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Original Article

Obstetrics and Gynaecology Section

Interpregnancy Interval Effect on Perinatal Outcome- A Prospective Observational Study

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ABSTRACT

Introduction: Spacing of birth is an important parameter affecting maternal and foetal health. Optimal birth spacing provides multiple benefits for both mother and her child. Both short and long Interpregnancy Intervals (IPI) is associated with multiple adverse perinatal outcomes. Therefore, IPI is viewed as a potential modifiable risk factor for adverse foetal-maternal outcome.

Aim: To study the association of IPIs with adverse maternal and foetal outcomes.

Materials and Methods: This prospective observational study was conducted in R.G. Kar Medical College and Hospital, Kolkata, West Bengal, India for a period of 18 months from January 2019 to June 2020. All multigravida women with atleast three antenatal checkups were included in the study. The subjects were divided in two groups: group A consisted of 86 subjects, who had <2 year IPI and group B consisted of 87 subjects, who had ≥2 year IPI. These were compared on the basis of following socio-demographic characteristics: maternal age, Body Mass Index (BMI), contraceptive use, socio-economic status. Foetal outcome was assessed by gestational age at delivery, birth weight, Appearance, Pulse, Grimace, Activity and Respiration (APGAR) score, need for Neonatal Intensive Care Unit/Sick Neonatal Care Unit (NICU/SNCU) admission and perinatal morbidity and mortality. Data were collected and statistically analysed using Statistical Package for Social Science (SPSS) version 19.0 (SPSS Inc, Chicago, IL, USA). Chi-square test was used for categorical data and students t-test was used for continuous data. Statistical significance in all evaluations was defined as p-value <0.05.

Results: Contraception use were significantly less in women with short IPI (p=0.001). The incidence of anaemia (p=0.026), scar dehiscence in postcaesarean pregnancies (p=0.031) and Postpartum Haemorrhage (PPH) (p=0.041) were also higher in mothers with short IPI. In this group incidence of low-birth-weight baby (p=0.039), preterm birth (p=0.041) and need for care of babies in NICU (p=0.043) were also higher and was statistically significant.

Conclusion: Lack of contraceptive use significantly increases the risk of short IPI which increases the risk of preterm delivery, maternal anaemia PPH and scar rupture in post-CS pregnancy and therefore, has a serious impact on maternal morbidity. Low birth weight and NICU/SNCU admission being more in group A was a drain on the health expenditure.

Keywords: Birth spacing, Contraceptive use, Preterm delivery

INTRODUCTION

Maternal and child health are considered as parameters of quality of healthcare of any nation. Birth spacing or IPI is an important affecting factor as both short and long IPI are associated with multiple adverse perinatal outcomes. World Health Organisation (WHO) recommends that birth spacing should be a minimum of two years. Recent studies by United States Agency for International Development (USAID) have suggested a birth spacing of 3-5 years might be more advantageous [1]. Globally around 25% birth still occurs at an interval of less than 24 months. Most cases were seen in Central Asia (33%) and Sub-Saharan Africa (20%) [2]. It is estimated that, if all IPI were fixed at a minimum of three years around 6 million of under five deaths could be averted annually [3]. Both short (<18 months) and long (>59 months) IPIs are associated with increased risks of adverse perinatal outcomes such as preterm birth, low birth weight, small for gestational age and need for NICU admission [4]. Conversely, the effect on maternal complications during pregnancy has received less attention. Some studies had shown that short IPI is associated with Premature Rupture Of Membrane (PROM), placental abruption, placenta praevia, Gestational Diabetes Mellitus (GDM) and increased risk of scar rupture in postcaesarean mothers. Similarly, long IPIs have long been related to increased risk of preeclampsia and labour dystocia [5]. A study also found that birth spacing is also related to long term cognitive development in children [6]. Besides the health implications, closely spaced birth intervals accelerate the population growth, and prevent women from contributing to society. According to WHO's Global Health Observatory, birth spacing is the option of individual or couples and it can be modified by making them aware of modern contraceptive methods and technologies. The importance of birth spacing has been a primary focus for researchers and policy makers. With this background, the current study was undertaken to compare maternal and perinatal outcomes in short and long IPI groups.

MATERIALS AND METHODS

It was a prospective observational study, done at the Department of Gynaecology and Obstetrics, R.G. Kar Medical College and Hospital, a tertiary level hospital in Kolkata, West Bengal, India the duration of 18 months (January 2019 to June 2020). The study was approved by Institutional Ethics Committee of R.G. Kar Medical College and Hospital, Kolkata, (Memo no. RKC/495 DT 15/01/19). All multigravida women with singleton pregnancy admitted in the labour ward, during the study period were taken as the study population.

