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Original Research Article

Study the impact of short interpregnancy interval on pregnancy outcome: a case-control study

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ABSTRACT

Background: The inter-pregnancy interval (IPI) refers to the period between the end of one pregnancy and the beginning of the next. It is a significant factor in maternal and neonatal health outcomes. It is typically defined as "the time span between a live birth and the conception/start of the next pregnancy". The present study was undertaken to find an impact on the association of short interpregnancy intervals with adverse perinatal outcomes.
Methods: The present study was carried out as a case-control study. All pregnant females attending the department of obstetrics and gynecology, Era's Lucknow Medical College and Hospital were enrolled in the study with short IPI versus normal IPI.
Results: Shorter interpregnancy gap was significantly associated with younger maternal age (15-25 years; RR 1.92), anemia in current pregnancy (RR=1.52), PROM (RR=15.33), birth weight <2.5 kg (RR=2.22). pregnancy complications like PROM, PIH and primary PPH were recorded in 13.8%, 1.7% and 1.7% women in current pregnancy.
Conclusions: Younger married women should be apprised of the need to maintain a reasonable interpregnancy gap as per national health mission guidelines in order to ensure a safe pregnancy and better pregnancy outcomes.

Keywords: Interpregnancy interval, Obstetric complications, Maternal outcome

INTRODUCTION

The inter-pregnancy interval (IPI) refers to the period between the end of one pregnancy and the beginning of the next. It is a significant factor in maternal and neonatal health outcomes. It is typically defined as "the time span between a live birth and the conception/start of the next pregnancy".[1] According to WHO recommendation for spacing is: 1) Following a live birth, it is suggested to wait at least 24 months before attempting the next pregnancy. This is to minimize the chances of unfavorable outcomes for the mother, baby, and newborn. 2) After a miscarriage or induced abortion, it is advised to wait for a minimum of six months before attempting to get pregnant again. This is recommended in order to lower the chances of adverse outcomes for both the mother and baby.[2]

The American College of Obstetricians and Gynecologists (ACOG) advises an IPI of 18 to 24 months after a live birth supporting WHO's findings on the optimal interval to minimize health risks.[3] Several other national and public health guidelines also recommend inter-pregnancy intervals of at least 18 to 24 months.[4,5] As such, the redundancy of association between short interpregnancy interval with adverse perinatal outcomes in high income countries could be primarily attributed to the ability of women in these countries to offset the nutritional depletion following childbirth with a better post-partum care, good nutrition and overall better quality of life owing to a better economic scenario.[6] This implies that socioeconomic factors and environment have a very important role in determining the direction of impact of short interpregnancy interval.

The differences in impact of short interpregnancy intervals among low/middle- and high-income countries become more important for economies like India which are fast transitioning to attain the status of a developed from a developing economy.

The remarkable economic growth attained by India during the last two decades could also have an impact on the association of short interpregnancy intervals with adverse perinatal outcomes. This makes it important to study the changing trends of this impact by assessing it in a prospective series and comparing it with the reported associations in the past years.

Hence, the present study was planned to study the impact of short interpregnancy interval on pregnancy outcomes at a large tertiary care teaching hospital in north India.

METHODS

Study design

The present study was carried out as a case-control study.

Settings

The study was carried out at department of obstetrics and gynecology, Era's Lucknow Medical College and Hospital (ELMCH). ELMCH is a tertiary care centre with state-of-the-art infrastructure catering primarily to socio-economically underprivileged suburban and rural population of Lucknow.

Duration of study

The study duration was twenty four months (April 2022 to April 2024).

Sampling frame

All pregnant females attending the department of obstetrics and gynecology, Era's Lucknow Medical College and Hospital. The sampling frame of the study included all pregnant women who consented to be part of the study whereas, primigravida, multiple pregnancy and known cases of medical disorders like heart/kidney disorders, diabetes mellitus/chronic hypertension were excluded.

Clearance and approvals

Permission was obtained from the institutional ethical committee. An informed consent was obtained from all the patients.

Primary objective

To compare the incidence of pregnancy outcomes of pre term labor/low birth weight/still birth between pregnancies with short IPI versus normal IPI.

