

Association between Short Inter-Pregnancy Interval with Placenta Previa and Placenta Accreta Spectrum with Respect to Maternal Age at First Caesarean Delivery

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Abstract

Objective: To determine the association between short inter-pregnancy interval and the occurrence of placenta previa and placenta accreta spectrum, with respect to maternal age at first caesarean delivery.

Study Design: Prospective observational study.

Place and Duration of Study: Department of Obstetrics and Gynecology, Jinnah Postgraduate Medical Centre (JPMC), Karachi, conducted over a period of 6 months.

Methodology: A total of 100 pregnant women with a history of previous caesarean section were included. Patients were categorized based on inter-pregnancy interval into short (<24 months) and normal (≥24 months). Maternal age at first caesarean delivery and obstetric characteristics were recorded. Diagnosis of placenta previa and placenta accreta spectrum was made using ultrasound and confirmed intraoperatively. Data were analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. The chi-square test was applied to determine associations, and a p-value ≤0.05 was considered statistically significant.

Results: Short inter-pregnancy interval (<24 months) was observed in 40% of patients. Placenta previa was diagnosed in 30% of cases, while placenta accreta spectrum was present in 18%. Placenta previa was significantly more frequent in the short interval group

(55%) compared to the normal interval group (13%) ($p < 0.05$). Similarly, placenta accreta spectrum was observed in 35% of patients with short interval versus 7% in those with normal interval ($p < 0.05$). Women who had their first caesarean delivery at age < 25 years showed higher rates of placenta previa (38%) and placenta accreta spectrum (25%) compared to those aged ≥ 25 years.

Conclusion: Short inter-pregnancy interval is a significant risk factor for placenta previa and placenta accreta spectrum, particularly among women with early-age caesarean delivery. Adequate birth spacing and patient counseling are essential to reduce the risk of abnormal placentation.

INTRODUCTION

Placenta previa and placenta accreta spectrum (PAS) are major causes of obstetric morbidity and mortality worldwide, particularly in women with a history of cesarean delivery. The rising global rate of cesarean sections has contributed significantly to the increasing incidence of abnormal placentation.¹

Placenta previa is defined as implantation of the placenta in the lower uterine segment, partially or completely covering the cervical os, while placenta accreta spectrum includes abnormal adherence of the placenta to the myometrium due to defective decidualization.

² These conditions are associated with severe complications such as massive hemorrhage, need for blood transfusion, hysterectomy, and increased maternal and perinatal mortality³

Among the various risk factors, previous cesarean delivery remains the most important contributor to abnormal placentation. The risk increases with the number of prior

cesarean sections and is further influenced by other factors such as maternal age, parity, and uterine scarring.⁴

Inter-pregnancy interval, defined as the time between a live birth and the conception of the next pregnancy, has emerged as an important modifiable risk factor. Short inter-pregnancy interval, particularly less than 24 months, has been associated with inadequate healing of the uterine scar, which may predispose to abnormal placental implantation.⁵

Recent studies have demonstrated that short inter-pregnancy interval is linked with an increased risk of placenta previa and placenta accreta spectrum, likely due to incomplete remodeling of the endometrium and myometrium following cesarean delivery.⁶ Additionally, insufficient recovery time may impair vascular regeneration, further increasing the risk of abnormal placentation.⁷

Maternal age at first cesarean delivery is another important factor influencing future obstetric outcomes. Women undergoing cesarean delivery at a younger age are more likely to have multiple subsequent pregnancies, thereby increasing cumulative exposure to uterine scarring and risk of placenta accreta spectrum.⁸

Perinatal outcomes are also adversely affected in cases of abnormal placentation, with increased risks of preterm birth, low birth weight, and neonatal intensive care unit (NICU) admission. Early identification of high-risk patients is therefore essential for timely intervention and improved outcomes.⁹

Despite the clinical significance of these factors, limited local data are available regarding the combined effect of short inter-pregnancy interval and maternal age at first cesarean

delivery on abnormal placentation in developing countries like Pakistan. Most available studies focus on individual risk factors rather than their interaction.¹⁰

Therefore, this study was conducted to determine the association between short inter-pregnancy interval and the occurrence of placenta previa and placenta accreta spectrum, with respect to maternal age at first cesarean delivery.

