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Original Article

Comparison Of Placenta Previa and Placenta Accreta Spectrum Disorder Between Women with A Short and Normal Inter-Pregnancy Interval Following Previous Caesarean Section in A Tertiary Care Hospital in Eastern India

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ABSTRACT

Background: Inter-pregnancy interval (IPI) influences maternal and perinatal outcomes, particularly in women with previous caesarean sections. This study aims to compare the incidence of placenta previa and placenta accreta spectrum (PAS) disorder between women with short (≤18 months) and normal (>18 months) IPIs.
Methods: A prospective observational study was conducted over 12 months at a tertiary care hospital in Eastern India. Women with a history of at least one prior caesarean section and current singleton pregnancy beyond 28 weeks were enrolled and grouped based on IPI. Placenta previa and PAS diagnoses were based on clinical, ultrasound, and intraoperative findings.
Results: Of 266 participants, 133 had short IPI and 133 had normal IPI. Placenta previa was diagnosed in 10 (7.51%) of the short IPI group and 44 (33.08%) in the normal IPI group. PAS occurred in 3 (30%) of the previa cases in short IPI and 14 (31.81%) in the normal IPI group. The incidence of placenta previa was significantly higher in the normal IPI group ($p<0.001$), while PAS incidence among previa cases showed no significant difference.
Conclusion: Both placenta previa & PAS disorder was significantly more common in the normal IPI group, potentially due to confounding factors such as higher maternal age and multiple prior caesarean deliveries.

Keywords: Cesarean section, Inter-pregnancy interval, Placenta accrete spectrum disorder, Placenta previa.

INTRODUCTION

The inter-pregnancy interval (IPI) refers to the duration from the conclusion of one pregnancy to the start of another conception[1]. A short inter-pregnancy interval is characterized by the period between the delivery of a previous infant and the conception of the current pregnancy, lasting less than or equal to 18 months[2]. However, there is inconsistency among studies regarding the definition of a short IPI, ranging from less than 3, 6, 9, 12, 18, or 24 months.

A short inter-pregnancy interval (IPI) has been linked to an increased risk of maternal complications, including preterm birth, low birth weight, and infants being small for their gestational age[1, 3, 4]. These pregnancies are also more prone to maternal anemia, preeclampsia, and postpartum hemorrhage, placenta previa. Furthermore, women with short IPIs may not have sufficient time to fully recover physically and emotionally from the preceding pregnancy and childbirth, leading to increased fatigue and stress. This phenomenon, often termed "maternal depletion syndrome," impedes the replenishment of essential nutrients. Breastfeeding practices also impact the recovery period, particularly for women who were malnourished before pregnancy, as the energy demands of breastfeeding prolong the time required for complete recovery before the next conception.

Research indicates that the inter-pregnancy interval influences the occurrence of placenta previa, particularly among women with a history of previous caesarean section deliveries.

However, there is a scarcity of data regarding the correlation between Inter-pregnancy Interval (IPI) and placenta previa, as well as the placenta accreta spectrum disorder, within low-income setup.

This insight stands to benefit healthcare providers, particularly midwives and obstetricians, by raising awareness of the potential risks associated with placenta previa following short IPIs subsequent to caesarean sections. Additionally, these findings will contribute to the enrichment of existing knowledge in this field and serve as a valuable reference point for future researchers.

MATERIALS AND METHODS

Experimental Design:

It was an institutional based prospective observational analytic study.

Study Setting:

A tertiary care hospital in a state capital in Eastern India.

Study population:

Inclusion Criteria:

Patients with previous caesarean section and currently at 28 or more weeks of gestation from last menstrual period or early scan were recruited in the study.

Exclusion Criteria:

1) Pregnancy with coexisting uterine fibroids,
2) Multiple gestations ,
3) Premature rupture of membrane in previous pregnancy in less than 34 weeks ,
4) Twin pregnancy,
5) History of previous post caesarean wound infection ,
6) IVF pregnancy ,

The sample size was calculated based on previous studies. From the previous studies the percentage of women with previous caesarean section and short inter-pregnancy interval, having placenta previa is 27.4%[5]. 266 were included in this study and they were placed in two groups as cases: Group A (short IPI) and controls, Group B (Normal IPI) with a 1:1 case to control ratio (133 cases and 133 controls)

Definition:

Short IPI: IPI ≤ 18 months between previous cesarean section and conception.
Normal IPI: IPI > 18 months. Written informed consent was obtained from all the participants in the study.