Secondary objective

To compare incidence of adverse outcomes such as anemia in pregnancy/pregnancy induced hypertension (PIH)/ premature rupture of membrane (PROM)/primary post-partum hemorrhage (PPH) between pregnancies with short IPI vs normal IPI.

Sample size

The minimum sample size required n=174 (consisting 58 cases and 116 control). All the pregnant women enrolled in the study were clinically examined, demographic details and history was collected. Data of each women was recorded on a separate case sheet, later data was entered in MS-excel data sheet and was subjected to statistical analysis.

Statistical analysis

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) version 21.0 statistical Analysis Software. The values were represented in number (%) and Mean±SD. Chi-square test was used to test the significance of categorical data while to test the significance of mean values of two study groups 't' test was used. Level of significance was $p<0.05$.

RESULTS

Out of 174 pregnant women enrolled in the study, 58 (33.3%) had interpregnancy gap ≤18 months, women in this group were considered as cases. Two third (174) of the women had interpregnancy gap >18 months considered as control.

Majority of the cases (56.9%) and controls (66.4%) were aged 25-25 years. Proportion of lower age women (<25 years) was significantly higher in cases (39.7%) than in controls (20.7%). Proportion of women from lower socio-economic status was higher among cases as compared to controls. It was not found to be statistically significant (p=0.093). Higher proportion of overweight and obese women were observed in controls (25.9% versus 15.5 and 6.0% versus 3.4%). This difference was also not found to be statistically significant (Table 1).

Among both the groups (cases as well as control) maximum women were gravida 2 followed by gravida 3 and minimum were gravida 3 (53.4%, 29.3% and 17.2% in cases and 43.1%, 37.9% and 19.0% in controls). Majority of cases (77.6%) as well as controls (69.8%) had history of one live birth only and most of cases (77.6%) as well as controls (68.7%) had no history of abortions. History of previous single abortion was revealed by 17.2% cases and 26.7% of controls, this was no significant (p=0.239) (Table 2).

Table 1: Comparison of sociodemographic profile between cases and controls.

Socio-demographic profile		Cases (n=58) (%)	Controls (n=116) (%)	Total (n=174) (%)	
Age (years)	<25	23 (39.7)	24 (20.7)	47 (27.0)	χ^2=9.258 p=0.010
	26-35	33 (56.9)	77 (66.4)	110 (63.2)	
	>35	2 (3.4)	15 (12.9)	17 (9.8)	
Socioeconomic status	Lower	29 (50)	39 (33.6)	68 (39.1)	χ^2=4.752 p=0.093
	Middle	19 (32.8)	45 (38.8)	64 (36.8)	
	Upper	10 (17.2)	32 (27.6)	42 (24.1)	
Body mass index	Under weight	1 (1.7)	4 (3.4)	5 (2.9)	χ^2=3.940 p=0.268
	Normal weight	46 (79.3)	75 (64.7)	121 (69.5)	
	Overweight	9 (15.5)	30 (25.9)	39 (22.4)	
	Obese	2 (3.4)	7 (6.0)	9 (5.2)	

Table 2: Comparison of obstetric history between cases and controls.

Obstetric history		Cases(n=58) (%)	Controls (n=116) (%)	Total (n=174) (%)	
Gravida status	Gravida 2	31 (53.4)	50 (43.1)	81 (46.6)	χ^2=1.771 p=0.412
	Gravida 3	17 (29.3)	44 (37.9)	61 (35.1)	
	Gravida 4 or above	10 (17.2)	22 (19.0)	32 (18.4)	
Number of live births	One	45 (77.6)	81 (69.8)	126 (72.4)	χ^2=2.357 p=0.502
	Two	10 (17.2)	30 (25.9)	40 (23)	
	Three	3 (5.2)	4 (3.4)	7 (4)	
	four	0 (0.0)	1 (0.9)	1 (0.6)	
Number of abortions	Nil	45 (77.6)	79 (68.1)	124 (71.3)	χ^2=4.214 p=0.239
	One	10 (17.2)	31 (26.7)	41 (23.6)	
	Two	2 (3.4)	6 (5.2)	8 (4.6)	
	three	1 (1.75)	0 (0)	1 (0.6)	

Table 3: Comparison of complications and birth weight in current pregnancy between of cases and controls.