Sample size calculation: The value of standard normal deviate is 1.96, considering 95% Confidence Interval (CI). The proportion of preterm deliveries in India is around 13-15% [7]. Keeping this in mind, the sample size calculated was 173, where "L" (precision in absolute term) was considered as 5. To select the study subject

systematic random sampling was applied. As about 150 antenatal mothers were admitted in Labour Ward every week, considering that, the sampling interval was 10.

Inclusion criteria: All multigravida women carrying a singleton pregnancy having a reasonable information and records of previous and current pregnancy and having atleast three antenatal visits during the present pregnancy were included in the present study.

Exclusion criteria: Primigravida, women with multiple gestation a past history of preterm delivery or abortion in between previous pregnancy and index pregnancy or with cervical incompetence and uterine anomalies were excluded from the study.

Study Procedure

The subjects were divided into two groups. group A consisted of 86 subjects who had <2 year IPI and group B consisted of 87 subjects who had ≥2 year IPI. Age, gravida and parity, gestational age at delivery, Body Mass Index (BMI), socio-economic status and contraceptive use were evaluated for each subject. Eligible women were selected after proper informed consent. Data were collected in prescribed proforma from antenatal and hospital records, thorough history and examination and daily regular observation of the patient, Routine laboratory investigations, and ultrasonography including dating scan, anomaly scan and growth scan were recorded.

Neonatal records of birth weight, APGAR score at 1 and 5 minutes, and need for admission to the NICU/SNCU was also recorded. IPI was calculated for each case. IPI is defined as delivery date of previous pregnancy- Last Menstrual Period (LMP) of present pregnancy [1]. Where LMP was not known or the patient conceived during lactational amenorrhoea, date of conception was calculated from earliest ultrasonography findings available.

Primary outcome (Perinatal outcome): (1) Preterm Birth: A neonate born before 37 completed weeks of gestation. (2) Birth weight: Low birth weight <2500 g; Very low birth weight=1000-1500 g; extremely low birth weight <1000 g [8]. (3) SNCU and NICU admission (4) APGAR score: 7-10=Healthy; 4-6=Moderately depressed; 0-3=Severely depressed [9]; (5) Stillborn/Intrauterine Foetal Death (IUFD) (6) Early and late neonatal death: Death within first seven days (Early); Between 7-28 days (Late) of birth.

Secondary outcome (Maternal outcome): (1) Preterm Labour (2) GDM (3) Antepartum haemorrhage: Placenta praevia, morbidly adherent placenta, Abruptio placentae (4) Risk of scar rupture in previous caesarean section pregnancy. (5) Intrauterine Growth Retardation (IUGR).

STATISTICAL ANALYSIS

Data analysis was done with SPSS 19.0 (SPSS Inc, Chicago, IL, USA). Chi-square test was applied for categorical data and Student's t-test was applied for continuous data. Statistical significance in all evaluation was defined as p-value <0.05.

RESULTS

Comparison of socio-demographic characteristics: The subjects were compared on the basis of following socio-demographic characteristics: maternal age, BMI, socio-economic status and contraception use.

The mean age in group A was 23.73±3.281 SD and 24.45±2.386 with a p-value=0.102. The average BMI in both the groups were highest in the 18.5-24.9 kg/m^2 category with group A (91.9%) and group B (96.6%) making the p-value=0.193. Most of the mothers in group A belonged to the lower socio-economic group (48.8%) and that of group B belonged to lower middle class (36.8%) [10]. Majority of the mothers were second gravida; those in group A was 40 (46.5%) and in group B was 39 (44.8%), p-value=0.140.

In group A, 36% mothers used contraception in contrast to 70.1% mothers in group B, p-value ≤0.001, which is statistically significant [Table/Fig-1].

Contraceptive use	Group A (n=86)	Group B (n=87)	p-value
Yes	31 (36%)	61(70.1%)	≤0.001
No	55 (64%)	26 (29.9%)	

[Table/Fig-1]: Comparison of contraceptive use among the two groups.
* Chi-square test

Comparison of study subjects based on antenatal complications: The antenatal complications compared were as following: Anaemia (p=0.026), Preterm labour (p=0.041), hypertensive disorders of pregnancy (p-value=0.853), GDM (p-value=0.977), PROM (p-value=0.983), placenta previa (p-value=0.770), abruptio placentae (p-value=0.479), IUGR (p-value=0.779). None of the conditions were found to have statistically significant difference between two groups except anaemia and preterm labour [Table/Fig-2].

