Journal of Population Therapeutics & Clinical Pharmacology

ORIGINAL RESEARCH ARTICLE
DOI: 10.53555/0hd78y54

EFFECT OF VARYING INTERPREGNANCY INTERVAL ON PREGNANCY OUTCOME IN A TERTIARY CARE HOSPITAL

Dr.Aiswarya Lohidakshan [1], Dr.Kunda Himaja [2 *], Dr.G.Parthasarathi Reddy [3]

[1] Post graduate in Department of OBG, S.V.Medical College, Tirupathi, Andhra Pradesh
[2] Assistant Professor, Department of OBG, S.V.Medical College, Tirupathi, Andhra Pradesh
[3] Professor, Department of OBG, S.V.Medical College, Tirupathi, Andhra Pradesh

***Corresponding author:** Dr.K. Himaja
*Assistant Professor, Department of OBG, S.V.Medical College, Tirupathi, Andhra Pradesh
Email Id- k.himaja.2k5@gmail.com

Abstract

Background: Inter pregnancy interval(IPI) is defined as the time period from the birth of the previous baby to the conception of the next pregnancy**.** Short IPI is most frequently defined as less than 6 months, but various definitions, ranging from less than 3 to less than 18 months are used in literature. Long IPI is recommended as more than 24 months by WHO. Both short and long IPI are known to adversely affect the mother and the baby. The present study is undertaken to know the effects of varying interpregnancy interval (IPI)over pregnancy outcome and to find out reasonably safe IPI.

Materials & methods: This a retrospective observational study conducted among 1000 multiparous women with singleton pregnancy who delivered at Government Maternity Hospital ,Tirupathi. All the postpartum women who were willing to participate were briefly explained about the study and informed consent was taken. Data was obtained from direct interview and previous medical records of the women and analysed.

Results: Among 1000 women in the present study, longer intervals(IPI) are common among older mothers when compared to women less than 25 years of age. 61.7% of the rural participants had IPIs of <18 months. As duration of breastfeeding increased, the IPI also increased. Only 21.2% of the study participants used any form of contraception between two births. The use of contraceptives obviously increases the IPI. The analysis of relationship between inter pregnancy intervals and preterm births shows that the number of preterm births is least (8.1%) within the 18-24 months IPI category and birth of LBW babies was also less.

Conclusion: Adequate IPI through spacing is the cost effective method to reduce adverse pregnancy outcome.IPI of 24 months is to be promoted for better wellbeing of women .Counseling for the same is to be initiated in antenatal period itself.

Key words –Interpregnancy interval, spacing, preterm birth, low birth weight.

Introduction

India is the most populous country in the world in 2025, surpassing China, with an estimated population of around 1.46 billion people. Maternal mortality rate of 7.3 and infant mortality rate of 28 per 1000 live births was notified as per sample registered system of Registrar General of India Sample report 2020**[1]** .

India's Maternal Mortality Ratio (MMR) has shown a consistent decline, reaching 93 per 100,000 live births in 2019-21 and further dropping to 88 per 100,000 live births in 2020-22, according to reports released in 2025. India infant mortality rate for 2025 is **24.98**, a **3.18% decline** from 2024.The total fertility rate of the nation has reduced from 3.4 in 1990 to 2.0 in 2020 and contraceptive use increased from 41 percent in 1990 to 56 percent in 2020. India's progress is a step towards the global SDG target of reducing the maternal mortality ratio to less than 70 by 2030.

One of the important causes of continued high maternal and infant mortality is short inter-pregnancy interval and frequent unwanted pregnancies. Government of India adopted the Reproductive, Maternal, New-born, Child and Adolescent Health (RMNCH+A) framework in 2013, which essentially aims to address the major causes of mortality and morbidity among women and children. Inter pregnancy interval(IPI) is defined as the time period from the birth of the previous baby to the conception of the next pregnancy**[2-7].** Short IPI is most frequently defined as less than 6 months, but various definitions, ranging from less than 3 to less than 18 months are used in literature**[2,4,8,9**]. Long IPI is recommended as more than 24 months by WHO. Beyond the WHO and US Agency for International Development recommendations for IPI longer than 24 months, no other formal recommendation regarding optimal IPI exits[2] .