All participants were followed up till delivery to ascertain the actual placenta position and any maternal or foetal morbidity and mortality were noted.

Plan for analysis of data:

Data obtained from the study was analysed using standard statistical methods. Statistical analysis was performed using the software SPSS for Windows version 25. After analysing the data appropriate Tests of Significance were used.

OUTCOMES:

Primary: Effect of inter-pregnancy interval (IPI) on the incidence of placenta previa and placenta accreta spectrum disorders in women with a previous caesarean section.

Secondary: Effect of short (≤ 18 months) and normal (>18 months) inter- pregnancy interval on maternal and perinatal outcome.

RESULTS

This study comprised 266 participants, all of whom had undergone at least one previous caesarean section. These participants were divided into two groups: Group A, consisting of cases with a short inter-pregnancy interval (IPI<18 months), and Group B, serving as controls with a normal inter-pregnancy interval (>18 months). The groups were matched in a 1:1 ratio, resulting in 133 cases and 133 controls.

Table 1: Clinical characteristics of the study participants

Variables	Short IPI	Normal IPI	P value
Mean age	26.81	29.47	<0.0001
Age groups ≤20	3 (2.25%)	2 (1.50%)	
21-34	126 (94.74%)	119 (89.47%)	
>34	4 (3.01%)	12 (9.03%)	
BMI Normal Overweight Underweight	129 (96.99%) 3 (2.25%) 1 (0.76%)	123 (92.48%) 8 (6.01%) 2 (1.51%)	0.1358
Gravidity 2 >2	81 (60.90%) 52 (39.10%)	60 (45.11%) 73 (54.89%)	
Mean IPI	13.459	56.992	<0.0001
Haemoglobin before delivery 6-8 mg/dl >8- <11 mg/dl ≥11 mg/dl	0 82 (61.65%) 51 (38.34%)	5 (3.75%) 66 (49.62%) 62 (46.63%)	0.3075
Intention of pregnancy Intentional Unintentional	55 (41.35%) 78 (58.65%)	130 (97.74%) 3 (2.26%)	<0.0001
Previous Baby Status Healthy Deceased	108 (81.20%) 25 (18.80%)	127 (95.48%) 6 (4.52%)	0.0004
Gestational age at delivery Preterm (<37weeks) Term (≥37 weeks)	45 (33.83%) 88 (66.17%)	54 (40.60%) 79 (59.40%)	0.0819

TABLE 2: Comparison of the placenta previa and placenta accreta spectrum disorder between women with short and normal interpregnancy interval

Placenta previa	Short IPI	Normal IPI	P value
Placenta previa by USG Present Absent	10 (7.51%) 123 (92.49%)	44(33.08%) 89 (66.92%)	<0.0001
Placenta accreta spectrum at delivery Present Absent	3 (2.25%) 130 (97.75%)	14 (10.52%) 119 (89.48%)	0.0101

Table 3: Relation of age and number of previous cesarean section with presence of placenta previa among the patients with normal IPI

Variables	Placenta previa		P value
	Present	Absent	
Age <30 ≥30	13 (21.31%) 31 (43.05%)	48 (78.69%) 41 (56.95%)	0.0097
Previous cesarean section 1 >1	23 (23.71%) 21 (58.33%)	74 (76.29%) 15 (41.67%)	0.0003

Table 4: Relation of age and number of previous cesarean section with presence of placenta accreta spectrum among the patients with normal IPI

Variables	Placenta accreta spectrum		P value
	Present	Absent	
Age	3 (4.91%)	58 (95.09%)	0.0863

<30 ≥30	11 (15.27%)	61 (84.73%)	
Previous cesarean section 1 >1	**8 (22.22%)** **6 (6.18%)**	**28 (77.78%)** **91 (93.82%)**	0.0212

Table 5: Placenta accreta spectrum during delivery among placenta previa cases

Pas among placenta previa	Short IPI	Normal IPI
Yes	3 (30.00%)	14 (31.81%)
No	7 (70.00%)	30 (68.19%)
Total	10 (100%)	44 (100%)