Complication	Cases (n=58)		Controls (n=116)		Total (n=174)	
	No.	%	No.	%	χ^2	P value
PROM	8	13.8	1	0.9	13.182	<0.001
PIH	1	1.7	1	0.9	0.253	0.615
Primary PPH	1	1.7	0	0.0	2.012	0.156
Birth weight (kg)						
<2.5	43	74.1	32	27.6	36.797	<0.001
2.5-3.5	10	17.2	74	63.8		
>3.5	5	8.6	10	8.6		

Table 4: Intragroup change in mode of previous delivery in cases and controls.

Current mode of delivery	Cases (n=58)				Controls (n=116)			
	Prev. vaginal del (n=24)		Prev. LSCS (n=34)		Prev. vaginal del (n=43)		Prev. LSCS (n=73)	
	No.	%	No.	%	No.	%	No.	%
Vaginal	21	87.5	0	0.0	30	69.8	1	1.4
LSCS	3	12.5	34	100.0	13	30.2	72	98.6
Wilcoxon signed rank test	Z=1.732; p=0.083				Z=3.207; p=0.001			

Incidence of PROM was significantly higher in cases (13.8%) as compared to controls. PIH (n=2; 1 each in cases and controls) and primary PPH (n=1; in cases) were rare incidences. Incidence of birth weight <2.5 kg was significantly higher in cases (74.1%) as compared to that in controls (27.6%) (p<0.001) (Table 3).

Among cases out of 24 previous vaginal deliveries mode of current delivery changed to LSCS in 3 (12.5%) cases

and all the previous LSCS deliveries no change in mode of delivery was observed, all were LSCS in current pregnancy too. Among cases change in mode of delivery was not found to be significant statistically. Among controls, out of 43 previous vaginal deliveries mode of delivery changed to LSCS for 13 (30.2%) women. Change in mode of delivery of previous LSCS (n=73) was observed in 1 (1.4%) woman. Change in mode of delivery of Controls was found to be significant statistically (Table 4).

DISCUSSION

Childbirth profoundly impacts maternal health, initiating numerous physical and emotional changes. Physically, women may experience perineal pain, uterine contractions, and postpartum bleeding as the body expels lochia, a mixture of blood, mucus, and uterine tissue.[7] The pelvic floor muscles, stretched during delivery, often weaken, potentially leading to urinary incontinence.[8] Additionally, breastfeeding can cause nipple pain and engorgement while influencing hormonal changes that promote uterine contraction and reduce postpartum hemorrhage.[9] Additionally, postpartum recovery involves restoring nutritional reserves, particularly iron and folate, which are depleted during pregnancy and childbirth.[10]

Recovery time varies, but it typically takes around six weeks for initial physical recovery, though complete restoration to a pre-pregnancy state can take six months to a year.[11] Factors influencing recovery include the type of delivery, individual health, and support systems. Persistent symptoms or complications warrant medical attention to ensure optimal maternal health.

In view of the physical, physiological and psychological changes occurring in a woman after childbirth, it is often questioned as to what is the ideal time for next pregnancy? The ideal time gap between two pregnancies is a topic of significant importance due to the physical, emotional, and physiological changes that occur after the first pregnancy. Physiologically as well as emotionally, the postpartum period is marked by the body's transition back to a non-pregnant state. This includes the normalization of cardiovascular, respiratory, and metabolic changes that occurred during pregnancy. A shorter IPI may not provide sufficient time for these systems to stabilize, potentially leading to increased risks in subsequent pregnancies, such as preterm birth, low birth weight, and small for gestational age infants.[9]

Expert panels, including the World Health Organization (WHO) and the American College of Obstetricians and Gynecologists (ACOG), recommend an interpregnancy interval (IPI) of at least 18 to 24 months but less than five years to optimize maternal and fetal health outcomes.[9-12]

Clinical evidence supports the benefits of an 18 to 24-month IPI. Studies have shown that shorter IPIs (less than 18 months) are associated with higher risks of adverse perinatal outcomes.[7] Conversely, very long IPIs (more than five years) have also been associated with adverse outcomes, potentially due to maternal aging and the loss of pregnancy-related adaptive physiological changes.[8]