Both short and long IPI are known to adversely affect the mother and the baby. Short IPI are associated with adverse neonatal outcomes like preterm births, low 2 birth weights, congenital defects and maternal effects like increased risk anemia, third trimester bleeding, premature rupture of membranes, puerperal endometritis , and maternal deaths**[2-9].** Long IPIs are associated with birth defects, preeclampsia and labor dystocia **[2-9]** .The average IPI in India is 16.7 months as compared to the average IPI in US and UK is 18 months and 19 months respectively**.[2,4]**

By estimating optimal IPI, steps to promote appropriate birth spacing can be undertaken, as it is the cost effective measure to decrease both maternal and neonatal morbidity and mortality. The current recommendation of WHO is to attempt the next pregnancy at least 24 months after the first child birth**[10,11].** However, the same report of WHO technical consultation on Birth spacing states that the risk of adverse outcomes associated with the interval of 18-27 months is unclear and has requested further analysis to clarify this point**[12]** . The Indian government with the campaign for birth spacing, "Ek Teen Do- Faide ka Mantar hai" ,recommends birth spacing of three years between two kids, which means an IPI of 26 months**[13].** According to annual report of family planning 2020-21,spacing between two child births is less than suggested interval of three years 3 in 52.3% of births in India. So there is still lacunae in establishing an optimal IPI and its need among healthcare providers and people.

There are no available estimates of PPC use globally or within the South Asian region , however one review from low and middle income country (LMIC) suggested a comparable modern PPC use rate of 41.2% in LMICs, and 42.4% in the South/South East Asian region specifically**[14]** . The overall usage of contraception in India has increased in the most recent 2019–21 wave of NFHS, to 66.7% among all women of reproductive age . Despite this increase in use, more than a quarter of births (27%) occurred within 24 months of the preceding birth (e.g. before the WHO-recommended birth interval**)[15**] . Recent work suggests an increase in postpartum contraceptive use among young women from 33% in 2015–16 to 42% in 2019–21, coupled with increases in pregnancy health service utilization.

Birth spacing is a simple tool, which when is handled effectively achieves the best inter pregnancy intervals, which averts the two most important adverse outcomes of any pregnancy, namely low birth weight and preterm birth, and also improves maternal health . Studying on the effect of varying inter pregnancy interval over pregnancy outcome will further guide the health care providers and Indian government to promote effective Health education measures .This study aims to determine an ideal IPI so as to execute birth spacing measure accordingly to achieve a healthy mother and baby, in turn a healthy society.

Aim Of The Study

To study the effects of varying inter pregnancy intervals on pregnancy outcomes.

Objectives

1. To analyse the effects of varying inter pregnancy intervals on the two important outcomes of pregnancy namely low birth weight and preterm births.
2. To identify the existence of an ideal inter pregnancy interval which decreases the incidence of low birth weight and preterm births.
3. To document the impact of inter pregnancy interval on maternal morbidity and mortality.

Inclusion Criteria

1. Multiparous women delivered at Government maternity hospital, Tirupati
2. Singleton with gestational age >28 weeks with spontaneous onset of labour delivered at Government maternity hospital, Tirupati
3.Known inter pregnancy intervals

Exclusion Criteria

1.Women with unknown inter pregnancy intervals(failure to recollect the date of birth of preceding child)
2. Primi parous women
3. Multiple gestation in any of the pregnancies. Multiple pregnancy per se is a risk factor for low birth weight and preterm births irrespective of the inter pregnancy interval. And having a multiple pregnancy in a previous gestation will have several unexplained effects on breast feeding and child rearing practices and will influence the birth spacing behaviour of the couple.

Materials And Methods

This is a Retrospective Observational study conducted among 1000 multiparous pregnant women delivered at
Government Maternity Hospital, Sri Venkateswara Medical College, Tirupati for a period of 1 year from the date of Institutional scientific and ethics committee approval .

Sample Size: 1000 Sample size estimation for retrospective observational study with qualitative outcome assuming 95% confidence interval is N = (Zα/2)2PQ = (1.96)2 ×17.1×82.9 = 310 E 2 4.2 ×4.2 Zα/2 = 1.96 (from z table) at 5% level of significance P= Prevalence of low birth weight =17.1 Q=100-P=82.9 % E=Allowable error of 25% relative to the estimate of 17.1% = 4.275 As the present study is observational in nature sample size is taken as 1000, based on convenient sampling method, owing to higher prevalence of low birth weight in India (17.1%) and for better result analysis. Government maternity hospital Tirupati has an average total deliveries of 12,340 per year and sample size of 310 was too less to get a significant result analysis.

