

**Research Article**

## **Comparison of Perinatal Outcome in Women with <6 Month Versus 12-17 Months of Interpregnancy birth Interval**

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**ABSTRACT:**

**Objectives:** To compare the perinatal outcome between <6 months and 12-17 months interpregnancy interval.

**Study design:** Prospective cohort study.

**Settings:** THQ Thal (MNS) Hospital, Layyah

**Materials & Methods:** A total of 420 women of reproductive age groups with singleton pregnancy and previous live birth of gestational age  $\geq 28$  weeks were included. Patients with multiple gestation pregnancy, diabetes mellitus, hypertension and heart diseases were excluded. Two groups (A & B) were formed and the patients according to their inter-pregnancy interval i.e. <6 months and 12-17 months were distributed in A & B respectively. The perinatal outcome i.e. preterm delivery and low birth weight were recorded by following the patients till delivery.

**Results:** The mean age of women in group A was  $26.73 \pm 6.56$  years and in group B was  $26.73 \pm 6.56$  years. The perinatal outcome was preterm delivery in 189 (90.0%) and low birth weight babies in 143 (68.10%) women of <6 months while in 12-17 months interpregnancy interval, it was noted in 111 (52.86%) and 102 (48.57%) women respectively

**Conclusion:** Our study concluded that appropriate inter pregnancy interval could reduce the rate of preterm delivery and low birth weight babies and optimal interval associated with the lowest risk of adverse perinatal outcome was 12-17 months.

**Keywords:** Birth spacing, short interval, preterm delivery, low birth weight.

### **INTRODUCTION**

The inter pregnancy interval is defined as the amount of time between pregnancies. It is calculated between the date the last pregnancy ended and the date of the woman's last menstrual period.<sup>1</sup> Though there is no official recommendation for the optimal inter pregnancy period, experts suggest 18 to 24 months as the ideal time period between pregnancies.<sup>2</sup> The timing between one pregnancy and the next may affect the risk of pregnancy complications. Both short and long interpregnancy intervals have been associated with adverse outcome, but the bulk of

adverse effects have been associated with short intervals.<sup>3</sup>

No matter what term is used, there is an implicit advantage for waiting or spacing subsequent pregnancies. The study found the average preferred waiting time between delivery and the next pregnancy was 2-3 years, even among health providers. The advantages for spacing births were found to affect the mother and husband, the last born, and the next child, and fell into three main categories: physical, psychological and financial advantages.<sup>4</sup> It is important to determine whether

the interpregnancy interval is a significant independent biological risk factor for adverse pregnancy events because women have some control over the spacing of their pregnancies and thus could potentially reduce their risk of such outcomes.<sup>3</sup>

Although the causal mechanism between interpregnancy intervals and negative perinatal outcomes remains unknown, there are two schools of thought as to the underlying cause. The first asserts that interpregnancy intervals are a marker for social factors, such as marital status or socioeconomic status affect that ultimately cause poor outcomes.<sup>5</sup> Alternately, some researchers have suggested that maternal nutrient depletion is the reason for negative perinatal outcomes after a short interpregnancy interval.<sup>6</sup> Recent research has found that interpregnancy intervals that are either too short or too long are associated with negative perinatal outcomes. This is known as a J-shaped relationship.<sup>7</sup> Avoidance of short intervals can be achieved through postpartum provision of contraception, but avoidance of long interpregnancy intervals is more problematic since a desired pregnancy may be precluded by subfertility, availability of a partner, economic issues, or illness.<sup>8</sup>

