis – Antenatal	99 (94.3%)	–
Time of Diagnosis – Intra-Operative	6 (5.7%)	–
Mode of Previous LSCS – Elective	24 (22.9%)	–
Mode of Previous LSCS – Emergency	81 (77.1%)	–
History of Previous C-Section – Yes	105 (100.0%)	–
Placenta Accreta Spectrum – Present	93 (88.6%)	–

Continuous variables are presented as mean ± SD with 95% confidence intervals; categorical variables as frequencies with percentages

The primary comparison of PAS occurrence according to the mode of the previous LSCS is shown. PAS occurred in 23 of 24 women (95.8%) with a previous elective LSCS and in 70 of 81 women (86.4%) with a previous emergency LSCS. Because one expected cell count was below five, Fisher's exact test was applied, and the difference between the two groups was not statistically significant (p=0.289) (Table 2).

Table 2: Occurrence of Placenta Accreta Spectrum According to the Mode of the Previous Lower Segment Caesarean Section (n=105)

PAS Status	Elective LSCS (n=24), n (%)	Emergency LSCS (n=81), n (%)	Total (n=105), n (%)	p-value
PAS Present	23 (95.8%)	70 (86.4%)	93 (88.6%)	0.289†
PAS Absent	1 (4.2%)	11 (13.6%)	12 (11.4%)	

Values are n (%); percentages are calculated within each LSCS group. †Fisher's exact test, applied because one expected cell count was below five

In a secondary, exploratory analysis of factors associated with PAS, the mean maternal age was significantly higher in women with PAS (32.83 ± 3.97 years) than in those without PAS (29.19 ± 4.93 years; p=0.001). No significant association was found with gestational age (p=0.674), BMI (p=0.246), residential status (p=0.315), booking status (p=0.712), or mode of admission (p=0.986) (Table 3).

Table 3: Comparison of Baseline Characteristics According to Placenta Accreta Spectrum Status (Secondary Exploratory Analysis, n=105)

Baseline Characteristics	PAS: Yes (n=93), Mean ± SD / n (%)	PAS: No (n=12), Mean ± SD / n (%)	p-value
Age (years)	32.83 ± 3.97	29.19 ± 4.93	0.001
Gestational Age (weeks)	34.41 ± 2.20	34.67 ± 2.73	0.674
BMI (kg/m^2)	28.91 ± 4.57	27.24 ± 5.27	0.246
Residential Status – Urban	74 (79.6%)	11 (91.7%)	0.315
Booking Status – Booked	49 (52.7%)	7 (58.3%)	0.712
Mode Of Admission – Emergency	54 (58.1%)	7 (58.3%)	0.986

Values are mean ± SD or n (%); p-values were derived from the independent-samples t-test or chi-square test, as appropriate

DISCUSSION

Placenta accreta spectrum is one of the most daunting obstetric challenges of modern times, and its worldwide prevalence increases directly with the escalating rates of caesarean delivery [17, 18]. The disorder involves a continuum of pathological trophoblastic adherence and

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invasion, ranging from superficial attachment to transmural penetration of the uterine wall and adjacent organs, and carries a high risk of massive haemorrhage, peripartum hysterectomy and death [19, 20]. Timely antenatal diagnosis, high clinical vigilance and organised multidisciplinary care are prerequisites for optimal management [18]. The present study was designed to evaluate whether the type of previous LSCS (elective or emergency) influences the occurrence of PAS in a high-risk obstetric population. The overall frequency of PAS in the present cohort was 88.6% (93/105), higher than that reported in many population-based studies; this reflects the referral nature of the centre, the high pretest probability conferred by the enrolment criteria and the inclusion of only women with ultrasound features suggestive of PAS. The predominant subtype was percreta (42.9%), indicating a clinically severe case-mix consistent with a tertiary referral population [18, 20]. With regard to the primary objective, the occurrence of PAS did not differ significantly between women with a previous elective versus emergency LSCS (95.8% vs 86.4%; Fisher's exact p=0.289). These proportions are directionally consistent with the findings of Alavi et al. who reported a higher frequency of placenta increta among patients with elective LSCS (94.37%) than emergency LSCS (86.31%), without a statistically significant difference [15]. Comparative studies addressing the urgency of caesarean delivery in PAS have largely examined peripartum and neonatal outcomes rather than PAS occurrence itself [7, 14]. The absence of a significant association between the urgency of the prior caesarean section and the occurrence of PAS is pathophysiologically plausible. Irrespective of the surgical indication, caesarean delivery results in myometrial incision and scar formation; the structural integrity and extent of subsequent uterine healing, mediated through defective decidualisation, impaired stromal remodelling and aberrant trophoblastic invasion at the scar niche, are the primary determinants of PAS risk [1, 12]. The emergency or elective nature of the caesarean section does not fundamentally alter this cellular mechanism. In contrast, maternal age was the only variable significantly associated with PAS in the present study (p=0.001), with the mean age being notably higher in the PAS group (32.83 ± 3.97 years) than in those without PAS (29.19 ± 4.93 years). This corroborates a substantial body of evidence identifying advanced maternal age as an independent risk factor for PAS, attributed to cumulative myometrial attrition, progressive uterine fibrosis, and reduced endometrial regenerative capacity over time [21, 22]. Antenatal diagnosis of PAS was achieved in 94.3% of patients, reflecting the high pretest probability in this cohort and the structured sonographic protocol employed [19, 23]. The primary finding of no statistically significant difference in PAS occurrence between the elective and emergency groups must be interpreted with caution. The elective group (n=24) was substantially smaller than the emergency group (n=81), and the observed PAS proportion was near-maximal in both. This ceiling effect, together with the wide confidence interval and the low achieved power (about 31%), indicates that the study was underpowered to detect a clinically meaningful difference even if one existed; the non-significant p-value therefore does not constitute evidence of equivalence between the groups.

Several limitations must be acknowledged. First, the cross-sectional design precludes causal inference, so the findings represent associations rather than cause-and-effect relationships. Second, the single-centre setting with non-probability consecutive sampling limits generalisability. Third, the relatively small and unequal groups (24 elective, 81 emergency) limited the statistical power to detect a between-group difference, as detailed above. Fourth, enrolment of only women with pre-existing ultrasound features suggestive of PAS introduced substantial selection bias and inflated the observed PAS prevalence, so the study is best interpreted as a study of suspected PAS rather than of the general obstetric population. Fifth, the ultrasound operator was not blinded to the previous LSCS type, and no formal inter-observer reliability assessment was performed. Finally, histopathological confirmation was not uniformly available. Future research should include adequately powered, multicentre prospective cohort studies with balanced elective and emergency groups, blinded ultrasound assessment and mandatory histopathological confirmation, incorporating the number and inter-delivery interval of prior caesarean sections and standardised sonographic and MRI protocols, to clarify the true determinants of PAS and refine antenatal risk stratification.

CONCLUSIONS

The present study demonstrates that PAS occurred with high frequency in women with a prior caesarean section, with no statistically significant difference in occurrence between those with a history of elective versus emergency LSCS (95.8% vs 86.4%; p=0.289). Advanced maternal age was significantly associated with PAS. Because of the marked selection bias and limited statistical power, these findings should be regarded as hypothesis-generating rather than confirmatory. Larger, adequately powered prospective studies with balanced groups are needed before firm clinical recommendations can be made regarding the influence of the mode of prior caesarean on PAS risk.

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Authors' Contribution

Conceptualization: FS
Methodology: FS, SN
Formal analysis: FS, SN
Writing and Drafting: FS, SN
Review and Editing: FS, SN

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflict of Interest

All the authors declare no conflict of interest.

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