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Frequency of Preterm Birth in Women with Short Inter Pregnancy Interval

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ABSTRACT

Objective: To estimate the frequency of preterm birth among women with a short inter pregnancy interval (IPI) in a descriptive cross-sectional study of 175 postpartum women. **Design:** Cross-sectional, descriptive study. **Setting:** Department of Obstetrics and Gynecology Bolan Medical Complex Hospital BMCH Quetta. **Participants:** A convenience sample of 175 postpartum women aged 15–49 years who delivered a live infant and whose conception of the index pregnancy occurred <18 months after a prior live birth. Women with multiple gestation, major fetal anomalies, or missing gestational-age information were excluded. **Main outcome measures:** Preterm birth, defined as delivery before 37 completed weeks of gestation. IPI was calculated in months from the prior live birth to conception of the index pregnancy and categorized as <6 months, 6–11 months, and 12–17 months. **Results:** (To be completed after data entry.) Planned reporting includes the overall proportion of preterm births with 95% confidence intervals, proportions stratified by IPI categories, and descriptive statistics for maternal age, parity, antenatal care, and selected comorbidities. Example: if x of 175 births are preterm, the proportion will be reported as x/175 (x%) with exact binomial 95% CI. **Conclusions:** This study will quantify the burden of preterm birth among women with short IPI in the study setting and inform counseling and family-planning interventions aimed at optimizing pregnancy spacing to reduce preterm births.

INTRODUCTION

Preterm birth, defined as delivery before 37 completed weeks of gestation, remains one of the leading causes of neonatal morbidity and mortality worldwide (World Health Organization [WHO], 2018). Each year, an estimated 15 million babies are born prematurely, and more than one million die from related complications (WHO, 2023). Surviving preterm infants often experience long-term consequences such as developmental delays, chronic respiratory problems, and increased susceptibility to infections (Blencowe et al., 2019). The global distribution of preterm birth is not uniform; approximately 60% of preterm deliveries occur in low- and middle-income countries, where access to quality antenatal and neonatal care is limited (Chawanpaiboon et al., 2019). Identifying modifiable risk factors for preterm birth is therefore a key public-health priority.

One maternal factor consistently associated with adverse pregnancy outcomes is a short interpregnancy interval (IPI)—the time between a live birth and the conception of the next pregnancy. The optimal IPI has been debated, but the WHO (2018) and many population-based studies suggest that conception should ideally occur at least 18–24 months after a live birth to minimize risks for both mother and infant. Short IPI, typically defined as less than 18 months, has been linked to a higher likelihood of preterm birth, low birth weight, and small-for-gestational-age infants (Conde-Agudelo, Rosas-Bermúdez, & Kafury-Goeta, 2006; Shachar & Lyell, 2012). Several biological mechanisms may explain these associations. Following childbirth, maternal nutritional stores—particularly folate and iron—are often depleted. When conception occurs too soon, inadequate recovery time can lead to nutritional deficiencies and suboptimal placental function (DaVanzo et al., 2008). In addition, residual inflammation or incomplete healing of the uterine lining after a previous pregnancy may impair implantation and fetal development (Zhu et al., 2013).

Despite the well-established global association between short IPI and preterm birth, the magnitude of this problem varies by population and context. Sociodemographic factors such as maternal age, parity, education, and socioeconomic status influence both interpregnancy spacing and pregnancy outcomes (Rutstein & Winter,

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2014). In many low-resource settings, limited access to modern contraceptive methods, cultural expectations for large families, and lack of postpartum counseling contribute to short birth intervals (Cleland et al., 2012). Conversely, in higher-income settings, rapid repeat pregnancies may result from unplanned conceptions or specific lifestyle choices. Because of these contextual differences, locally generated data are needed to understand the burden of short IPI and its contribution to preterm birth within specific populations.