Since 1920 many researchers have investigated the relationship between pregnancy spacing (time laps between two consecutive pregnancies) and various birth outcomes including low birth weight, preterm birth small size for gestational age an infant mortality.<sup>7,9</sup> Low birth weight and preterm birth are second leading cause of death for all U.S infants and leading cause of death for African-American infants.<sup>9</sup> Women with short and very long Inter-pregnancy interval are at increased risk for delivering preterm, low birth weight & small for gestational age infants.<sup>10</sup> It is proved that females who were conceived between 18 to 23 months after previous live birth have the lowest risk of adverse perinatal outcome such as low birth weight and preterm birth.<sup>11</sup> The pregnant woman and child spacing less than one year have significantly higher prevalence of iron deficiency anemia which is important risk factor of preterm

and subsequent low birth weight.<sup>11</sup> Thus both short and long Inter-pregnancy interval has been associated with increased risk of adverse perinatal outcome.<sup>12</sup>

There have been extensive researches on the effect of pregnancy or birth spacing on variety of outcomes including infant, child mortality, maternal mortality and morbidity.<sup>13</sup> Recent studies are still inconclusive, but more studies show a positive association between short birth intervals and low birth weight,<sup>14</sup> preterm birth,<sup>15</sup> and small for- gestational age,<sup>16</sup> while others show little or no association with some of these outcomes.<sup>17</sup> The risk for these adverse outcomes was increased and ranged from 1.2 to more than 3.0. The risk was high in some developing countries<sup>18</sup> and slightly lower in the developed countries.<sup>14</sup> The LBW outcomes were curvilinear with a high risk for the short and very long intervals in United States<sup>19</sup> and India.<sup>20</sup>

Meta-analysis of studies from 1970-1984 on low birth weight (LBW) has shown that the effect of short birth intervals on low birth weight is inconclusive, but also that the short birth intervals may not be an important cause of intrauterine growth retardation (IUGR) in the United States, where most of the reviewed studies were carried out.<sup>21</sup> A study conducted by Agustin Conde-Agudelo and colleagues<sup>9</sup> compared the birth outcomes, preterm birth was recorded in 95% in patients with <6 months inter-birth interval while 56% in women with 12-17 months and low birth weight was recorded in 63% versus 51% respectively.

In Pakistan, no study was conducted before, the results of the study would be helpful for creating awareness in general population as guide to maintain proper inter-pregnancy interval for the avoidance of poor perinatal outcome, further this study would be helpful for the obstetrician also to control the avoidable burden of patients by advising couples for ideal interpregnancy birth interval (12-17 months) for achieving good perinatal outcome.

#### **OPERATIONAL DEFINITIONS:**

- **Preterm:** Preterm birth was defined as the birth occurred before completion of 37 weeks of gestation.
- **Low birth Weight:** Low birth weight babies were those whose weight less than 2.5 Kg at the time of birth.
- **Inter-pregnancy interval:**
  - **<6 months of Inter-pregnancy interval:** It was defined “< 6 months time elapsed from the last delivery date to last menstrual period of the index pregnancy”
  - **12-17 months of Inter-pregnancy interval:** It was defined “12-17 months time elapsed from the last delivery date to last menstrual period of the index pregnancy”

## MATERIAL AND METHODS

**STUDY DESIGN:** Prospective Cohort study.

**SETTING:** THQ Thal (MNS) Hospital, Layyah

**DURATION OF STUDY:** January 2017 to June 2017

### Inclusion Criteria:

- Reproductive age group.
- Singleton pregnancy.
- Women with previous live birth.
- Parity 1-4.
- Gestational age  $\geq$  28 weeks assessed on LMP.
- <6 months of Inter-pregnancy interval for Group-A (exposed group).
- 12-17 months of Inter-pregnancy interval for Group-B (un-exposed group).