Study Methodology

Data was collected from the study participants after explaining about the study to them and getting their informed consent. To avoid selection bias, the participants were chosen based on a randomised approach. The questionnaire for data collection was filled by the interviewing the participant in person. The participants were interviewed in the comfort of their beds with no attendees, one day after vaginal delivery and three days after caesarean section to ensure their comfort and to have their fullest cooperation. Antenatal records were also studied to obtain the required information. The inter pregnancy interval was calculated as follows: Number of days between the index birth and the preceding birth – gestational age at the time of the index birth (in days). The resulting number was converted to months and inter pregnancy intervals were categorised into three groups as less than 18 months, 18-24 months and more than 24 months. The number of preterm births and low birth weight babies in each group was calculated.

Statistical analysis:

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test was

used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. ANOVA test was used to determine the mean difference between three or more groups. Graphical representation of data: MS Excel and MS word were used to obtain various types of graphs such as bar diagram, Pie diagram. p value (Probability that the result is true) of <0.05% was considered as statistically significant after assuming all the rules of statistical tests.

Results

Table 1 –IPI distribution

	IPI in months	Number	Percentage (%)
IPI (months)	<18 months	328	32.8
	18-24	133	13.3
	>24	539	53.9
	Total	1000	100

It is observed that longer intervals are common among older mothers when compared to women less than 25 years of age, implying decreasing fecundity with advancing age. Nearly half of the study participants have stopped their education at high school level. More than eighty five percent of the participants had at least high school level education with p values 0,001.The majority of the study subjects belonged to rural area(62.7%),as this hospital is the main referral centre for many nearby villages. It is seen that 61.7% of the rural participants had IPIs of <18 months. 42% of urban women had IPI >24months.Thus closely spaced pregnancies appear to occur more commonly in the rural population. The relationship is also statistically significant. (p<0.001)Majority of the study population were hindus(80%),followed by Christians(11%) and muslims(9%).Religion and cultural practises also play an important role in childbearing and interpregnancy interval. 92.3% of the study population were house wife and only 7.7% were employed. There was statistically significant relation between IPI and occupation with p value 0.04.

It‘s an appreciable observation that majority(86%) had their booking visit in first trimester and 13% in second and a minimal 1% in third trimester. This actually shows a good awareness among the population about need to start antenatal care at the earliest for better health of mother and baby.This earlier the booking visit had a better fetal outcome and this was statistically significant with p value 0.27.Thus inter pregnancy intervals exert independent effects on preterm births irrespective of the birth order of the child (for birth orders 2 and 3)and this relation is significant.(p-0.01) Preterm births with birth orders 4 and above were not present in the sample.

Table 2 – Duration of breast feeding comparision with respect to IPI

Breast feding(months)	N	Mean	SD	95% confidence interval for mean		Minimum	Maximum	P value
				Lower limit	Upper limit			<0.001
<18	328	11.9	6.30	11.21	12.58	0	30	
18-24	133	15.58	7.86	14.23	16.93	0	30	
>24	539	18.67	10.12	17.81	19.52	0	48	
Total	1000	16.04	9.26	15.46	16.61	0	48	

As duration of breastfeeding increases, the IPI also increases. Only 21.2% of the study participants used any form of contraception between two births, of which >98% used the intra uterine contraceptive device. The use of contraceptives obviously increases the IPI and it is statistically significant(p-<0.001).

It is observed that more women who had normal deliveries (36%) have shorter inter pregnancy intervals when compared to women who had caesarean section. This relationship however was not found to be statistically significant: p value by Pearson Chi square is 0.078.

In women with a previous normal delivery, the incidence of primary caesarean section is increased when inter pregnancy intervals are >24 months. This is significant statistically.(p-0.001) The caesarean section rates are high after long inter pregnancy intervals (>24 months)

Table 3 –Association between IPI and indication for LSCS distribution

	<18 months	18-24 months	>24 months	Total
Previous LSCS	311	93	116	520
Fetal distress	19	21	12	52
Labour dystocia	7	3	18	28

Out of the total 594 women who underwent LSCS, 520 (87.5%) were previous lscs patients and the remaining 74 were due to fetal distress(52),labour dystocia(28).The most common indication for primary c section in 24 months IPI was labour dystocia.