Parameters evaluated		Group A (n=86)	Group B (n=87)	p-value
Anaemia	Yes	41 (47.7%)	23 (26.4%)	0.026
	No	45 (52.3%)	64 (73.6%)	
Gestational age at delivery	(<37 weeks)	20 (23.3%)	10 (11.5%)	0.041
	(≥37 weeks)	66 (76.7%)	77 (88.5%)	
PPH	Yes	16 (18.6%)	7 (8%)	0.041
	No	70 (81.4%)	80 (92%)	

[Table/Fig-2]: Table demonstrating antepartum and postpartum complications between the two groups.
*Chi-square test

Mode of delivery and postpartum complications: Vaginal delivery, instrumental delivery and caesarean section were similar in both groups (p-value=0.860). The number of mothers belonging to group A who underwent caesarean section was 29 and it was 26 in group B. Of them, 18 were scar dehiscence postcaesarean pregnancies in group A and 19 in group B. While evaluating postoperative complications Postpartum Haemorrhage (PPH) p-value=0.041 [Table/Fig-2] and scar dehiscence p-value=0.031 were more in short IPI group and was statistically significant [Table/Fig-3].

Scar dehiscence in post-Cs pregnancy	Group A (n=18)	Group B (n=19)	p-value
Yes	10 (55.6%)	4 (21.1%)	0.031
No	8 (44.4%)	15 (78.95%)	

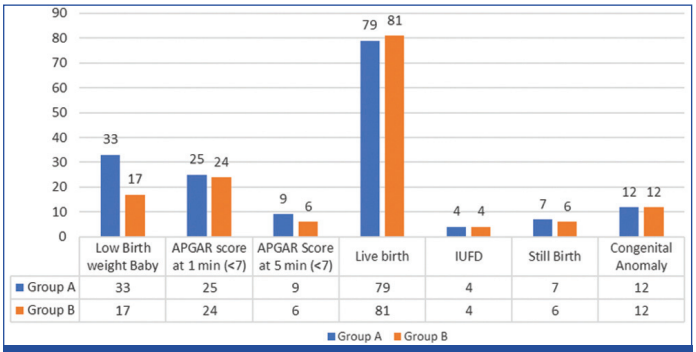
[Table/Fig-3]: Table comparing the occurrence of scar dehiscence among the two groups.
*Chi-square test

Comparison based on perinatal outcome between group A and group B: Perinatal complications were compared in terms of low birth weight (defined as birth weight <2500 grams), APGAR score at 1 and 5 minutes, number of IUFD, still birth and live birth and congenital anomalies of new born. Out of the parameters compared it was found that incidence of preterm birth (p=0.041), babies with birth weight between 1500-2499 gm (p=0.039) were more in short IPI which was statistically significant that is summarised [Table/Fig-4,5].

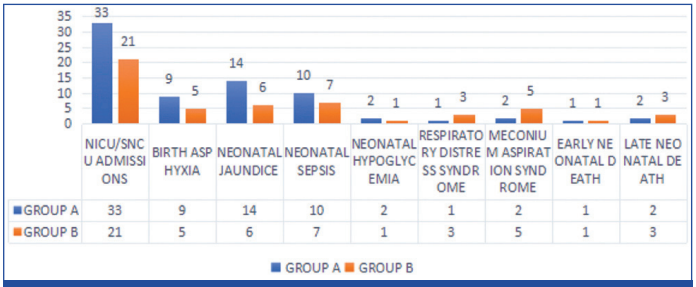
Distribution of babies according to NICU/SNCU admission and neonatal complications: Subjects were compared in terms of NICU or SNCU admission and neonatal complications. Neonatal complications of interest were birth asphyxia, neonatal jaundice, neonatal sepsis, neonatal hypoglycaemia, respiratory distress syndrome, meconium aspiration syndrome and early and late neonatal death. This has been summarised in [Table/Fig-6]. Except for the total number of admissions in NICU/The SNCU (p=0.043), rest of the parameters in either group was not statistically significant.

Neonatal parameters		Group A (n=86)	Group B (n=87)	p-value
Preterm birth	Yes	20 (23.3%)	10 (11.5%)	0.041
	No	66 (76.7%)	77 (88.5%)	
Birth weight (in grams)	>/=2500	53 (61.6%)	70 (80.5%)	0.039
	1500-2499	30 (34.9%)	15 (17.2%)	
	<1499	3 (3.5%)	2 (2.3%)	
APGAR score (1 minute)	≤7	25 (31.6%)	24 (29.6%)	0.782
	>7	54 (68.4%)	57 (70.4%)	
APGAR score (5 minute)	≤7	9 (11.4%)	6 (7.4%)	0.387
	>7	70 (88.6)	75 (92.6%)	
Outcome	Stillbirth	7 (8.1%)	6 (6.9%)	0.896
	Livebirth	79 (91.9%)	81 (93.1%)	
NICU/SNCU admission	Yes	33 (38.4%)	21 (24.1%)	0.043
	No	53 (61.6%)	66 (75.9%)	
Early/Late neonatal death	Early neonatal death	1 (1.2%)	1 (1.1%)	0.157
	Late neonatal death	2 (2.3%)	3 (3.4%)	
	Recovery at NICU	30 (34.9%)	17 (19.5%)	