### Exclusion Criteria:

- Multiple gestation pregnancy.
- Women with high risk pregnancies(Diabetes, hypertension, Cardiac diseases)

### Data collection procedure:

After approval from local ethical committee, patients admitted in the department of Gynecology fulfilling the inclusion/exclusion criteria were selected. Informed consent was taken from the participants with the assurance of confidentiality to include their data in study. Patients were divided into two groups (A & B) according to their inter-pregnancy interval i.e. <6 months

(exposed group) (“< 6 months time elapsed from the last delivery date to last menstrual period of the index pregnancy) and 12-17 months(un-exposed group) (12-17 months time elapsed from the last delivery date to last menstrual period of the index pregnancy) respectively. After this, proper history and general physical examination was done in every patient. All patients in both groups will be followed till delivery and the perinatal outcome i.e. preterm delivery (birth occurred before completion of 37 weeks of gestation) and low birth weight (those babies whose weight less than 2.5 Kg at the time of birth) were noted. All this information was recorded by the researcher on a pre-designed proforma (Annexure).

### Statistical analysis:

The collected data was entered in SPSS version 11 and analyzed through its statistical package. Mean  $\pm$  Standard deviation were calculated for age and parity. Perinatal outcome in patients of both group i.e. preterm delivery and low birth weight were calculated and presented in tabulated form as frequency and percentage. Chi square test was applied to determine the significant in both groups and p value  $\leq 0.05$  will be considered as significant. Stratification for age and parity was done to control the effect modifiers and post-stratification chi square was applied to see the effect of these on outcome variables. P-value  $\leq 0.05$  was taken as significant. Relative risk was also calculated for the two groups.

## RESULTS

Age range in this study was from 18 to 40 years with mean age of  $26.77 \pm 6.92$  years. The mean age of women in group A was  $26.73 \pm 6.56$  years and in group B was  $26.73 \pm 6.56$  years. Majority of the patients 33.81% were between 18 to 25 years of age as shown in Table 1. The mean parity in group A was  $2.29 \pm 1.08$  and in group B was  $2.37 \pm 1.05$ . Majority of the patients 33.09% were para-1 as shown in Table 2.

The perinatal outcome was preterm delivery in 189 (90.0%) and low birth weight babies in 143 (68.10%) women of group A (<6 months

interpregnancy interval) while in group B (12-17 months interpregnancy interval), it was noted in 111 (52.86%) and 102 (48.57%) women respectively (Table 3) with a p-value<0.05 which was statistically significant.

Stratification of age groups with respect to preterm delivery and low birth weight babies have shown in Table 4 & 5 respectively. Stratification of parity with respect to preterm delivery and low birth weight babies have shown in Table 6 & 7 respectively.

**Table-1:** Age distribution for both groups.

Age (years)	Group A (n=210)		Group B (n=210)		Total (n=420)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
18-25	73	34.76	69	32.86	142	33.81
26-30	56	26.67	59	28.09	115	27.38
31-35	42	20.0	45	21.43	87	20.71
35-40	39	18.57	37	17.62	76	18.09
Mean ± SD	26.73 ± 6.56		26.73 ± 6.56		26.77 ± 6.92	

**Table-2:** %age of patients according to parity in both groups.

Parity	Group A (n=210)		Group B (n=210)		Total (n=420)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
Para-1	74	35.24	65	30.95	139	33.09
Para-2	63	30.0	67	31.90	130	30.95
Para-3	43	20.48	46	21.90	89	21.19
para-4	30	14.29	32	15.24	62	14.76
Mean ± SD	2.29 ± 1.08		2.37 ± 1.05		2.31 ± 1.07	

**Table 3:** Perinatal Outcome in both Groups (n=420).

Perinatal Outcome		Group A (n=210)		Group B (n=210)		P value	RR
		No.	%age	No.	%age		
Preterm Birth	Yes	189	90.0	111	52.86	0.000	1.70
	No	21	10.0	99	47.14		
Low Birth Weight	Yes	143	68.10	102	48.57	0.000	1.40
	No	67	31.90	108	51.43		

➤ P value is < 0.05 which is statistically significant.