Factors Associated With Preterm Births:

A previous stillbirth was strongly associated with a preterm birth in this study

Table 4: Relationship between outcome of previous baby and preterm in present pregnancy

			Preterm		
			Yes	No	Total
Outcome of previous baby	Live	Count	260	716	976
		% within Outcomeof baby	26.6%	73.4%	100.0%
		%within Preterm	91.5%	100.0%	97.6%
	Still	Count	24	0	24
		% within Outcomeof baby	100.0%	.0%	100.0%
		%within Preterm	8.5%	.0%	2.4%
Total		Count	284	716	1000
		% within Outcomeof baby	28.4%	71.6%	100.0%
		%within Preterm	100.0%	100.0%	100.0%

	Value	df	Sig.
PearsonChi-Square	30.997(b)	1	
Nof ValidCases	1000		

Table 5 - Association between Previous Gestational age and Preterm

		PreviousGA					
		Full term		Preterm		Total	
		Count	ColumnN %	Count	ColumnN %	Count	ColumnN %
Preterm	No	661	74.5%	69	61.1%	730	73.0%
	Yes	226	25.5%	44	38.9%	270	27.0%
	Total	887	100.0%	113	100.0%	1000	100.0%

PearsonChi-Square=9.212, df=1, p=0.002*

A previous preterm birth was noted to beassociated with a subsequent pre term birth in 38 %.

Table 6:-Association between IPI and Preterm distribution

			IPI (Months)			Total
			<18 Months	18to24Months	>24 Months	
Preterm	No	Count	246	111	373	730
		%withinPreterm	33.7%	15.2%	51.1%	100.0%
		%withinIPI (Months)	75.0%	83.5%	69.2%	73.0%
		%of Total	24.6%	11.1%	37.3%	73.0%
	Yes	Count	82	22	166	270
		%withinPreterm	30.4%	8.1%	61.5%	100.0%
		%withinIPI (Months)	25.0%	16.5%	30.8%	27.0%
		%ofTotal	8.2%	2.2%	16.6%	27.0%
Total		Count	328	133	539	1000
		%withinPreterm	32.8%	13.3%	53.9%	100.0%
		%withinIPI (Months)	100.0%	100.0%	100.0%	100.0%
		%of Total	32.8%	13.3%	53.9%	100.0%

PearsonChi-Square=11.991, df=2,p= 0.002*

The analysis of relationship between inter pregnancy intervals and preterm births shows that the number of preterm births is least (8.1%) within the 18-24 months IPI category. The association was also statistically significant

The number of preterm births is the least in the 18-24 months inter pregnancy interval category, irrespective of the age of the mother. However the relationship between inter pregnancy interval and preterm births get attenuated with increasing maternal age.

Factors Associated With Low Birth Weight:

The trimester at which antenatal care was started affects the birth weight of the baby.

Incidence of LBW was least(24.1%),when antenatal care was started in the first trimester compared to other trimesters. A still birth in a previous pregnancy is associated with increased risk of low birth weight in the present pregnancy similar to the increased risk of preterm birth as observed earlier.A still birth in a previous pregnancy is associated with increased risk of low birth weight in the present pregnancy similar to the increased risk of preterm birth as observed earlier.

Table 7: Association between IPI and LBW distribution

			IPI (Months)			**Total**
			<18Months	**18to24 Months**	**>24Months**	
LBW	No	Count	248	107	387	742
		%withinLBW	33.4%	14.4%	52.2%	100.0%
		%withinIPI (Months)	75.6%	80.5%	71.8%	74.2%
		%of Total	24.8%	10.7%	38.7%	74.2%
	Yes	Count	80	26	152	258
		%withinLBW	31.0%	10.1%	58.9%	100.0%
		%withinIPI (Months)	24.4%	19.5%	28.2%	25.8%
		%of Total	8.0%	2.6%	15.2%	25.8%
Total		Count	328	133	539	1000
		%withinLBW	32.8%	13.3%	53.9%	100.0%
		%withinIPI (Months)	100.0%	100.0%	100.0%	100.0%
		%of Total	32.8%	13.3%	53.9%	100.0%

PearsonChi-Square=4.678, df=2, p=0.096

As depicted here the number of low birth weight babies are least in the 18-24 months interval when compared to intervals 24 months.

Table 8-**:Association between Previous LBW and Low birthweight**

		PreviousLBW			
		No		**Yes**	
		Count	**ColumnN%**	**Count**	**ColumnN%**
LBW	No	626	77.3%	116	61.1%
	Yes	184	22.7%	74	38.9%
	Total	810	100.0%	190	100.0%

PearsonChi-Square=21.18,df=1,p <0.001*

This study shows that history of a LBW baby in previous pregnancy has has increased risk of having LBW baby in present pregnancy.out of the 184 LBW,74(38%) mothers had history of LBW in previous pregnancy.

