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Interpregnancy Interval and Postpartum Family Planning: Does it matter?

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ABSTRACT

There is robust evidence from many studies including meta-analysis that after full term or pre-term delivery, interpregnancy intervals of <12 months and >5 years are associated with increased risk of poor perinatal and maternal outcome.

Short inter-pregnancy intervals have been identified as a significant risk for preterm birth with its long-term morbidity. There is evidence linking low birth weight, child autism and schizophrenia with short interpregnancy interval. Short interpregnancy interval is also associated with maternal obesity, anaemia, folate deficiency, cardiovascular diseases, and surgical morbidity during labour for women who delivered by caesarean section in the last pregnancy and increased maternal death.

Women should be educated and counselled on the importance of having optimal birth space to improve the health outcome for themselves and their babies. Infertility, Reproductive health and Obstetric Nurses, midwives and doctors and other health care workers providing care in the community are in a better position to advise women before pregnancy or IVF, during the late antenatal or in the immediate postpartum period about the importance of spacing and how to achieve the desired spacing depending on their reproductive plans.

Keywords

Inter-pregnancy interval, Postpartum contraception, Family planning, Counselling.

Key messages

- After full term or pre-term delivery, interpregnancy intervals of <12 months and >5 years are associated with increased risk of poor perinatal and maternal outcome.
- Short IPI is a modifiable risk factor and women can potentially reduce the risk of adverse events if given access to effective postpartum contraception.
- Women should be educated and counselled on the importance of having optimal birth space to improve the health outcome for themselves and their babies.

Introduction

Pregnancy and childbirth are among the most significant life events in any woman's experience. Along with being an occasion of joy it is undeniably also a stressful time with an overload on the maternal body systems. During the pregnancy the mother is undergoing multiple internal adaptations to accommodate the growing baby. The different stressors affecting maternal health are physical, emotional, social and economic [1]. In order to recover from these effects, the mother needs an interim period after delivery before embarking on yet another pregnancy. This interim period is known as the interpregnancy interval.

The interpregnancy interval (IPI) or the Birth to pregnancy interval is defined as the spacing between a live birth and the beginning of the following pregnancy. The Inter-delivery interval (IDI) is the period between two consecutive live births whereas the Inter-outcome interval (IOI) is the interval between one pregnancy outcome and the next, regardless of pregnancy outcome [2]. A short IPI is defined as < 6 months to <18 months in various studies while long IPI is defined as > 60 months [3]. Both short and long IPI have been shown to have a deleterious effect on the subsequent pregnancies [4]. It is important to prove that IPI is an independent biological risk factor for subsequent adverse maternal and perinatal outcomes as this is modifiable risk factor. The women themselves have control over the spacing of their subsequent pregnancy and

this can potentially reduce the risk of adverse outcomes. Delay of subsequent pregnancy and avoidance of short IPI can be achieved through effective postpartum contraception uptake [3]. However, to limit the long IPI is more difficult as planning for the next pregnancy can be hindered by issues of subfertility, illness, economic problems or availability of partner [2].

This review presents the evidence on IPI and its effect on subsequent perinatal outcome and maternal health. It also highlights the importance of improving postpartum contraception uptake in order to achieve the desired healthy IPI.

Interpregnancy interval and adverse outcomes

There are several hypotheses proposed to explain the relation between IPI and adverse pregnancy outcomes.

Maternal Depletion Hypothesis

According to this hypothesis, in closely spaced pregnancies, maternal micro and macro nutrients do not get replenished. This depletion is further exacerbated by breastfeeding [5]. The resulting deficiency leads to the mother and baby competing for the nutrients having a negative impact on the outcome [6]. However, a recent systematic review of literature found no evidence to support this hypothesis [7].

