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Original Research Article

Effect of inter-pregnancy interval on pregnancy outcome

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ABSTRACT

Background: The inter-pregnancy interval (IPI) significantly impacts maternal and child health outcomes. Objective of the study was to determine the effect of inter-pregnancy interval on maternal and foetal outcome.
Methods: This prospective observational study was conducted at Sri Ramachandra Institute of Higher Education and Research Institute from September 2022 to April 2024. A total of 385 pregnant women in their second pregnancy were categorized into three groups based on the inter-pregnancy interval as short (<24 months), optimal (24-59 months), and long (>59 months). Data on maternal outcomes, intrapartum assessments, and foetal complications were collected and analysed using descriptive and comparative statistics.
Results: Out of 385 participants, 37.1% had an IPI of <24 months, 55.1% had an IPI of 24-59 months, and 7.8% had an IPI of >59 months. Shorter IPIs were associated with higher rates of anaemia (77%) and postpartum haemorrhage (45.8%). Longer IPIs were linked to increased gestational diabetes (50%) and hypertensive disorders (63.3%). Foetal complications such as macrosomia were more common in the longer IPIs group (16%).
Conclusions: Both short and long IPIs are linked with adverse maternal and foetal outcomes, emphasizing the need for optimal spacing between pregnancies to improve health outcomes.

Keywords: Inter-pregnancy interval, Maternal health, Foetal health, Pregnancy outcomes, Spacing

INTRODUCTION

The inter-pregnancy interval (IPI) is a dynamic continuum that represents a multiplicity of complex factors that influence the course of a woman's subsequent pregnancies within her reproductive chronology. It symbolizes not just a time interval between pregnancies but also a period of fundamental changes in the body, mind, and society that have an impact on the health of mothers and children.[1] According to World Health Organization (WHO), the best time to give birth is at least 24 months apart from the previous pregnancy, or 33 months or more between two consecutive births.[2] The time between pregnancies provides the body with a chance to recover from the stresses of pregnancy, childbirth, and nursing. When pregnancies are spaced out optimally, maternal health markers like iron preservation, folic acid levels and overall nutritional status can be restored.[3] The inter-pregnancy interval interacts with a wide range of societal factors that influence healthcare access and reproductive decision-making, in addition to biological factors. The time and spacing of pregnancies are significantly influenced by cultural norms, socioeconomic level, educational achievement, and geographic location, all of which modify the trajectory of mother and child health outcomes.[4]

Furthermore, the inter-pregnancy interval serves as a crucial indicator of maternal well-being, directly influencing maternal mortality rates and healthcare access disparities.[5]

Objective

Objective of the study was to determine the effect of inter-pregnancy interval on maternal and foetal outcome.

METHODS

This prospective observational study was conducted among 385 pregnant women in their 2nd pregnancy, with previous singleton pregnancies, attending the Department of Obstetrics and Gynaecology, in a tertiary care teaching hospital located in Chennai, from September 2022-April 2024. Subjects were categorized into three groups based on their interpregnancy interval (IPI): short (less than 24 months), optimal (24 to 59 months), and long (more than 59 months) IPI groups. This sample size was deemed adequate to achieve the study objectives while ensuring statistical robustness. Those with pregnancies involving multiple foetuses, or with pre-existing medical conditions before conception, such as chronic hypertension, diabetes mellitus, cardiovascular or thyroid disorders, or those who have undergone a lower segment caesarean section in a previous pregnancy were excluded. The study protocol was reviewed and approved by the institutional ethics committee to ensure compliance with ethical standards and guidelines (Ref: CSP-MED/22/AUG/79/121). Accordingly, throughout the study, strict adherence to ethical guidelines was maintained to safeguard the rights and well-being of the participants. Patient confidentiality was ensured, and informed consent was obtained from all participants before their inclusion in the study. Maternal outcomes included conditions like abortion, ectopic pregnancy, molar pregnancy, anaemia, gestational diabetes mellitus, hypertensive disorders in pregnancy, abruptio placenta, placenta previa, malpresentations, post-dated pregnancies and postpartum haemorrhage. In addition, intrapartum assessment involving mode of onset of labour and delivery was considered. Foetal outcomes included conditions like foetal growth restriction, intrauterine foetal death, preterm birth, small for gestational age, macrosomia, meconium aspiration, and early neonatal death. Data analysis was done using appropriate software such as statistical package for the social sciences (SPSS) version 22, after entering the data into Microsoft excel 2013. Descriptive statistics included mean, standard deviation, median, and interquartile range for continuous variables, and frequency distributions for categorical variables. Comparative analysis to compare maternal and foetal outcomes among the three groups was done by Chi-square test or Fisher's exact test for categorical variables, and analysis of variance (ANOVA) for continuous variables, where $p<0.05$ was statistically significant.

RESULTS

Out of 385 participants, 143 (37.1%) had an inter-pregnancy interval of less than 24 months, 212 (55.1%) had interval of 24 to 59 months and 30 (7.8%) had more than 59 months interval. Accordingly, they were classified as short, optimal, and long inter-pregnancy interval groups (Figure 1). Age distribution among the participants from the 3 groups was comparable, with most were of 20-35 years age, with 90.9%, 95.8%, and 86.7% respectively. Similarly, participants aged >35 years were 4.9%, 4.2%, and 13.3% respectively.