Relationship Between IPI And Maternal Complication

Table 9: Frequency of IPI and Anemia

	<18 months	**18-24months**	**>24 months**	
No anemia	0	12	93	105
Mildanemia	42	16	142	200
Moderateanemia	158	45	204	407
Severeanemia	128	60	100	288
Total	328	133	539	1000

The maximum number of anemic mothers were noted to be in the short IPI <18 months. All the study participants with IPI < 18 months were anemic but with varying degree.

Table 10 : Frequency of IPI and Pregnancy induced hypertension.

	<18MONTHS	**18-24months**	**>24 months**	
Gestational hypertension	17	16	28	61
Preeclampsia	18	14	49	81
Eclamspsia	8	12	22	42
NoPIH	285	91	440	816
	328	133	539	1000

There was a total of 18% of Pregnancy induced hypertensive mothers in the study, out of which majority (53%) were abover >24 months of IPI.18-24 months IPI group was observed to have least number pregnancy induced hypertensive cases.

Table 11: Frequency of IPI and Antepartum Haemorrhage

Antepartum haemorrhage	**<18Months**	**18-24Months**	**>24 months**	
Yes	92	36	56	184(18.4%)
No	236	97	483	816(81.6%
	328	133	539	1000

18.4% of study subjects had antepartum hemmorhage,out of which 50% subjects had IPI< 18 months.

Discussion

The current study with a sample size of 1000,was a retrospective observational study conducted in Government Maternity Hospital, Tirupati, Andhra Pradesh with majority (59%) of mothers with IPI of >24 months,13% with 18-24 months and 32% with 36 years as in table below.

Among the study population, it is observed that longer intervals are common among older mothers when compared to women <25 years of age, implying decreasing fecundity with advancing age. Nearly half of the study participants have discontinued their education at high school level, > 85% of had at least high school level education. So awareness campaigns on birth spacing should find their way into high school curriculum to be more effective. 'Catching them young' is the key. Adolescents should have a basic idea of the preferred age for marriage and child birth, and also about the need for birth spacing and optimal birth spacing intervals. This basic knowledge enables easy acceptance of family planning methods and clears myths .

As this hospital is the major referral centre for many nearby villages, majority (69%) hails from rural areas and these group had shorter inter pregnancy intervals probably due to illiteracy in family and the pressure from elders to complete the family as soon as possible, as told by many study subjects. 55 85% of study population were second gravidas,15% third and 2% fourth gravida.

Miller et al showed that higher birth order (five and above) combined with short IPI of less than 6 months was a significant risk factor for low birth weight and preterm births**[16]** No participant in this study had a birth order of 5 or above. The earlier a woman begins her prenatal care, the better the pregnancy outcomes. Early iron and folic acid supplementation reduces the chances of LBW and possibly preterm birth. It also reduces the incidence of preeclampsia and placental abruption (which in turn cause LBW & PTB) as anaemia is considered to be a risk factor in the development of preeclampsia. Majority in the study had their antenatal care started from the first trimester(86%) and just 1% in the third trimester. This improvement in antenatal care and patient follow up could be due to the efforts of Indian government through ASHAs (Accredited Social Health Activists) and incentives for both mother and ASHA her selves. Mothers who breast fed the first babies for longer periods were successful in increasing the IPI and this relation was statistically significant. Yet the association between long duration of breast feeding and long IPIs is intriguing and remains to be studied.

Only 21.2% of the study participants used any form of contraception between two births, of which >98% used the intra uterine contraceptive device. Among the people who used contraceptives,48% had IPI of 18-24 months. Counselling is an important aspect in Family Planning services. The GATHER technique is the recommended approach. • G – Greet the client with respect • A – Ask about their family planning needs • T – Tell them about the available options • H – Help them in making choices • E – Explain about the chosen method in detail and Encourage them to ask doubts • R – Return to them again for follow up.

It is observed that more women who had normal deliveries have shorter inter pregnancy intervals when compared to women who had caesarean section. This relationship however was not found to be statistically significant. In women with a previous normal delivery, the incidence of primary caesarean section is increased when inter pregnancy intervals are >24 months in this study and most common indication being labour dystocia,followed by fetal distress. This relation between long IPI and labour dystocia was examined earlier by a highquality cross sectional study including nearly 650,000 Michigan births and was found that functional dystocia(including delayed delivery,failed induction,absence of effective uterine contractions,abnormal uterine contractions and prolonged labour)was strongly associated with long IPI . However it is also noted that a smaller study among multiparous Nigerian women failed to detect an association between long IPI and risk for labour dystocia**.[17].**

Factors affecting preterm birth.