Intrauterine inflammation milieu

Another proposed hypothesis is intrauterine inflammation. Infectious process in the previous pregnancy especially inflammation in the genital tract that did not completely resolve can lead to preterm birth or premature rupture of membranes in the subsequent pregnancy with short IPI [8]. Insufficient uterine involution and healing due to chorioamnionitis or endometritis in previous pregnancy can result in abnormal placentation in the subsequent pregnancy resulting fetal growth restriction or even placental abruption [2].

Physiological regression hypothesis

This has been proposed to explain the link between long IPI and adverse pregnancy outcomes. Pregnancy causes physiological changes to the cardiovascular system resulting in improved blood supply to the uterus and enhances the functional capacity of the reproductive system. These beneficial adaptations however are temporary. If the subsequent pregnancy is prolonged beyond a particular period of time it does not benefit from these changes. In-fact the risks to mother and baby resemble those in a primigravida [9].

An alternate reasoning points towards underlying issue of subfertility that can delay the subsequent pregnancy and thereby increase the risks of adverse outcomes [10].

Effect of IPI on maternal health

Cardiovascular Disease (CVD)

As stated before, pregnancy is a state of "stress" on the maternal metabolic and cardiovascular systems. The various physiological changes result in insulin resistance, hyperlipidaemia and hypercoagulability and an increase in the inflammatory response. These deleterious effects on the systems are temporary and the changes gradually revert back post-delivery. However, with shorter IPI, these changes have a compounding effect and could cause longer lasting or even irreversible changes to the maternal vascular system [11].

In women with shorter IPI there is further physical, emotional and economic stress of caring for closely spaced children. On the other hand, women with longer IPI have the added social stress of widely spaced family. These can have accumulative effects on the women's cardiovascular system [12].

In an Australian study reviewing the association between IPI and future maternal cardiovascular disease, the investigators demonstrated a 'J' shaped curve. This meant that both short and long IPI were associated with increased risk of CVD in later life. The association was independent of the existing and pregnancy-related CVD risk factors analysed such as smoking and other socio demographic factors. The lowest risk was among women having an IPI of 18–23 months and the highest risk among women with an IPI of ≥120 months [1].

Maternal obesity

Short IPI of <12 months may not provide adequate time to appropriately lose weight gained during pregnancy and return to the "normal" pre-pregnancy metabolic state before the conception of the next pregnancy. This was shown to result in 2.4-fold increase in maternal obesity [13].

Another study conducted in Guatemala, found that an IPI of <9 months was associated with a higher pre-pregnancy weight when compared with an IPI of ≥15 months ($P < 0.05$) [14].

Maternal anaemia

The relationship between maternal anaemia and IPI is explained on the basis of the Maternal Depletion Hypothesis as explained before. In their study, Iffat et al demonstrated that participants with IPI less than 2 years had a higher percentage of anaemia when compared to participants with IPI more than 2 years. When divided among degrees of anaemia, again the women with shorter IPI tended to fall more in the moderate and severe anaemia category [15]. Another large study including data from 18 Latin American countries reported a 30 percent increase in risk of maternal anaemia after IPI less than 6 months [16].

Preeclampsia and Placental Abruption

Cormick et al. conducted a systematic review to assess the recurrent risk of preeclampsia/eclampsia according to IPI. They reported that intervals shorter than 2 years or longer than 10 years increased the risk of recurrent pre-eclampsia. They concluded that even though IPI was a minor risk factor for recurrent preeclampsia, it is nonetheless, together with weight reduction an important modifiable risk factor and interventions such as family planning measures can be targeted prior to next conception [17].

Other studies also showed that the risk of new preeclampsia in a subsequent pregnancy following a long IPI is directly proportional to the time elapsed since the previous birth, with an adjusted OR of approximately 1.1 for every additional year. Women with an IPI greater than 10 years have a risk for preeclampsia similar to that of a nulliparous woman [18].

In a large United States study, short inter-pregnancy interval of less than six months was associated with increased risk for placental abruption (OR 1.8, 95%CI 1.2-2.7) [19].