Among the 385 participants, maternal complications included many conditions, of which anaemia was found to be more common among the pregnant women, followed by gestational diabetes and pregnancy related hypertension disorders. Upon comparison of the maternal complications among the IPI groups, conditions like miscarriage, ectopic pregnancy, molar pregnancy, abruption, placenta previa, and malpresentation were comparable among the 3 groups. Anaemia was significantly higher among the optimal group. Gestational diabetes, pregnancy related hypertension disorders and post-dated pregnancy were significantly higher among the long IPI group. Short IPI group had significantly higher proportion of women with PPH ($p<0.05$) (Table 1).

After excluding those pregnant women who did not deliver due to complications like miscarriage, ectopic pregnancy and molar pregnancy, delivery related aspects were compared among the three IPI groups, which showed no significant difference with respect to pre-term delivery. However, induced labour and LSCS deliveries were significantly higher among the long IPI group ($p<0.05$) (Table 2).

Similarly, comparison of foetal complications showed that most of them were comparable among the three IPI groups. Proportion of meconium-stained liquor and macrosomia were significantly more among the long IPI group ($p<0.05$) (Table 3).

Table 1: Comparison of maternal complications among the 3 IPI groups (n=385).

Variables	Inter-pregnancy interval (IPI) group (%)			Total	P value
	Short (n=143)	Optimal (n=212)	Long (n=30)		
Miscarriage	40 (28.0)	56 (26.4)	04 (13.3)	100 (100.0)	0.254
Ectopic pregnancy	18 (12.6)	31 (14.6)	01 (3.3)	50 (100.0)	0.237
Molar pregnancy	02 (1.4)	04 (1.9)	00 (0.0)	06 (100.0)	0.999
Anaemia	110 (76.9)	170 (80.2)	13 (43.3)	293 (100.0)	<0.001*
GDM	26 (18.2)	85 (40.1)	15 (50.0)	126 (100.0)	<0.001*
Pregnancy HTN disorders	23 (16.1)	73 (34.4)	19 (63.3)	115 (100.0)	<0.001*
Abruption	02 (1.4)	04 (1.9)	01 (3.3)	07 (100.0)	0.999
Placenta previa	01 (0.7)	03 (1.4)	01 (3.3)	05 (100.0)	0.344
Malpresentation	06 (4.2)	13 (6.1)	02 (6.6)	21 (100.0)	0.685

Continued.

Variables	Inter-pregnancy interval (IPI) group (%)			Total	P value
	Short (n=143)	Optimal (n=212)	Long (n=30)		
Postdated pregnancy	02 (1.4)	03 (1.4)	04 (13.3)	09 (100.0)	0.003*
PPH	38 (45.8)	30 (24.8)	06 (24.0)	74 (100.0)	0.015*

*P<0.05 is statistically significant.

Table 2: Comparison of delivery related aspects among the 3 IPI groups (n=385).

Variables	Inter-pregnancy interval (IPI) group (%)			Total	P value
	Short (n=83)	Optimal (n=121)	Long (n=25)		
Pre-term delivery	26 (31.3)	27 (22.3)	07 (28.0)	60 (100.0)	0.347
Induced labour	33 (39.7)	67 (55.4)	21 (84.0)	121 (100.0)	<0.001*
LSCS delivery	20 (24.1)	44 (36.4)	17 (68.0)	81 (100.0)	<0.001*

*P<0.05 is statistically significant.

Table 3: Comparison of foetal complications among the 3 IPI groups (n=385).

Variables	Inter-pregnancy interval (IPI) group (%)			Total	P value
	Short (n=83)	Optimal (n=121)	Long (n=25)		
Foetal growth retardation	20 (24.1)	20 (16.5)	01 (4.0)	41 (100.0)	0.197
Intra uterine foetal death	02 (2.4)	03 (2.5)	01 (4.0)	06 (100.0)	0.900
Preterm birth	26 (31.3)	27 (22.3)	07 (28.0)	60 (100.0)	0.292
Short for gestational age	43 (51.8)	51 (42.1)	07 (28.0)	101 (100.0)	0.090
Meconium-stained liquor stained liquor	12 (14.5)	31 (25.6)	12 (48.0)	55 (100.0)	0.002*
Early neonatal death	01 (1.2)	02 (2.5)	01 (4.0)	04 (100.0)	0.641
Macrosomia	02 (2.4)	08 (6.6)	04 (16.0)	14 (100.0)	0.042*

*P<0.05 is statistically significant.