A previous still birth was strongly associated with a preterm birth in this study. Similar findings are reported by Heinonen et al **[18]** .

The analysis of relationship between inter pregnancy intervals and preterm births shows that the number of preterm births is least (8.6%) within the 18-24 months IPI category. The association was

also statistically significant. The association between short IPI and PTB was recognised long back **[8,19],**and it was further confirmed by the large meta-analysis performed by Conde-Agudelo et al**.[20]** .The meta-analysis was based on 67 studies conducted in between 1966 and 2006 and examined correlations between birth spacing and perinatal outcomes. IPI from less than 6 months compared to and IPI 18 to 23 months was associated with a 40% increased risk for PTB. DeFranco et al reached similar conclusions data analyzed using the Missouri Department of Database of health birth certificates**[21]** . Between 156,330 women who had 2 births between 1989 and 1997, risk for PTB and PTB recurrence was increased at second birth for women with an IPI lower than 6 months (adjusted OR, 1.48 and 1.44, respectively) and for women with an IPI of 6 to 12 months (edited OR, 1.14 and 1.24, respectively). The recent study by Rodrigues and Barros focused on the association of short IPI and spontaneous PTB**.[22]** Women with an IPI of 6 months or less were detected 3.6 times greater likelihood of spontaneous early PTB

Factors affecting low birth weight

The evidences available on the association between long IPI and the risk of LBW births are mixed. While some studies show that long IPI is significantly associated with a higher risk of LBW births (Conde-Agudelo et al., 2005; Qin et al., 2017; Zhu & Le, 2003) **[4,23,24]**, a few others report no possible association (Basso, Olsen, Knudsen, & Christensen, 1998; Klebanoff, 1988**).[25,26**] The trimester at which antenatal care was started affects the birth weight of the baby. Numerous studies are in agreement with the fact that the number of antenatal visits and the gestational age at the first visit were protective factors against having a low birth weight baby. A still birth in a previous pregnancy is associated with increased risk of low birth weight in the present pregnancy similar to the increased risk of preterm birth as observed earlier.

Maternal complications in relation to IPI.

Though this study was majorly concentrated on the fetal outcome of IPI. The maternal effects were not ignored. Out of the 1000 study subjects ,it was noticed that anemia was present in majority of them(86%). It was noted that all mothers with IPI < 18 months were anemic ,however the severity of anemia varied. The correlation of short IPI and anemia are attributed to the maternal depletion syndrome in many studies**.[2,27,28,29].**

Even this study proves this theory as a possible reason for it. Infact ,Conde-Agudelo and Belzian conducted a study of 456,889 women in18 Latin American countries and noted that 30% increased risk for anemia among pregnant women after an IPI of less than 6 versus 18-24 months**.[4]** But previous and smaller studies were unable to prove a significant association in multivariate analysis**.[30,31]**

Especially a quality retrospective study by Razzaque et al among 11,122 women from Bangladesh showed no increased risk to the mother anemia with a short IPI **[7]** . As of now,no study has yet controlled for breastfeeding during IPI or in the third trimester bleeding, both of which have been associated with maternal anemia. Consistent with a 2007 systematic review by Conde-Agudelo et al**,[20]** it is agreeable that due to confounding variables and conflicting and incomplete reports, no conclusion can be drawn on the causal relationship between short IPI and anemia. Further well-controlled studies are required to confirm the presence or absence of this association.

There were 184 total cases of antepartum hemorrhage in this study and it was more commonly seen in IPI <18months but the relation was not statistically significant probably due to small sample size.Bleeding in the third trimester, puerperal endometritis, placenta abruption and placenta previa were all correlated with a short IPI[20]. A cross-sectional study by Conde Agudel et al**.[20]** found a 70% increased risk of bleeding in the third trimester and a 30% increased risk puerperal endometritis in women with IPI less than 6 months versus an IPI of 18 to 23 months.