**Table 4:** Stratification of age of patients with respect to Preterm Delivery.

Age Groups		Group A (n=210)		Group B (n=210)		P-value	RR
		No.	%age	No.	%age		
18-25 years	Yes	65	89.04	38	55.07	0.000	1.616
	No	08	10.96	31	44.93		
26-30 years	Yes	51	91.07	31	52.54	0.000	1.73
	No	05	8.93	28	47.46		
31-35 years	Yes	39	92.86	21	46.67	0.000	1.99
	No	03	7.14	24	53.33		
36-40 years	Yes	34	87.18	21	56.76	0.003	1.536
	No	05	12.82	16	43.24		

**Table 5:** Stratification of age of patients with respect to Low Birth Weight.

Age Groups		Group A (n=210)		Group B (n=210)		P value	RR
		No.	%age	No.	%age		
18-25 years	Yes	51	69.86	34	49.28	0.012	1.417
	No	22	30.14	35	50.72		
26-30 years	Yes	39	69.64	28	47.46	0.016	1.467
	No	17	30.36	31	52.54		
31-35 years	Yes	27	64.29	22	48.89	0.148	1.314
	No	15	35.71	23	51.11		
36-40 years	Yes	26	66.67	18	48.65	0.112	1.370
	No	13	33.33	19	51.35		

**Table 6:** Stratification of Parity with respect to Preterm Delivery.

Parity		Group A (n=210)		Group B (n=210)		P value	RR
		No.	%age	No.	%age		
Para-1	Yes	65	87.84	36	55.38	<b>0.000</b>	<b>1.586</b>
	No	09	12.16	29	44.62		
Para-2	Yes	57	90.48	36	53.73	<b>0.000</b>	<b>1.684</b>
	No	06	9.52	31	46.27		
Para-3	Yes	39	90.70	23	50.0	<b>0.000</b>	<b>1.814</b>
	No	04	9.30	23	50.0		
para-4	Yes	28	93.33	16	50.0	<b>0.000</b>	<b>1.867</b>
	No	02	6.67	16	50.0		

**Table 7:** Stratification of parity with respect to Low Birth Weight.

Parity		Group A (n=210)		Group B (n=210)		P value	RR
		No.	%age	No.	%age		
Para-1	Yes	50	67.57	32	49.23	<b>0.028</b>	<b>1.372</b>
	No	24	32.43	33	50.77		
Para-2	Yes	45	70.31	31	46.27	<b>0.004</b>	<b>1.544</b>
	No	18	29.69	36	53.73		
Para-3	Yes	30	69.77	21	45.65	<b>0.022</b>	<b>1.528</b>
	No	13	30.23	25	54.35		
para-4	Yes	18	60.0	18	56.25	<b>0.765</b>	<b>1.067</b>
	No	12	40.0	14	43.75		

**DISCUSSION**

The most popular term for the waiting time or spacing between delivery and the next pregnancy was fatretrahaor “resting period.” This term refers to the period when a woman recuperates her health and the last born child secures his/her right to sufficient lactation and comprehensive care. No matter what term is used, there is an implicit advantage for waiting or spacing subsequent pregnancies.<sup>19</sup> There was general agreement among all focus groups that the resting period between pregnancies allows the mother time to recuperate from pregnancy, labor and lactation; replenish her nutritional stores including calcium, iron, and vitamins; permits her uterus to return to its natural state; and provides time for the last born to secure his/her rights to comprehensive care and lactation.<sup>22</sup> Psychologically, it was felt that the mother would experience less stress, less exhaustion, be more relaxed and have adequate time to take care of herself, her last born child, her home and her husband.<sup>22</sup>

The relationship between interpregnancy interval and risk of preterm birth and low birthweight is well established. Our study was aimed to compare

this perinatal outcome between short (<6months) and long (12-17 months) interpregnancy interval. In our study, the perinatal outcome was preterm delivery in 90.0% and low birth weight babies in 68.10% women with <6 months interpregnancy interval while in women with 12-17 months interpregnancy interval, it was noted in 52.86% and 48.57% women respectively. A study conducted by Agustin Conde-Agudelo and colleagues<sup>9</sup> compared the birth outcomes, preterm birth was recorded in 95% in patients with <6 months inter-birth interval while 56% in women with 12-17 months and low birth weight was recorded in 63% versus 51% respectively. In another study, same author concluded that shorter interpregnancy intervals are significantly associated with increased risk of adverse perinatal outcomes i.e. pre-term birth, low birthweight, and small for gestational age, than longer interpregnancy interval.<sup>13</sup>