Table 6: IPI on Maternal and Neonatal morbidity

Variables	Short IPI	Normal IPI	P value
Birth Weight <2.5 kg ≥2.5 kg	50 (37.59%) 83 (62.41%)	55 (41.35%) 78 (58.65%)	0.7788
SNCU Admission Yes No	22 (16.55%) 111 (83.45%)	28 (21.05%) 105 (78.95%)	0.4329
Obstetric Hysterectomy Yes No	3 (2.25%) 130 (97.75%)	14 (10.52%) 119 (89.48%)	0.0101
CCU/ HDU Admission of Mother Yes No	10 (7.51%) 123 (92.49%)	44 (33.08%) 89 (66.92%)	< 0.0001

DISCUSSION

In our study, as shown in Table 3, in short IPI (≤ 18 months) group, 10 mothers (7.51%) have placenta previa and 123 mothers (92.49%) mothers don't have placenta previa. Whereas, in Normal IPI (>18 months) group 44 mothers (33.08%) have placenta previa and 89 (66.92%) mothers don't have placenta previa. The p-value of this comparison is <0.0001 which is extremely significant and the Odds ratio is 0.1644.

Within the short IPI (≤18 months) group, 3 out of 133 mothers (2.25%) experienced placenta accreta spectrum during delivery, while the majority, 130 mothers (97.75%), did not. Whereas, in the normal IPI (>18 months) group, 14 out of 133 mothers (10.52%) exhibited placenta accreta spectrum. Notably, only 16 mothers were identified with placenta accreta spectrum through ultrasonography, highlighting a discrepancy between ultrasonography findings and actual occurrences. The statistical analysis yielded a significant p-value of 0.0101 and an Odds ratio of 0.1962.

Comparatively, Umeh UA et al. (2022)[6] reported a prevalence of 0.8% for placenta accreta spectrum in mothers with a normal IPI, and 2% in those with a short IPI, with an Odds Ratio of 2.02 and a non-significant p-value of 0.57. Similarly, McLaughlin HD et al. (2022)[7] found that 40% of mothers in the optimal IPI group and 49% in the short IPI group exhibited placenta accreta spectrum, yielding a non-significant p-value of 0.19. They concluded that, short inter-pregnancy interval of <18 months or <12 months were not associated with placenta accrete spectrum. In the contrary, Munoz JL et al (2022)[8] found that short interval pregnancies are at risk for greater degrees of placenta invasion seen in placenta increta and percreta when compared to inter-pregnancy interval >18 month. Wax JR et al (2000)[9] showed in their study that caesarean to conception that is inter-pregnancy interval are shorter in patients with abnormally adherent placentas. On the other hand, Liang Y et al (2023)[10] had the result that women at a maternal age between 18 to 24 years at first caesarean delivery and with an inter-pregnancy interval less than two years were at increased risk for placenta previa and PAS.

In our study, shown in Table 5, in normal IPI (>18 months) group, among 61 patients with age <30 years, 13 (21.31%) patients have placenta previa and 48 (78.69%) patients don't have placenta previa. Whereas among 72 patients with age ≥30 years, 31(43.05%) patients have placenta previa and 41 (56.95%) patients don't have placenta previa. The p-value is 0.0097, considered very significant. The relative risk is 0.4950. In our study as placed in Tab-16, in IPI>18 months group, among 61 patients with age<30 years, 3 (4.91%) patients have placenta accreta spectrum and 58(95.09%) patients don't

have placenta accreta spectrum. Where as, among 72 patients with age≥30 years, 11(15.27%) patients have placenta accreta spectrum and 61(84.73%) patients don't have placenta accreta spectrum. The p-value is 0.0863 though considered not quite significant but the relative risk is 0.3219.