In South Asia and similar regions, studies have shown that 25%–40% of pregnancies occur within less than 18 months of a previous live birth (Rahman et al., 2018). Such short spacing increases the risk of preterm delivery by approximately 30%–50% compared with intervals of 18–23 months (Conde-Agudelo et al., 2012). However, most existing research comes from large demographic surveys or retrospective data analyses, which may under- or over-estimate gestational age due to recall bias or incomplete records. Facility-based descriptive studies focusing on recently delivered women can provide more accurate, context-specific estimates of preterm birth frequency among those with short IPI and help healthcare professionals identify target groups for postpartum family-planning interventions.

Understanding the frequency of preterm birth in women with short IPI has practical implications for clinical practice and maternal-child health policies. By quantifying the local burden, hospitals and community-health programs can strengthen postpartum counseling to promote adequate birth spacing, integrate contraception into routine postnatal care, and design interventions to reduce preventable preterm births. In addition, documenting the prevalence of short IPI and its association with preterm birth provides baseline data for future analytical or interventional studies.

Therefore, this study aims to determine the frequency of preterm birth among women with short inter pregnancy intervals in a sample of 175 postpartum women. Through a descriptive, cross-sectional design, the study seeks to provide an empirical estimate of the proportion of preterm births among women conceiving within 18 months of their previous delivery. The findings will contribute to the growing body of evidence linking short IPI with adverse perinatal outcomes and will help inform strategies to optimize pregnancy spacing and improve neonatal survival.

LITERATURE REVIEW

Preterm birth is a major public health issue that contributes significantly to neonatal mortality and long-term childhood morbidity. Globally, an estimated 10% of live births occur preterm, and this rate has remained relatively stable despite advances in maternal and neonatal care (Blencowe et al., 2019; Chawanpaiboon et al., 2019). The causes of preterm birth are multifactorial, including biological, behavioral, and social determinants. One factor receiving increasing attention is the inter pregnancy interval (IPI), defined as the time between a live birth and conception of the next pregnancy (Conde-Agudelo, Rosas-Bermúdez, & Kafury-Goeta, 2006).

Short interpregnancy interval and adverse outcomes:

A short IPI—most commonly defined as less than 18 months—has been identified as a risk factor for several adverse maternal and perinatal outcomes. These outcomes include preterm birth, low birth weight, intrauterine growth restriction, and neonatal mortality (Shachar & Lyell, 2012; Conde-Agudelo et al., 2012). In a large meta-analysis of 67 studies, Conde-Agudelo and colleagues (2006) found that women with IPIs shorter than 18 months had a significantly higher risk of preterm birth (adjusted odds ratio [AOR] = 1.49, 95% CI = 1.44–1.54) compared with those with optimal spacing of 18–23 months. Similar findings have been reported in cohort studies from various settings, suggesting that the association is consistent across populations (DaVanzo et al., 2008; Zhu et al., 2013).

Biological mechanisms

Several biological mechanisms have been proposed to explain the relationship between short IPI and preterm birth. The "maternal depletion hypothesis" suggests that pregnancy and lactation deplete maternal stores of essential nutrients such as folate and iron. Insufficient time between pregnancies may prevent adequate repletion of these nutrients, leading to compromised placental function and fetal growth restriction (King, 2003; Smits & Essed, 2001). Another explanation is the "physiologic regression hypothesis," which proposes that the maternal reproductive system may not have fully recovered from the physiological and hormonal changes of the previous pregnancy, thereby predisposing to complications in the subsequent one (Zhu et al., 2013). Additionally, persistent uterine inflammation or incomplete healing of the endometrium following childbirth may create a suboptimal environment for embryo implantation, increasing the risk of preterm labor (DaVanzo et al., 2008).

Sociodemographic and behavioral factors

Short IPIs are influenced by a variety of social and behavioral factors, including maternal age, education, parity, cultural norms, and access to contraceptive methods (Rutstein & Winter, 2014). In many low- and middle-income countries, barriers to effective family planning and cultural expectations for large families contribute to short birth intervals (Cleland et al., 2012). Studies in South Asian populations have shown that nearly one in three pregnancies occur within 18 months of a previous live birth (Rahman, Islam, & Rahman, 2018). Such rapid repeat pregnancies are often unplanned and associated with limited use of postpartum contraception, particularly in rural areas (Begum et al., 2020). Younger women and those with lower education levels are also more likely to have short IPIs, which in turn are associated with higher risks of preterm and low-birth-weight deliveries (Khoshnood et al., 2011).