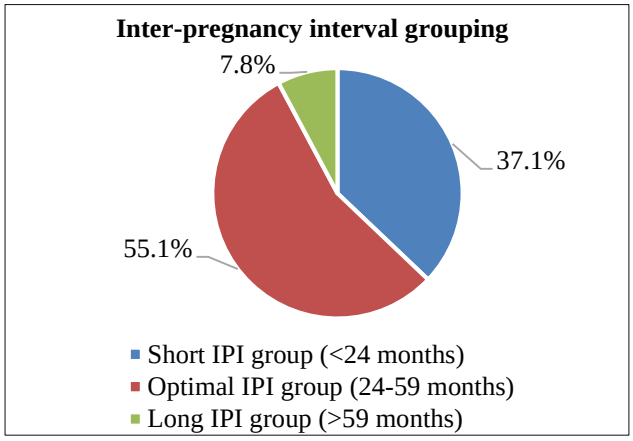

Figure 1: Grouping of participants based on the inter-pregnancy interval (n=385).

DISCUSSION

The study aimed to determine the effect of inter-pregnancy intervals on maternal and foetal outcomes by analysing the distribution of these intervals among 385 participants and comparing them across different age categories. The findings indicate a predominant occurrence of shorter inter-pregnancy intervals (<24 months) among the study population, even though those with optimal interval were more in the present study. This is a point of concern as a systematic review by Gemmill and Lindberg and other studies supported the conclusion that short interpregnancy intervals are linked to higher risks of adverse outcomes, similar to the present study findings.[6-10] Coming to the age distribution, majority of participants in the present study were between 20-35 years old (93.2%), with most of the shorter inter-pregnancy intervals (<24 months) occurring within this age group. This age distribution is consistent with other studies that show younger women, particularly those in their prime reproductive years, are more likely to have shorter intervals between pregnancies.

The current study found no significant difference in first trimester complications, including miscarriage, ectopic pregnancy, and molar pregnancy, across different IPIs. Miscarriage was the most common complication in all three groups. This aligns with previous systematic review finding by Hutcheon et al confirmed that shorter IPIs are not linked to higher miscarriage rates.[11]

Anaemia was most prevalent in the <24 months and 24-59 months IPI groups, with a significant drop in the >59 months group. This pattern might be attributed to maternal nutritional depletion in shorter IPIs. GDM was significantly higher in the >59 months group. This finding is supported by other studies suggesting that longer IPIs are associated with an increased risk of GDM, possibly due to age-related insulin resistance and metabolic changes. A study by Hanley et al in 2019 also reported similar findings, highlighting that the risk of GDM increases with longer IPIs due to factors like maternal age and weight gain between pregnancies.[12] Prevalence of hypertensive

disorders like gestational hypertension, pre-eclampsia, and eclampsia was notably higher in the >59 months IPI group. This is in line with studies showing that longer IPIs are associated with increased risks of hypertensive disorders due to similar age-related vascular changes and weight gain.[13] Shachar and Lyell et al study demonstrated an increased risk of hypertensive disorders with longer IPIs.[14] Similarly, Schummers et al found that maternal age and extended intervals between pregnancies contribute to higher rates of hypertension-related complications.[15] Postdated pregnancy was more common in the >59 months IPI group. This might be linked to changes in uterine and placental function over time, supporting findings from other research indicating that longer IPIs can increase the likelihood of postdated pregnancies.[16,17] Wendt et al reported that extended IPIs correlate with higher incidences of post-term deliveries.[18] PPH was significantly more common in the <24 months IPI group. This could be due to the insufficient recovery period for the uterus and other reproductive organs between closely spaced pregnancies. The distribution of complications such as abruption, placenta previa, and malpresentation did not show significant differences across IPI groups. This consistency suggests that these specific complications might be less influenced by the length of the IPI and more by other factors such as maternal age, health status, and genetic predispositions. These findings are supported by similar studies indicating that the risk for these complications remains relatively stable regardless of IPI.[19] In the present study, it was found that shorter IPIs (<24 months) were associated with a higher incidence of spontaneous labour (60.2%), while longer IPIs (>59 months) showed a significant increase in labour induction (84%). This trend is consistent with findings by Tessema et al, who reported that short IPIs are associated with increased spontaneous labour, possibly due to residual physiological adaptations from the previous pregnancy that facilitate natural labour onset.[20] Significant differences were observed in foetal complications in the present study, particularly with longer IPIs. For instance, meconium-stained liquor was most prevalent in the >59 months group, which is consistent with literature indicating increased risks of foetal distress in post-term pregnancies associated with prolonged IPIs.

Strengths

This study was conducted in a tertiary care hospital equipped with the most modern and advanced amenities, meeting the medical demands of a sizable population, during the study period as well as after the delivery. As a result, we had access to high-risk obstetric patients with a range of presenting types.

Limitations

One limitation of this study is the potential for confounding variables, which could influence both the inter-pregnancy interval and pregnancy outcomes. Another limitation is the sample size, which may not be large enough to detect small but clinically significant differences in outcomes, or to allow for stratification by important variables such as maternal age or pre-existing health conditions.

CONCLUSION

The study concludes that both very short and very long IPIs are linked with adverse maternal and foetal outcomes, emphasizing the need for optimal spacing between pregnancies to improve health outcomes. Ultimately, promoting optimal inter-pregnancy intervals offers significant benefits for maternal and child health, social wellbeing, and sustainable development.

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