In the findings as shown in Tab-5, in Normal IPI (>18 months) group, among 97 patients with previous 1 caesarean section 23 (23.71%) patients have placenta previa and 74(76.29%) patients don't have placenta previa. Whereas, among 36 patients with previous >1 caesarean section 21(58.33%) patients have placenta previa and 15(41.67%) patients don't have placenta previa. The p-value of this comparison is 0.0003, considered extremely significant. The Relative risk is 0.4065. In our study, in Normal IPI (>18 months) group, among 36 patients with previous >1 caesarean section, 8 (22.22%) patients have palcenta accreta spectrum and 28(77.78%) patients don't have palcenta accreta spectrum as shown in Table-17.Where as, among 97 patients with previous 1 cesaresn section, 6(6.18%) patients have placenta accreta spectrum and 91(93.82%) patients don't have placenta spectrum. The p-value is 0.0212, considered significant. The Relative risk is 3.593.

Our study observed a higher incidence of placenta previa and placenta accreta spectrum (PAS) in the normal IPI (>18 months) group, contrasting with other studies that found no significant association between IPI and these conditions. This discrepancy may be explained by confounding factors such as increasing maternal age and the number of prior caesarean sections—both recognized risk factors. Cieminski et al. (2005)[11] linked advanced age and multiparity to placenta previa, while Clark et al. (1985)[12], Marshall et al. (2011)[13], and Umeh et al. (2022)[6] reported rising risks of placenta previa and PAS with successive caesarean deliveries.

In our study, obstetric hysterectomy was significantly lower in the short inter-pregnancy interval (IPI ≤18 months) group (2.25%) compared to the normal IPI group (>18 months) (10.52%), with a p-value of 0.0101 (OR = 0.1962, 95% CI: 0.05499–0.6997). Hemoglobin levels showed no significant difference (p = 0.3075); most patients in both groups were mildly anemic. Mean hemoglobin was 10.693 ± 1.007 mg/dl in the short IPI group and 10.839 ± 1.301 mg/dl in the normal IPI group.

Regarding child health history, 81.2% of patients in the short IPI group had previously healthy babies, compared to 95.48% in the normal IPI group (p = 0.0004). Pregnancy intention varied significantly: only 41.35% of short IPI pregnancies were planned vs. 97.74% in the normal IPI group (p < 0.0001; RR = 0.4231). Notably, 43.63% of intended pregnancies in the short IPI group followed a previous adverse child outcome

Placenta accreta spectrum (PAS) was found in 31.48% of placenta previa cases overall. Among short IPI cases with previa, 30% had PAS vs. 31.81% in the normal IPI group. **Jauniaux et al. (2019)** [14] showed that the prevalence of placenta previa with PAS is 11.10%. **According to American College of Obstetricians and Gynaecologists (ACOG) [***Committee Opinion No. 529, July 2012. Reaffirmed 2021]*, placenta accreta among placenta previa is 3% and that prevalence increases with number of previous caesarean section by 11% in previous 1 CS, 40% in previous 2 CS, 61% in previous 3 CS and 67% in previous 4 CS.

STRENGTHS:

1. It is a prospective study design since the data was collected prospectively.
2. All the patients were reviewed at delivery and the placenta previa or PAS confirmed by inspection.

LIMITATIONS:

1. Sample size is less than the prevalance of pregnant mother with previous caesarean section.
2. Single- institution study at a large referral centre of patients at high risk of PAS, there is hospital bias. So, the result of these analyses are not likely generalizable to low risk populations.
3. There is multiple confounding factors such as advanced maternal age, multiple number of previous caesarean sections, increased inter-pregnancy interval due to different factors (viz. secondary infertility, changing of partner etc.) which are not assessed .

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CONCLUSION

It's evident that the Inter-pregnancy Interval (IPI) plays a significant role in the occurrence of placenta previa and placenta accreta spectrum disorder. Our findings indicate a higher prevalence of both conditions among those with an normal IPI (>18 months). This study also revealed that the occurrence of placenta previa and placenta accreta spectrum depends not only on inter-pregnancy interval , but also on so many factors like maternal age, number of previous caesarean section, indications of previous caesarean section etc.

Furthermore, we observed that a normal IPI correlates with a higher incidence of maternal and slightly more neonatal comorbidities. Conversely, a shorter IPI showed a positive association with maternal anaemia status.

DATA AVAILABILITY

The data used to support the findings of this study are available upon request from the corresponding author.

ETHICAL APPROVAL

Ethical approval was obtained from Institutional Ethics Committee. The study was conducted in accordance with the Declaration of Helsinki. There was individual counselling for each woman recruited for the study after which her informed written consent was obtained.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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