Maternal age

In the present study, majority of women in both case (62.5%) and control (67.9%) groups were aged between 26 and 35 years (Table 1). Gurmu et al also reported majority of cases (64.4%) as well as controls (50.3%) in age group 25-34 years.[15] Some other workers also reported a similar age profile.[22,24] Jani et al on the other hand had much higher proportion of cases as compared to that of controls in age group 20-25 years (68.8% versus 31.3%).[19] Bera et al too reported a relatively younger mean age (<25 years) in their study.[23] Generally, most of the studies have reported maternal age within 20-30 years range and mean age lying within this range.[17,18,21,22,24] It may be noted that all the women in this study were multigravida and were having at least second pregnancy, thus the age profile of the women in present study must be considered in accordance with at least average age of second childbearing.

Gravida status

In the present study, majority cases were gravida 2 only (53.1%) while majority of controls were gravida 3 or above (64.2%) (Table 2). Compared to the present study, Gurmu et al had 46.6% of cases and 39% of controls in Gravida 4+ category.[15] In the studies of Jani et al and Bera et al however, majority of cases as well as controls were gravida 2 only (51.4% versus 54.3%).[19,23] In another study, there was dominance of Gravida 2+.[20] As such, gravida 2 was the minimum requirement for this study and all the studies, including the present study fulfilled this minimum criteria. There was no study reporting dominance of >gravida 3.

Socio-economic strata

In the present study, significantly higher proportion of cases (59.4%) as compared to that of controls (34.6%) belonged to lower socioeconomic strata (Table 1). Although Gurmu et al did not describe the socioeconomic status of the women, however, in their study too sociodemographic variables like education and occupation were of lower order in cases as compared to that of controls.[15] The socioeconomic profile of women in the present study is similar to that reported by Asnani et al who also reported a dominance of lower socioeconomic class.[22]

Pregnancy complications

In the present study, we found significantly higher anemia and PROM in cases as compared to that in controls. However, for other outcomes we did not observe a significant difference between the two groups. For anemia the findings of the present study are in accordance with the

observations of Jani et al and Asnani et al respectively.[19,22] For PROM, though its incidence has been found to be higher in cases as compared to that in controls in other studies too yet they did not find this difference to be significant (Table 5).

Table 5: Incidence of pregnancy complications in cases and controls in different studies in comparison with present study.

Author (year)	Group	Pregnancy complications					
		Anemia	PIH	Pre-eclampsia	GDM	PROM	APH/PPH
Lewis and Mor (2020)[25]	Cases (n=125)	65.6	6.4	-	3.2	16.8	
	Controls (n=125)	52.8	19.2	-	2.4	7.2	
Abozeid et al (2021)[18]	Cases (n=86)	-	7.2	2.3	-	3.5	4.7
	Controls (n=164)	-	9.8	5.5	-	0.6	2.4
Jani et al (2023)[19]	Cases (n=70)	65.7*	8.6*		27.1	7.1	-
	Controls (n=70)	45.7	31.4		27.1	2.9	-
Asnani et al (2023)[22]	Cases (n=87)	20.7* Sev. An.	-	8*	-	-	9.19
	Controls (n=125)	7.2	-	4	-	-	8.8
Present study (2024)	Cases (n=58)	75.9*	1.7	-	-	13.8*	1.7
	Controls (n=58)	50.0	0.9	-	-	0.9	0.0

*Values marked with an asterisk indicate a statistically significant difference between cases and controls as reported in the respective studies. Data extracted from previously published studies for comparison.

Table 6: Incidence of adverse perinatal outcomes in cases and controls in different studies in comparison with present study.