[Table/Fig-4]: Table comparing the perinatal outcome between the two groups. *Chi-square test



[Table/Fig-5]: Comparison of the perinatal outcomes between the two groups A and B.



[Table/Fig-6]: NICU or SNCU admission and neonatal complications in Group A and Group B.

DISCUSSION

The present study aimed to find out the association of IPIs with adverse maternal and foetal outcomes and participants fulfilling the inclusion criteria were divided into two groups- group A consisted of 86 subjects, whose IPI was less than two years and group B consisted of 87 subjects, where IPI was equal to or more than two years.

The baseline demographic variables of the two groups e.g., age, parity, BMI, and socio-economic status were comparable in both groups making the study better. Understandably, the use of contraceptives was more in Group B. Women not using contraceptives were 4.42 times more likely to have a short IPI as reported by Tsegaye D et al., [11]. Unplanned pregnancies were associated with a shorter IPI as documented by Kaharuza FM et al., in their study at Denmark in 2001 [12].

In the present study, antenatal complications e.g., hypertensive disorders and diabetes were not found to be significantly different between the two groups. This was in contrast to the study conducted by Conde-Agudelo A et al., who showed that mothers with IPI of 60 months or more were at greater risk of preeclampsia/eclampsia (adjusted OR 1.83,95% CI 1.72-1.94) [4]. Hanley EG et al., showed that short IPI was significantly associated with an increased risk of GDM (adjusted OR 1.35, 95% CI 1.02-1.80 for 0-5 months) [5]. However, the incidence of anaemia was found to be more in group A and was statistically significant in this study. Apart from this finding, antepartum complication in both the groups was not statistically dissimilar.

In the present study, preterm deliveries were more in group A which was statistically significant. This was similar to the study by Chen I et al., who found a significantly increased odds for preterm births (adjusted OR 1.36; 95% CI 1.20-1.53) [13]. Similar findings were reported in a study by Zhu BP et al., [14]. Further studies by CC Onwuka et al., and by Riyanto DL et al., reported that there was a significant association between short IPI and preterm deliveries which is an independent risk factor for these mothers [15,16].

However, there was no appreciable difference in the mode of delivery, when the two groups were compared in the current study.

Considering postcaesarean pregnancies scar dehiscence was found to be significantly higher in group A in the current study. This finding was also reflected by a cohort study on 1527 mothers with one prior caesarean section undertaken by Bujold E et al., and found that the risk of scar rupture was higher in mothers with IPI less than 24 months [17]. In the present study, the occurrence of PPH was significantly more in group A. This finding was similar to the study by Sanga LA et al., who found that longer IPI was associated with a lower risk of PPH (adjusted OR 0.71,95% CI 0.52-0.97) [18].

In the current study, number of IUFD was similar in both groups. The rate of stillbirth though higher in group A was not however statistically significant. The occurence of low birth weight babies were higher in group A and were statistically significant. However, very low birth weight babies were similar in both groups. Similar results were shown in studies by Chen I et al., Zhu BP et al., Conde-Agudelo A et al., [13,14,19]. Infants needing NICU admission were higher in group A mostly for having low birth weight, birth asphyxia and jaundice and were statistically significant. This was similar to the study by Chen I et al., [13]. Though not statistically significant both early and late neonatal death was more common in babies of mothers in group A.

In the present small study, it was observed that short IPIs cause more complications and thereby, cause more maternal and perinatal morbidity. Here, lies the importance of use of proper contraceptive devices for spacing of pregnancy.

Limitation(s)

The present study was done in a single institute. However, multicentric studies with large sample size would have better results. Some important confounders including data on fertility issues, pregnancy intention etc., were lacking. Further studies can be conducted in future by taking care of the confounding factors involved.

CONCLUSION(S)

Lack of knowledge about benefits of birth spacing and contraceptive use significantly increases the prevalence of short IPI. This issue is relevant to public health and clinical practice because as seen in the current study, short IPI is a risk factor for adverse outcomes. Therefore, interventions to prevent such outcomes need to be emphasised in a developing and populous country , like India.

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