This supports the older studies that states long IPI is directly related to increased incidence of preeclampsia**.[2-9]** In general, multiparous women are known to have less risk for preeclampsia compared to nullipara. Risk for preeclampsia in a subsequent pregnancy is directly proportional to the elapsed time from the previous birth**[2-9].**A woman with an IPI of more than 10 years is equally

likely to experience preeclampsia as the first woman pregnancy. Effect of partner change between pregnancy, which was previously considered a risk factor preeclampsia, subsides after long-term follow-up IPI **[32]**

Limitations Of The Study

This was a hospital based study that entirely relied on the data collected from the patients. Hospital-based data usually suffer from serious selection bias. In hospital-based data, bias may also arise due to the overrepresentation of women who experienced any pregnancy-related complications. When compared to other landmark studies on inter pregnancy intervals, which had sample sizes in millions, the sample size of this study is small. Further studies with a large sample can help in reiterating the ideal inter pregnancy interval concept. Large sample size also enables a stratified analysis for potentially confounding factors. In that case, interviewing the participant becomes unnecessary and data for a large number of births over a period of many years can be obtained from the population database. Inter pregnancy intervals are a fertile and upcoming topic for future research and once they are readily available, numerous associations and relationships can be studied easily. This study groups all intervals more than 24 months into one category. When large numbers are available, this category can be further split up into 6 or 12 month intervals giving a clearer picture of association between various inter pregnancy intervals and their outcomes

Conclusion

Birth spacing is a simple tool which when handled properly to achieve the best inter pregnancy intervals, the two most important outcomes of any pregnancy, namely birth weight and gestational age at birth improve and maternal complications reduce drastically. From this study it is found that the 18-24 months birth to pregnancy interval is associated with the least incidence of preterm births and low birth weight babies. While the current suggestion by the WHO is to wait for at least 24 months before planning the next pregnancy, a number of studies including the present one show that the 18-24 months interval is associated with the best outcomes. Thus inter pregnancy interval is a Goldilocks phenomenon. As one postpones the next pregnancy further, the body forgets the changes it underwent during the previous pregnancy and has to learn them again from scratch and hence the outcomes may be less than satisfactory. Using appropriate contraceptive methods to avoid intervals of less than 18 months is the next step. Birth spacing and family planning are the building blocks of a prosperous world as they directly or indirectly contribute to all spheres of human development. The unmet need for contraception in the post partum period is quite high and it needs to be addressed aggressively. Counselling can then be continued at the time of pregnancy and then again after delivery. A well informed person makes better choices and is not influenced by the myths surrounding contraception. Thus, a new life beginning with an ideal inter pregnancy interval, has already won half the battle!

Conflict of Interest- Not available
Financial Support -Not available
Ethical approval: The study was approved by the Institutional Ethics Committee

References

1.Officeof the Registrar General& Census Commissioner,India(ORGI).SAMPLE REGISTRATION SYSTEM(SRS)-STATISTICAL REPORT2020 .Office of the Registrar General & Census Commissioner ,India (ORGI);2022p.1–334.
2. ShacharBZ,LyellDJ. Interpregnancy interval and obstetrical complications.Obstet Gynecol Surv. 2012 Sep;67(9):584-96.3.DaVanzo J, Hale L, Razzaque A, Rahman M. Effects of interpregnancy interval and outcome of the preceding pregnancy on pregnancy outcomes in Matlab, Bangladesh.BJOG.2007Sep;114(9):1079-
4.Conde-Agudelo A, Belizán JM, Norton MH, Rosas-Bermúdez A. Effect of the interpregnancy interval on perinatal outcomes in Latin America. Obstet Gynecol. 2005 Aug;106(2):359-66.