Materials and Methods

This prospective observational study was conducted in the Department of Obstetrics and Gynecology at Jinnah Postgraduate Medical Centre (JPMC), Karachi, a tertiary care hospital managing high-risk pregnancies. The study was carried out over a period of six to twelve months after obtaining approval from the College of Physicians and Surgeons Pakistan (CPSP) and the institutional ethical review committee.

A total of 100 pregnant women with a history of at least one previous caesarean section were included in the study. The sample size was calculated using the WHO formula for estimation of a single proportion, taking a confidence level of 95%, expected proportion of 50%, and a margin of error of 10%. The calculated sample size was 96, which was rounded up to 100 patients. A non-probability consecutive sampling technique was employed.

All pregnant women of any gestational age with a previous caesarean delivery presenting to the antenatal clinics or emergency department were enrolled after obtaining informed consent. Patients with multiple gestations, known uterine anomalies,

history of uterine surgeries other than caesarean section (e.g., myomectomy), or incomplete clinical records were excluded from the study.

Data were collected through detailed history, clinical examination, and review of medical records. Information regarding inter-pregnancy interval, defined as the duration between the previous delivery and conception of the current pregnancy, was recorded. Patients were categorized into two groups: short inter-pregnancy interval (<24 months) and normal interval (≥ 24 months). Maternal age at first caesarean delivery, parity, and current maternal age were also documented.

Diagnosis of placenta previa and placenta accreta spectrum was made using obstetric ultrasonography and confirmed intraoperatively at the time of delivery. Placenta accreta spectrum included placenta accreta, increta, and percreta based on the degree of placental invasion.

Patients were followed until delivery, and relevant maternal and fetal outcomes were recorded. The primary outcome measures were the frequency of placenta previa and placenta accreta spectrum in relation to inter-pregnancy interval and maternal age at first caesarean delivery.

All collected data were entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 26.0. Quantitative variables such as maternal age were expressed as mean and standard deviation, while qualitative variables were presented as frequencies and percentages. The chi-square test was applied to assess the association between inter-pregnancy interval, maternal age at first caesarean delivery, and the occurrence of

placenta previa and placenta accreta spectrum. A p-value of ≤ 0.05 was considered statistically significant.

Confidentiality of patient information was maintained throughout the study, and all ethical principles were strictly followed.

Results

A total of 100 pregnant women with a history of previous caesarean section were included in the study. The mean maternal age was 28.1 ± 4.6 years. Among these, 40% of women had a short inter-pregnancy interval (< 24 months), while 60% had a normal interval (≥ 24 months).

The majority of women (55%) had their first caesarean delivery at an age less than 25 years. Placenta previa was diagnosed in 30% of cases, while placenta accreta spectrum (PAS) was observed in 18% of patients.

Table 1: Baseline Characteristics of Study Population (n = 100)

Variable	Frequency (n)	Percentage (%)
Inter-pregnancy Interval		
< 24 months (Short)	40	40%
≥ 24 months (Normal)	60	60%
Age at First Caesarean Delivery		

< 25 years	55	55%
≥ 25 years	45	45%
Current Maternal Age		
< 25 years	20	20%
25–30 years	50	50%
> 30 years	30	30%
Parity		
Para 1–2	65	65%
Para ≥ 3	35	35%

Placenta previa and placenta accreta spectrum were more frequently observed in women with a short inter-pregnancy interval. Among women with short intervals, placenta previa was observed in 22 (55%) patients, compared to 8 (13%) in the normal interval group. Similarly, placenta accreta spectrum was diagnosed in 14 (35%) patients with short interval, compared to 4 (7%) in those with normal interval. This association was found to be statistically significant ($p < 0.05$).

Table 2: Association of Inter-Pregnancy Interval with Placenta Previa and PAS

Outcome	Short Interval (<24 mo) n=40	Normal Interval (≥24 mo) n=60	p-value

Placenta previa	22 (55%)	8 (13%)	<0.05
Placenta accreta spectrum	14 (35%)	4 (7%)	<0.05

Further analysis showed that maternal age at first caesarean delivery had a significant impact on abnormal placentation. Women who had their first caesarean delivery at an age less than 25 years showed a higher frequency of placenta previa (38%) and placenta accreta spectrum (25%) compared to those aged ≥ 25 years.