Author (Year)	Group	Perinatal outcome					
		Preterm labour/birth	Low birth weight	Stillbirth/perinatal mortality	Cesarean rate	NICU Adm.	Cong. Abn.
Lewis and Mor (2020)[25]	Cases (n=125)	17.6	20.8	-	54.4	16.0	
	Controls (n=125)	9.6	11.2	-	45.6	10.4	
Abozeid et al (2021)[18]	Cases (n=86)	17.4*	22.1*	-	39.5*		
	Controls (n=164)	1.2	7.9	-	22.0		
Gurmu et al (2022)[15]	Cases (n=146)	7.5*	13.7*	1.4	-		
	Controls (n=292)	4.5	6.5	0.7	-		
Jani et al (2023)[19]	Cases (n=70)	12.9	18.6*	-	48.6*	22.9	-
	Controls (n=70)	4.5	5.7	-	25.7	12.9	-
Asnani et al (2023)[22]	Cases (n=87)	24.1*	33.3*	12.6	55.17	23*	1.1
	Controls (n=125)	10.4	14.4	6.4	58.4	11.2	0.8
Bera et al (2023)[23]	Cases (n=86)	23.3*	38.4*	3.5	33.7	38.4*	-
	Controls (n=87)	11.5	19.5	4.5	29.9	24.1	-
Present study (2024)	Cases (n=58)	-	74.1*	-	63.8	-	-
	Controls (n=58)	-	27.6	-	73.3	-	-

*Values marked with an asterisk indicate a statistically significant difference between cases and controls as reported in the respective studies. Data extracted from previously published studies for comparison.

Perinatal outcomes

An overview of Table 6 reveals that in the present study, we did not encounter any preterm delivery in either of two cases, although a number of studies report preterm deliveries in both the groups and incidence of preterm deliveries to be significantly higher in cases as compared to that in controls.[15,18,22,23] In the present study, we did not record any stillbirth or perinatal mortality. In the other studies too, it has either not been recorded or its incidence has generally been low. Incidence of preterm delivery in other series ranges from 7.5% to 24.1% in cases as compared to 1.2% to 10.4% in controls. Absence of preterm births in the present study could be incidental and could be attributed to small sample size as well as most of the cases being unbooked cases who presented at term only. As far as low birth weight is concerned, the findings in the present study are in consonance with other studies that also show its incidence to be lower in controls as compared to that in cases In the present study the rate of low birth deliveries was amongst highest in both cases as well as controls as compared to the other studies, however,

it may be attributed to high prevalence of anemia in cases as well as controls (Table 6). In the present study we did not encounter any significant difference between two groups for rate of cesrean delivery but instead found it to be proportional higher in controls (73.3%) than in cases (63.8%). Similar to the present study, Asnani et al also found the caesarean rate to be higher in controls than in cases but did not find the difference to be significant statistically.[22] Only two workers found the incidence of caesarean delivery to be significantly higher in cases as compared to that in controls.[15,18] In the present study, outcomes were limited to evaluation in labour room only and NICU admission and subsequent outcomes were not part of the study. However, we found birth weight to be significantly affected by interpregnancy gap, thereby showing shorter interpregnancy gaps limit the maternal nutritional well-being sufficient to provide support for fetal growth and development (Table 6).

This study has a few important limitations. It was conducted in a single tertiary care centre, which may limit the generalizability of the findings to other populations. The sample size was relatively small, reducing the ability to detect less common maternal and neonatal outcomes. In addition, many women, particularly in the short interpregnancy interval group, were unbooked and presented late, which may have led to under-reporting of complications such as preterm labour. Finally, the study did not evaluate long-term neonatal outcomes, restricting the assessment of the full impact of short interpregnancy intervals.

CONCLUSION

More than three quarter of women with shorter interpregnancy gap (75.9%) had anemia in current pregnancy. Shorter interpregnancy gap was significantly associated with younger maternal age (15-25 years; RR 1.92), anemia in current pregnancy (RR=1.52), PROM (RR=15.33), birth weight <2.5 kg (RR=2.22). pregnancy complications like PROM, PIH and primary PPH were recorded in 13.8%, 1.7% and 1.7% women in current pregnancy. Majority (58.6%) of women with shorter interpregnancy group delivered through caesarean section and delivered babies with birth weight <2.5 kg (73.8%) in current pregnancy. Younger married women should be apprised of the need to maintain a reasonable interpregnancy gap as per national health mission guidelines in order to ensure a safe pregnancy and better pregnancy outcomes.

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