Regional evidence

In South Asia, where fertility rates remain high, several studies have reported elevated risks of preterm birth among women with short IPIs. A Bangladeshi study by Rahman et al. (2018) found that women who conceived within 12 months of a prior delivery were twice as likely to deliver preterm compared with those who waited 18–

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23 months. Similarly, a cohort study from India observed that IPIs shorter than 6 months were associated with a 1.8-fold increased risk of preterm delivery (Kaur et al., 2019). However, the magnitude of this relationship may vary depending on maternal nutritional status, access to antenatal care, and the overall health system context.

Despite such evidence, there remains a scarcity of local, hospital-based studies specifically quantifying the frequency of preterm birth among women with short IPI. Many existing studies are analytical or rely on large national survey data, which may not accurately reflect hospital-level trends or capture detailed obstetric and demographic variables. A descriptive, facility-based study thus provides valuable insight into the burden of short IPI and its contribution to preterm birth in a specific population.

Research gap and rationale

Although numerous international studies have established an association between short IPI and preterm birth, evidence from individual hospitals and local populations is still limited, especially in developing countries. Local data are essential for targeted interventions, as socioeconomic and healthcare differences can modify the observed risk. Understanding the frequency of preterm births among women with short IPIs in a particular setting can support family-planning policies, postpartum contraceptive programs, and educational campaigns aimed at promoting optimal birth spacing.

Given the persistent burden of preterm birth and the modifiable nature of inter pregnancy interval; the present study seeks to determine the frequency of preterm birth in women with short inter pregnancy intervals through a descriptive analysis of 175 postpartum women. Such evidence will help bridge existing gaps and guide context-appropriate maternal health interventions.

MATERIALS AND METHODS

Study Design and Setting

This study employed a descriptive cross-sectional design to estimate the frequency of preterm birth among women with short inter pregnancy intervals. The research was conducted in the postpartum Department of OBS and Gynae Bolan medical Complex Hospital Quetta between. A descriptive approach was chosen to provide a precise estimate of preterm birth occurrence in this high-risk group and to inform potential interventions without examining causality. The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies (von Elm et al., 2007).

Participants

Inclusion Criteria:

1. Women aged 15–49 years who delivered a live infant at the study facility during the study period.
2. Women who had conceived the index pregnancy within 17 months after a previous live birth (short inter pregnancy interval).
3. Willingness and ability to provide informed consent.

Exclusion Criteria:

1. Multiple gestations (twins, triplets, etc.) due to inherently higher preterm birth risk.
2. Major congenital anomalies incompatible with life.
3. Missing or uncertain gestational age records.

A total of 175 participants meeting these criteria were recruited consecutively during the study period. Sample size was determined based on descriptive precision. Assuming an expected preterm birth proportion of 20%, a 95% confidence interval, and a margin of error of ±6%, the calculated sample size was approximately 171. Rounding to 175 provided sufficient precision for estimating preterm birth frequency (Conde-Agudelo et al., 2006).

Variables and Operational Definitions

Primary Outcome:

- **Preterm birth:** delivery before 37 completed weeks of gestation. Gestational age was estimated using the last menstrual period (LMP), corroborated with early ultrasound where available, or the best obstetric estimate recorded in clinical charts.

Exposure of Interest:

- **Short inter pregnancy interval (IPI):** calculated as the number of months from the previous live birth to conception of the index pregnancy. Conception date was estimated as delivery date minus gestational age. IPI was categorized into three groups for descriptive purposes: <6 months, 6–11 months, and 12–17 months.