Klerman LV et al<sup>23</sup> in his study found that in bivariate analysis, the percentage of preterm deliveries decreased as the inter pregnancy interval increased. In yet another study utilizing Utah data, Zhu BP et al<sup>24</sup> found that after controlling for confounders, the risk of adverse

perinatal outcomes i.e. preterm birth, low birth weight babies and small for gestational age infants, was high if the interpregnancy interval was < 3 months and that the risks declined rapidly as the interpregnancy interval increased. The risk for preterm births nearly tripled when less than 12 months elapsed between pregnancies, according to a recent retrospective cohort study of more than 400,000 births done by DeFranco EA et al.<sup>25</sup> He has found significant difference in preterm delivery rates following short interpregnancy interval <12 months compared with women with normal interpregnancy interval (53.3% vs 37.5% respectively).

Al-Jasmi F et al<sup>26</sup> in his case-control study in Emirati women has found short interpregnancy interval as a high risk factor for spontaneous preterm birth. Similar findings were also noted by Rodrigues T et al.<sup>10</sup> Several studies suggest that the relation between short interpregnancy intervals and preterm delivery vary between populations depending on social, economic and cultural development, most reporting increased risk of preterm birth with short interpregnancy intervals when conducted in low-income or black populations.<sup>14</sup> In a study conducted by Conde-Agudelo A et al<sup>27</sup> compared the birth outcomes, preterm birth was recorded in 40% in patients with <6 months inter-birth interval while 9% in women with 12-17 months and low birth weight was recorded in 35% versus 18% respectively.

Interpregnancy interval shorter than 6 months was also found to be an increased risk for preterm birth, small for gestational age infants, low birth weight babies, early neonatal death and congenital malformations.<sup>28</sup> Short (<6 months) interpregnancy interval was also found to be an independent risk factor for preterm delivery and neonatal death by Smith GCS et al.<sup>29</sup> Bener A et al<sup>30</sup> had found J-shaped association between the interpregnancy interval and low birth weight. Low birth weight rate was 25.2% when the interpregnancy interval was < 6 months and decreased as the inter pregnancy interval increased.

The reasons for the association between a short interval between pregnancies and adverse perinatal outcomes are unclear. A plausible explanation is the maternal nutritional depletion hypothesis,<sup>31</sup> including folate depletion,<sup>32</sup> maternal stress produced by the new pregnancy,<sup>13</sup> postpartum hormonal imbalance continuing into the new pregnancy,<sup>14</sup> and preovulatory aging of the oocyte due to an extended follicular phase of the first ovulatory cycle. Maternal nutritional depletion hypothesis states that a close succession of pregnancies and periods of lactation worsen the mother's nutritional status because there is not adequate time for the mother to recover from the physiological stresses of the preceding pregnancy before she is subjected to the stresses of the next. This results in depletion of maternal nutrient stores, with the subsequent increased risk of adverse perinatal outcomes.<sup>21</sup>

## CONCLUSION

This study concluded that short interpregnancy interval (<6 months) was associated with higher rates of preterm births (90.0%) and low birth weight babies (68.10%) compared to long interpregnancy interval (12-17 months) in which this rate was found to be 52.86% and 48.57% respectively. Hence, our study advises women on the benefits of delaying a subsequent pregnancy for approximately 12-17 months to improve the perinatal outcome. So, we recommend that there should be health awareness programs on local and national levels to educate and teach the association between adverse pregnancy outcomes and short (<6 months) interpregnancy intervals and emphasizes women on the benefits of delaying a subsequent pregnancy for approximately 12-17 months to improve the perinatal outcome.

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