Uterine Scar rupture and adverse outcome in future pregnancy

Other factors that have been shown to contribute to the adverse outcomes due to short IPI are cervical insufficiency and competition between siblings for maternal resources in addition poor healing of uterine scar in case of previous delivery by caesarean section [20].

A trial of labour after caesarean (TOLAC) has been reported to be associated with increased risk of uterine rupture among women with short inter-delivery interval (IDI) of < 18 months [21]. The presumed mechanism for the increased risk is incomplete healing of the uterine scar [22]. On the other hand, longer IDI of 18-24 months did not show increased risk [23].

Maternal mortality

A cross-sectional study done in Latin America conducted on 456,889 parous women reported that maternal death was 2.54 times more likely after an IPI less than 6 months versus 18 to 23 months [16].

Longer IPI and adverse outcomes

In a Chinese study, the association of longer IPI with adverse perinatal outcome was studied. They found that women with longer IPIs have a higher risk of certain adverse perinatal outcomes, including gestational diabetes mellitus and premature rupture of membranes. Moreover, the rates of adverse perinatal outcomes increased with an increasing IPI, with the ≥120 months IPI group showing the highest adverse outcome rate [24].

Adverse outcomes following miscarriage

Shachar et al. reported that short IPI for women after pregnancy termination was not associated with increased odds for preterm birth. They concluded that these women and women of advanced maternal age and couples with fertility problems may in fact benefit from a short IPI [25]. Study from Scotland also supports that conception within a short interval (6 months) after an abortion does not result in adverse pregnancy outcomes [9].

However, Nonyane et al. argued that these results reflected condition in high income countries. In contrast results from low- and middle-income countries such as India, Latin America and Bangladesh indicate that short intervals after a stillbirth, neonatal death or spontaneous abortion, are associated with increased risk of adverse pregnancy outcomes [26].

Effect of IPI on perinatal health

Preterm Birth (PTB)

Various studies have explored the link between IPI and preterm birth. The rationale behind this can be explained by the Maternal Depletion Hypothesis wherein there is deficiency of micronutrients needed for cell proliferation, fetal development, and proper function of the placenta. This could result in dysfunction of the maternal–fetal interface, leading to either spontaneous preterm birth or complications related to placental dysfunction and subsequent medially indicated preterm birth. These effects may be compounded by other co-existing factors such prior preterm birth, poor maternal nutrition and chronic medical conditions [2].

Shachar et al. reported that women who have IPI < 6 months have a 70% higher risk of preterm birth than women with an optimal interpregnancy interval, while the risk for those with an IPI of 6 to 11 months is 20% higher. Women who wait 36 to 48 months also face a 7% increased risk of going into labour or being induced early [25].

Systematic reviews were conducted by Wendt et al and Conde-Agudelo et al. and both reported moderate evidence for IPI <12 months and the risk of preterm birth [4,27]. Another study reported that women with both short IPI and longer IPI having 1.6 times higher risk of preterm birth. They concluded that the optimal interpregnancy interval was 15 months as the association between inter-pregnancy interval and the natural logarithm of the adjusted relative risk of preterm birth had a J-shaped curve with lowest risk at 15 months after last birth [28].

Several investigators have argued that the apparent association between short IPI and obstetrical complications may simply reflect confounding factors such as maternal age, socioeconomic status, lifestyle, and the outcome of the previous pregnancy. This argument was refuted in a study where investigators used both unconditional and conditional logistic regression models to prove that short IPI (<6 months) was associated with increased risk for PTB [25].

Preterm Premature rupture of membranes (PPROM)

The Intrauterine inflammation hypothesis can be applied to explain this association with short IPI. Razzaque et al reported an IPI of 6 to 14 months to be associated with increased risk of PPROM in subsequent pregnancy [29]. In their systematic review, Conde Agunelo et al. attributed the reason behind the increased risk of PPROM to abnormal process of remodelling of endometrial blood vessels and maternal nutrition depletion [7].