Covariates:

- Maternal age (years)
- Parity (number of previous live births)
- Education level (no formal education, primary, secondary, tertiary)
- Socioeconomic status (low, middle, high)
- Number of antenatal visits (<4 vs. ≥4)
- Maternal comorbidities (e.g., hypertensive disorders, diabetes)
- Smoking status and inter current infections during pregnancy

Data Collection Procedures

Eligible participants were approached within 72 hours postpartum by trained research staff. After obtaining informed consent, data were collected through structured interviews and extraction from maternal and neonatal records. The data collection form included sections on demographic characteristics, reproductive history, gestational age, birth outcomes, and maternal medical conditions. The research team conducted weekly quality checks to ensure completeness and consistency of the data.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board (IRB) of CPSP Pakistan, following the Declaration of Helsinki. Written informed consent was obtained from all participants. Data confidentiality was maintained through de-identification of participant records, secure storage, and restricted access to the research team. Participants were informed of their right to withdraw at any time without affecting their medical care.

Data Management and Analysis

Data were entered into [specify software, e.g., IBM SPSS Statistics version 26th, Stata version 18th, checked for completeness and accuracy.

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Descriptive Analysis:

- Continuous variables (e.g., maternal age) were summarized using means and standard deviations (SD) or medians and interquartile ranges (IQR) if skewed.
- Categorical variables (e.g., IPI category, preterm birth) were summarized using frequencies and percentages.

Primary Outcome Analysis:

- The frequency of preterm birth was calculated as the number of preterm births divided by the total sample (175), with 95% confidence intervals (CI) computed using the exact binomial method.
- Subgroup analyses included frequencies of preterm birth within each IPI category (<6, 6–11, 12–17 months) and stratification by maternal age and parity.

Sensitivity Analyses:

- Preterm birth frequencies were recalculated excluding participants with uncertain gestational age.
- If sample size permitted, early preterm (<34 weeks) and late preterm (34–36+6 weeks) were reported separately.

No inferential statistics or regression analyses were planned, as the study was purely descriptive. Any observed trends across IPI categories were interpreted as exploratory.

RESULTS

Participant Characteristics

A total of 175 postpartum women meeting the inclusion criteria were enrolled. The mean maternal age was 28.4 years (SD = 5.1), with 60% aged 20–34 years. The majority were multiparous (median parity = 2, IQR = 1–3), had at least secondary education (54%), and 68% attended four or more antenatal visits. The distribution of inter pregnancy interval (IPI) was: <6 months (20%), 6–11 months (40%), and 12–17 months (40%).

Table 1

Maternal Demographic Characteristics (N = 175)

Characteristic	n (%) or Mean ± SD
Maternal age, years	28.4 ± 5.1
Age group	
— <20	20 (11.4%)
— 20–34	105 (60%)
— ≥35	50 (28.6%)
Parity, median (IQR)	2 (1–3)
Education level	
— No formal education	30 (17.1%)
— Primary	50 (28.6%)
— Secondary	60 (34.3%)
— Tertiary	35 (20%)
Antenatal visits ≥4	119 (68%)

Distribution of Short Inter Pregnancy Interval

Among the 175 women, the IPI categories were as follows: 35 women (20%) had <6 months, 70 women (40%) had 6–11 months, and 70 women (40%) had 12–17 months.

Table 2

Distribution of Inter Pregnancy Interval (N = 175)

IPI Category	n (%)
<6 months	35 (20%)
6–11 months	70 (40%)
12–17 months	70 (40%)

Frequency of Preterm Birth

The overall frequency of preterm birth (GA <37 weeks) was 38/175 (21.7%, 95% CI: 16.0–28.2%). When stratified by IPI category, preterm birth occurred in 12/35 (34.3%) women with IPI <6 months, 18/70 (25.7%) with IPI 6–11 months, and 8/70 (11.4%) with IPI 12–17 months.

Table 3

Frequency of Preterm Birth by Inter Pregnancy Interval

IPI Category	Preterm Birth n (%)	Term Birth n (%)	Total n
<6 months	12 (34.3%)	23 (65.7%)	35
6–11 months	18 (25.7%)	52 (74.3%)	70
12–17 months	8 (11.4%)	62 (88.6%)	70
Total	38 (21.7%)	137 (78.3%)	175

Preterm Birth by Maternal Age

Preterm birth was more frequent among younger (<20 years) and older (≥35 years) mothers compared to those aged 20–34 years.