5.Zhu BP. Effect of inter pregnancy interval on birth outcomes: findings from three recent US studies. Int J GynaecolObstet.2005Apr;89Suppl1:S25-33. PubMed PMID: 15820365.6. Habimana-Kabano, Ignace, et al. ―Inter-Pregnancy Intervals and Maternal Morbidity: New Evidence from Rwanda.‖ *African Journal of Reproductive Health / La Revue Africaine de La Santé Reproductive*, vol. 19, no. 3, 2015, pp.77–86.
7.DeFranco EA, Seske LM, Greenberg JM, Muglia LJ. Influence of interpregnancy interval on neonatal morbidity. Am J Obstet Gynecol. 2015 Mar;212(3):386.e1-9.
8.Fuentes-Afflick E, Hessol NA. Interpregnancy interval and the risk of premature infants. Obstet Gynecol. 2000 Mar;95(3):383-90.
9.BassoO,OlsenJ,KnudsenLB,ChristensenK.Lowbirth weightandpreterm birth after short interpregnancy intervals. Am J Obstet Gynecol. 1998 Feb;178(2):259-63.
10.WorldHealthOrganization.(2007).ReportofaWHOtechnicalconsultationon birthspacing: Geneva, Switzerland1315June2005.World Health Organization .
11.WHO Recommendations on interventions to improve preterm birth outcomes [Internet]. Geneva; 2015.
12.Maintain 3 year gap :: National Health Mission - nhm.gov.in [Internet]. [cited 2022Nov22].
13.Jones, N.B. (2002)*Bushman birth spacing: A test for optimal interbirth intervals*, *Ethology and Sociobiology*. Elsevier.
14. Dev R, Kohler P, Feder M, Unger JA, Woods NF, Drake AL. A systematic review and meta-analysis of postpartum contraceptive use among women in low-and middle-income countries. Reprod Health. 2019;16:1–17.
15.International Institute for Population Sciences (IIPS), ICF. National family health survey (NFHS-5), 2019–21: India. Mumbai: IIPS; 2021.
16.Miller, J. (1994). Birth order, interpregnancy interval and birth outcomes among Filipino infants.*Journal of Biosocial Science,26*(2), 243-259.
17.OrjiEO,Shittu AS, Makinde ON, Sule SS .Effect of prolonged birth spacing on maternal and perinatal outcome. East Afr Med J.2004Aug;81(8):388-91.
18.Heinonen S, Kirkinen P. Pregnancy outcome after previous stillbirth resulting from causes other than maternal conditions and fetal abnormalities. Birth. 2000Mar;27(1):33-7.
19.Zhu BP, Rolfs RT, Nangle BE, Horan JM. Effect of the interval between pregnancies on perinatal outcomes. N Engl J Med. 1999 Feb 25;340(8):589-94.
20. Conde-Agudelo A, Rosas-Bermúdez A, Kafury-Goeta AC. Birth spacing and risk of adverse perinatal outcomes: a meta-analysis. JAMA. 2006 Apr 19;295(15):1809-23.
21.DeFranco EA, Stamilio DM, Boslaugh SE, Gross GA, Muglia LJ. A short interpregnancy interval is a risk factor for preterm birth and its recurrence. Am J Obstet Gynecol.2007Sep;197(3):264.e1-6..
22 .Rodrigues T, Barros H. Short interpregnancy interval and risk of spontaneous preterm delivery. Eur J Obstet Gynecol Reprod Biol. 2008 Feb;136(2):184-8.
23.Zhu BP, Le T. Effect of interpregnancy interval on infant low birth weight: a retrospective cohort study using the Michigan Maternally Linked Birth Database. Matern Child HealthJ.2003Sep;7(3):169-78
24.QinC,MiC,XiaA,ChenWT,ChenC,LiY,LiY,BaiW,TangS.Afirstlookat the effects of long inter-pregnancy interval and advanced maternal age on perinatal outcomes: A retrospective cohort study. Birth. 2017 Sep;44(3):230-237.
25.BassoO,OlsenJ,KnudsenLB,ChristensenK.Lowbirth weight and preterm birth after short interpregnancy intervals. Am J Obstet Gynecol. 1998 Feb;178(2):259-63.

26.Klebanoff MA. Short inter pregnancy interval and the risk of low birth weight. Am J Public Health.1988Jun;78(6):667-70.
27.Miller JE. Birth intervals and perinatal health: an investigation of three hypotheses. Fam Plann Perspect.1991Mar-Apr;23(2):62-70.

28.Winkvist A, Rasmussen KM, Habicht JP. A new definition of maternal depletion syndrome. Am J Public Health. 1992 May;82(5):691-4.
29.JanetC.King,The Risk of Maternal Nutritional Depletion and Poor Outcomes Increases in Early or Closely Spaced Pregnancies, *The Journal of Nutrition*,2003 May133(5):1732-36.
30.Khan KS, Chien PF, Khan NB. Nutritional stress of reproduction. A cohort study over two consecutive pregnancies. Acta Obstet Gynecol Scand. 1998 Apr;77(4):395-401.
31.Singh K, Fong YF, Arulkumaran S. Anaemia in pregnancy--a cross-sectional study in Singapore. Eur J Clin Nutr. 1998 Jan;52(1):65-70.
32.Skjaerven R, Wilcox AJ, Lie RT. The interval between pregnancies and the risk of preeclampsia. N Engl J Med. 2002 Jan 3;346(1):33-8.