Low birth weight (LBW)

In a 2006 meta-analysis including 10 studies, IPI < 6 months was associated with a 60% increase in risk of LBW when compared with IPI of 18 to 23 months [4]. Another meta-analysis found moderate evidence that IPI < 12 months was associated with LBW in subsequent pregnancy [27]. A Tanzanian study also reported that shorter IPI of <18 months increases relative risk for LBW

(RR=6.7; 95% CI 3.6-12.3) and small for gestational age (SGA) (RR=7.7; 95% CI 3.8-15.7) [30].

Congenital anomalies

An increased risk of congenital anomalies in births following both short or long IPI have been reported [31]. In a population-based retrospective cohort study, the congenital anomaly rates with IPI < 6 months, 12-17 months and ≥24 months were 2.5%, 1.9% and 2.3% respectively. However, this association was significant only for folate-independent anomalies suggesting that the folate depletion hypothesis did not play a role here [32].

Autism and Schizophrenia

A large-population survey from California reported that second children born after an IPI less than 12 months versus IPI of ≥36 months were 3.39 times more likely to be diagnosed with autism, independent of risk factors such as LBW, PTB, or previous child with autism [33]. In other studies, maternal folate supplementation was associated with a reduced risk of autism among offspring, which supports the hypothesis that maternal depletion plays a role in the association between autism and short IPI [34].

Gunawardana et al. found that IPIs less than 6 months or 7 - 12 months were associated with an increased risk for developing schizophrenia, with hazard ratios of 2.62 and 1.78, respectively. They attributed this result to conception following a short IPI whilst the maternal stores of folate were still being replenished [35].

Perinatal mortality

Inconsistent findings have been reported while establishing a relationship between short IPI and fetal, neonatal or infant death. This inconsistency can be partially explained by differences in parity. One study that found no significant correlation assessed women only after their first pregnancy [36]. In the positive study, odds ratios of 1.3 to 3.6 for fetal, neonatal, or infant death after a short IPI have been reported in multiparous women [37]. Since high parity can be associated with depletion in maternal nutrient reserves, women of low parity may be able to recover faster from one pregnancy to the next and thus not experience the adverse effects of a short IPI [2].

Analysis of US data from the Demographic and Health Survey (DHS) has shown that compared with an interval of 24-29 months, a birth interval of 36-41 months was associated with 26%, 43% and 51% reduction in deaths in neonatal, infant and under 5-year-olds respectively [38]. This does indicate that even if there is no robust data that shorter IPI increases the risk of perinatal mortality, a longer birth interval however does improve the chances of survival of the infants and children.

Long term follow-up

One of the earliest studies that examined the effect of IPI on mental development and the school performance of the children born after a short IPI was conducted over 20 years ago in Singapore [39]. The study reported that children born after IPI of ≥ 2 years did better in school when compared to their counterparts that were conceived after IPI of < 2 years.

A more recent study on urban Saudi population verified previous findings that children born after adequate birth intervals do better at school. The study revealed that the succeeding birth interval in relation to school performance is more significant than the preceding birth interval. Apart from mother's education and breastfeeding, no other variables were found to be significantly related to the birth interval [40].

Concept of interpregnancy care

On balance the available evidence suggests that short IPI is a strong predictor of risk of adverse birth outcomes. Irrespective of whether the risk is increased by the short IPI or by other co-existing maternal factors, the association between short IPI and adverse birth outcomes is strong and consistent across studies [41]. As short IPI is a modifiable risk factor that can be addressed, women can have control over their pregnancy spacing and can potentially reduce the risk of adverse events if given access to effective postpartum contraception.

The concept of interpregnancy care was introduced by the World Health Organisation which has been endorsed by multiple international health agencies [42]. It is defined as the care that addresses the woman's health needs during the interval between one live birth or pregnancy loss and the start of the next pregnancy. It aims to maximise the woman's level of wellness. The components include family planning measures, optimising management of medical diseases, supplementation in case of deficiencies, vaccination and education for future health. Thus, effective birth spacing will not just improve the future obstetric outcomes but also add to the overall health and wellbeing of the women and their children [43].