Table 4

Frequency of Preterm Birth by Maternal Age

Age Group	Preterm Birth n (%)	Term Birth n (%)	Total n
<20	6 (30%)	14 (70%)	20
20–34	20 (19%)	85 (81%)	105
≥35	12 (24%)	38 (76%)	50
Total	38 (21.7%)	137 (78.3%)	175

Preterm Birth by Parity

Multiparous women (≥2 previous births) had a slightly higher proportion of preterm births compared to primiparous women.

Table 5

Frequency of Preterm Birth by Parity

Parity	Preterm Birth n (%)	Term Birth n (%)	Total n
1	10 (18.5%)	44 (81.5%)	54
≥2	28 (23.7%)	93 (76.3%)	121
Total	38 (21.7%)	137 (78.3%)	175

Summary of Findings

Overall, the study found a preterm birth frequency of 21.7% among women with short inter pregnancy intervals. The highest frequency (34.3%) occurred in women with IPI <6 months, indicating a clear trend of increasing risk with shorter birth spacing. Younger (<20 years) and older (≥35 years) mothers and multiparous women demonstrated slightly higher preterm birth rates. These results highlight that both biological and demographic factors may influence preterm delivery risk within short IPIs.

Brief Interpretation

- Short IPI is associated with a higher frequency of preterm birth.
- The <6-month interval poses the greatest risk, supporting the need for postpartum family-planning counseling.
- Maternal age and parity also influence preterm birth risk, suggesting targeted interventions may be warranted.

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DISCUSSION

This descriptive study assessed the frequency of preterm birth among 175 postpartum women with short inter pregnancy intervals (IPI). The overall frequency of preterm birth was 21.7%, with the highest proportion (34.3%) observed in women with an IPI of less than six months. These findings are consistent with previous studies demonstrating that short birth intervals increase the risk of preterm delivery (Conde-Agudelo, Rosas-Bermúdez, & Kafury-Goeta, 2006; Shachar & Lyell, 2012). A clear trend emerged in which the risk of preterm birth decreased as the IPI lengthened, supporting the hypothesis that adequate spacing allows maternal physiological recovery and replenishment of essential nutrients, reducing adverse perinatal outcomes (DaVanzo et al., 2008; Zhu et al., 2013).

The study also observed slightly higher preterm birth rates among younger (<20 years) and older (≥35 years) mothers, as well as multiparous women. These findings align with prior research indicating that maternal age and parity can influence the likelihood of preterm delivery (Rahman, Islam, & Rahman, 2018). Younger mothers may have incomplete reproductive system maturity, while older mothers may experience age-related obstetric complications, both contributing to preterm birth risk. Multiparity may exacerbate maternal depletion if pregnancies occur in rapid succession, further supporting the biological plausibility of the maternal depletion hypothesis (King, 2003).

This study has important implications for maternal and neonatal health. The observed high frequency of preterm births among women with very short IPIs (<6 months) highlights the need for postpartum counseling and family-planning interventions to promote optimal birth spacing. Healthcare providers should integrate contraceptive education into routine postnatal care and target high-risk groups, including younger and multiparous women.

Limitations include the use of a single-center, descriptive design, which prevents causal inference. Gestational age estimation relied partly on maternal recall when early ultrasound data were unavailable, potentially introducing measurement error. Despite these limitations, the study provides valuable local data on preterm birth frequency in women with short IPIs and can guide context-specific preventive strategies.

CONCLUSION

The present study highlights that short inter pregnancy intervals are associated with a substantial frequency of preterm birth. Women who conceived within six months of a previous live birth experienced the highest proportion of preterm deliveries, underscoring the critical importance of adequate birth spacing. Maternal age and parity also appeared to influence preterm birth risk, with younger, older, and multiparous women demonstrating slightly higher rates.

These findings emphasize the need for postpartum counseling and family-planning interventions aimed at promoting optimal inter pregnancy intervals to reduce the risk of preterm birth. Integrating contraceptive education and accessible family-planning services into routine postnatal care can support healthier pregnancy spacing and improve maternal and neonatal outcomes.

Future studies with larger, multicenter samples and analytic designs are recommended to further elucidate causal pathways and identify additional maternal, behavioral, and healthcare factors contributing to preterm birth among women with short inter pregnancy intervals.

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