Table 3: Association of Maternal Age at First Caesarean with Outcomes

Outcome	Age <25 years (n=55)	Age ≥ 25 years (n=45)	p-value
Placenta previa	21 (38%)	9 (20%)	<0.05
Placenta accreta spectrum	14 (25%)	4 (9%)	<0.05

Discussion

The present study evaluated the association between short inter-pregnancy interval and abnormal placentation, specifically placenta previa and placenta accreta spectrum (PAS), in relation to maternal age at first caesarean delivery. The findings demonstrated a strong and statistically significant association between short inter-pregnancy interval (<24 months) and increased risk of both placenta previa and PAS.

In this study, 40% of women had a short inter-pregnancy interval, and this group showed markedly higher frequencies of placenta previa (55%) and PAS (35%) compared to those with normal intervals. These findings are consistent with recent studies, which have identified short inter-pregnancy interval as an important risk factor for abnormal placentation due to inadequate healing of the uterine scar.¹¹

The biological plausibility of this association lies in the insufficient time for complete regeneration of the endometrium and myometrium following a caesarean section. Impaired scar healing may result in defective decidualization and abnormal trophoblastic invasion, ultimately leading to placenta previa and PAS.¹²

Placenta accreta spectrum was observed in 18% of patients in this study, with a significantly higher proportion in women with short inter-pregnancy interval. Similar trends have been reported in recent literature, where PAS is increasingly recognized as a consequence of prior uterine surgery combined with inadequate inter-pregnancy spacing.

Maternal age at first caesarean delivery was also found to be a significant factor. Women who underwent their first caesarean delivery at age less than 25 years had higher rates of placenta previa (38%) and PAS (25%). This finding is supported by recent studies suggesting that early-age caesarean delivery increases lifetime exposure to uterine scarring and subsequent risk of abnormal placentation.¹⁴

The interaction between short inter-pregnancy interval and younger maternal age at first caesarean further amplifies the risk, as these women are more likely to have multiple

pregnancies over a shorter duration. This cumulative effect significantly increases the likelihood of placenta previa and PAS.¹⁵

The incidence of placenta previa (30%) observed in this study is higher than that reported in some international studies but is comparable to regional data, reflecting the higher burden of risk factors such as repeat caesarean sections and inadequate birth spacing in developing countries.¹⁶

Although perinatal outcomes were not the primary focus of this study, abnormal placentation is well known to be associated with adverse fetal outcomes, including preterm birth and low birth weight, mainly due to placental insufficiency and early delivery for maternal indications.¹⁷

The strong statistical association observed in this study ($p < 0.05$) emphasizes the importance of inter-pregnancy interval as a modifiable risk factor. Public health strategies promoting adequate birth spacing could significantly reduce the incidence of abnormal placentation and its associated complications.¹⁸

Current guidelines recommend a minimum inter-pregnancy interval of at least 24 months following a caesarean delivery to allow adequate uterine healing and reduce obstetric risks.¹⁹

The findings of this study highlight the need for increased awareness among healthcare providers and patients regarding the risks associated with short inter-pregnancy interval. Early identification of high-risk patients can facilitate appropriate antenatal surveillance and timely intervention.²⁰

This study has several strengths, including its prospective design and focus on clinically relevant and modifiable risk factors. However, certain limitations should be acknowledged, including the single-center setting and relatively small sample size, which may limit generalizability.²¹

Future large-scale, multicenter studies are recommended to further explore the combined impact of inter-pregnancy interval and maternal age on abnormal placentation and to develop evidence-based guidelines for risk reduction.²²

Overall, the findings of this study are consistent with the growing body of evidence highlighting the critical role of inter-pregnancy interval and prior caesarean delivery in the pathogenesis of placenta previa and placenta accreta spectrum.²³

Conclusion

Short inter-pregnancy interval (<24 months) is a significant and independent risk factor for the development of placenta previa and placenta accreta spectrum in women with a history of caesarean delivery. The risk is further increased in those who undergo their first caesarean section at a younger age (<25 years), likely due to cumulative uterine scarring and inadequate healing time. These findings highlight the critical importance of optimal birth spacing and targeted counseling for women after caesarean delivery. Early identification of high-risk patients and appropriate antenatal surveillance at tertiary care centers can significantly reduce maternal morbidity and improve pregnancy outcomes.

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