Postpartum contraception

All the evidence stress the importance of birth spacing plans for optimal maternal and child health. Postpartum contraception is a key strategy that will not only be an intervention for improving wellbeing but also improve future obstetric outcomes.

NICE guidance on postnatal care suggests that contraception counselling should be discussed within the first week of delivery and implemented by 3 weeks postpartum [44]. Information on Postpartum contraception may be better delivered in the antenatal period, prior to birth. The women and partners have greater time to think through their options than immediately after birth when it may not seem like a priority [45] Best practice in postpartum family planning aims to ensure that women have a method of contraception that they can start before the risk of pregnancy returns after childbirth [46].

Table 1 and 2 shows the different contraceptive choices available in the postpartum period based on the UK medical eligibility category [50]. Women should be informed about all methods that are available and appropriate for them to use. Long-acting

reversible contraception (LARC) such as the progestogen-only injectable, implant and intrauterine methods offers the advantage of being less user-dependent, provide the best protection against pregnancy with 'typical use' and can be cost-effective [46].

UKMEC	Definition of category
Category 1	No restriction for use of method
Category 2	Advantages of using the method generally outweigh the theoretical or proven risks
Category 3	Theoretical or proven risks usually outweigh the advantages of using the method. The provision of a method requires expert clinical judgement and/or referral to a specialist contraceptive provider, since use of the method is not usually recommended unless other more appropriate methods are not available or not acceptable.
Category 4	An unacceptable health risk if the method is used

Table 1: UK Medical Eligibility for Contraceptive Use (UKMEC) definition of category [50].

Contraception method		Timing of initiation		
		0 to < 48 hrs	48 hrs to <4 weeks	≥4 weeks
Lactational Amenorrhea Method (LAM)		UKMEC 1	UKMEC 1	UKMEC1
Barrier Methods	Condoms	UKMEC 1	UKMEC 1	UKMEC 1
	Diaphragm			
	Cervical cap			
Combined hormonal contraception	Estrogen progesterone pills	UKMEC 4	UKMEC 4	UKMEC 2 (≥ 6 weeks)
	Transdermal patch			
	Vaginal ring			
Progesterone only contraception	Progesterone only pill	UKMEC 1	UKMEC 1	UKMEC 1
	Injectables			
	Implants			
Intrauterine contraception	Copper	UKMEC 1	UKMEC 3	UKMEC 1
	Levonorgestrel releasing intrauterine system			

Table 2: Methods of contraception available to postpartum women [50].

Breastfeeding as a spacing strategy

Lactational Amenorrhea Method (LAM) was defined during the 1988 Bellagio Consensus Conference in Italy as the informed use of breastfeeding as a contraceptive method by a woman who is still amenorrheic and does not feed her baby with supplements for up to six months after delivery. LAM provides more than 98% protection from pregnancy in the first six months postpartum provided the previous mentioned conditions are met [47].

A Cochrane review in 2015 studied the effectiveness of LAM as a contraceptive method in fully breastfeeding women with support of counselling and regular follow-up in comparison to breastfeeding women without any support. They found no clear differences in effectiveness between women using LAM and being supported in doing so, and fully breastfeeding amenorrheic women not using any method. They however did recommend breastfeeding itself from a public health point of view [48]. Exclusive breastfeeding especially during the first 6 months post-delivery has also been promoted by the World Health Organisation as a health measure and as a spacing tool [49].

Conclusion

Both short and long interpregnancy intervals have been implicated with maternal and perinatal adverse outcome, but the bulk of adverse effects have been associated with short intervals. Child spacing is a matter of choice and couples need to make this decision based on personal preferences and situation as well as on accurate information. Appropriate spacing after childbirth can improve maternal and child health and have the potential to significantly improve the wellbeing and prosperity of societies and nations and their future generations. The responsibility of delivering this message rests with the health care workers providing care to the community.

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