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Short interdelivery interval in modern obstetrics: Maternal and neonatal outcomes

Modern obstetride doğumlar arası kısa interval: Maternal ve neontal sonuçlar

Metehan İmamoğlu[1], Deniz Şimşek[2], Burcu Dinçgez[2], Seda Ünal[2], Ahmet Demirci[2], Olcay İlhan[2], Ayşegül Gizem İmamoğlu[1], Gökay Özçeltik[3]

[1]*Bridgeport Hospital/Yale New Haven Health, Clinic of Obstetrics and Gynecology, Bridgeport, USA*

[2]*University of Health Sciences Turkey, Bursa Yüksek İhtisas Training and Research Hospital, Clinic of Obstetrics and Gynecology, Bursa, Turkey*

[3]*Ege University Faculty of Medicine, Department of Obstetrics and Gynecology, İzmir, Turkey*

Abstract

Objective: To investigate the maternal, neonatal outcomes of the patients with short interdelivery interval (IDI) considering initial pregnancy outcomes.

Materials and Methods: Women with two consecutive deliveries between 2016 and 2020 were included in the study. The maternal and neonatal outcomes of both pregnancies were reviewed. The time interval between consecutive deliveries was calculated. The patients were divided into two groups in terms of IDI either less or more than 24 months.

Results: The number of patients with short IDI (≤24 months), and normal IDI was 1.915 and 1.370, respectively. About 15% of the women in both groups had at least one obstetric morbidity. The rates of uterine rupture, placenta previa, and peripartum hysterectomy were higher in women with short IDI. The number of patients with low birth weight, very low birth weight, and stillbirth was higher in the short IDI group.

Conclusion: Patients with short interpregnancy intervals should be considered high-risk pregnancy. Adequate contraceptive methods should be used to prevent unintended pregnancies.

Keywords: Interdelivery interval, birth spacing, inter-pregnancy interval, stillbirth, neonatal morbidity

Öz

Amaç: Bu çalışmada doğumlar arası intervali kısa olan gebeliklerin maternal ve neonatal sonuçlarının incelenmesi amaçlanmıştır.

Gereç ve Yöntemler: 2016 ve 2020 yılları arasında iki kez doğum yapmış kadınlar çalışmaya dahil edildi. Doğumlar arasındaki süre hesaplandı. Katılımcılar, doğumlar arası interval 24 aydan az veya fazla olmak üzere iki grupta incelendiler.

Bulgular: Doğumlar arası interval 24 aydan az olan hasta sayısı 1,915 ve 24 aydan fazla olanların sayısı 1,370 olarak belirlendi. Her iki grupta en az bir obstetrik morbiditesi olan hasta oranı %15 olarak bulundu. Uterus rüptürü, plasenta previa, peripartum histerektomi oranları doğumlar arası intervali kısa olanlar grubunda daha yüksekti. Düşük doğum ağırlığı, çok düşük doğum ağırlığı ve ölü doğum oranları doğumlar arası intervali kısa olanlar grubunda daha yüksekti.

Sonuç: Doğumlar arası interval 24 aydan az olan gebeler yüksek riskli gebelik olarak kabul edilmelidir. İstenmeyen gebelikleri önlemek açısından doğum kontrol yöntemlerinin doğru uygulanması çok önemlidir.

Anahtar Kelimeler: Doğumlar arası aralık, doğum aralığı, gebelikler arası aralık, ölü doğum, neonatal morbidite

PRECIS: Pregnancies with short interdelivery interval should be considered as high-risk. Two years seems as an appropriate interval between consecutive pregnancies. Contraception should be provided to individuals to avoid unintended pregnancies.

Address for Correspondence/Yazışma Adresi: Metehan İmamoğlu, MD,
Bridgeport Hospital/Yale New Haven Health, Clinic of Obstetrics and Gynecology, Bridgeport, USA
Phone: +12038931386 **E-mail:** drmetehan@gmail.com **ORCID ID:** orcid.org/0000-0002-7803-8012

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Introduction

Childbearing potential during the reproductive lifespan has utmost importance for women order to plan their families in the way that they desire. Women inquire about the adequate time for the subsequent pregnancy after the delivery. The obstetricians may struggle to respond to this request because there is not even a consensus on the explanation of that period. Researchers have suggested various definitions to determine the appropriate timing for a subsequent pregnancy, such as inter-pregnancy interval (IPI) (time between live birth and subsequent conception), interdelivery interval (IDI) (the period between consecutive live births), and inter-outcome intervals (timing between two pregnancies). The World Health Organization recommends a two-year interval between subsequent pregnancies due to increased perinatal adverse outcomes and a short IPI is referred to a period of less than 2 years[1]. However, there are controversies in the definition of short IPI with various durations ranging from 3 to 24 months in different articles[2-4]. Several studies have revealed the association of various maternal and neonatal adverse outcomes with short IPI[2-6]. The hypotheses were put forth to explain the adverse outcomes of short IPI based on maternal nutrition depletion, or maternal folate depletion[7,8]. Besides these hypotheses; antenatal care, socioeconomic status, lifestyle behaviors might play a role in adverse outcomes; nonetheless, it has been emphasized that these concomitant issues had a small effect, and mainly short IPI played an independent role in adverse maternal and perinatal outcomes[9]. Patients who suffered a missed abortion, stillbirth, or early neonatal death may not be willing to comply with obstetricians' recommendations[10,11]. Furthermore, unintended pregnancies are common in the first 2 years after a delivery. A recent report has shown that about 30% of American women had an IPI at less than 18 months[12]. Considering such a high population in a developed country; the maternal and neonatal outcomes of the patients with a short IDI between subsequent pregnancies in developing countries is worthy of investigating. The definition of IPI was calculated in almost all studies on mothers' recall. Thus, IDI ensures an accurate duration between two deliveries. This study aimed to investigate the maternal and neonatal outcomes of women who gave consecutive births within a short IDI.

Materials and Methods

Pregnant women who were delivered between April 2016 and April 2020 at a tertiary-care center in Bursa, Turkey was reviewed. Among these, patients with two consecutive births who received antenatal care at this institution were included in the study. Ethical approval was obtained from the Institutional Review Board at University of Health Sciences Turkey, Bursa Yüksek İhtisas Training and Research Hospital. The data for the study were obtained from the birth certificates and from the hospital records. IDI was calculated as the number of months between deliveries. The cut-off for IDI were selected as 12 and 24 months. Therefore, patients were grouped based on their IDI being less or more than 12 and 24 months separately. The adverse outcomes were defined as preterm delivery, primary cesarean section (indications were as fetal malpresentation, fetal distress, prolonged or arrest of labor, cephalopelvic disproportion, suspected fetal macrosomia, umbilical cord prolapse etc.), pre-eclampsia, fetal anomaly (detected by ultrasound before birth), placental abruption, gestational diabetes mellitus, complicated vaginal delivery (operative delivery, serious perineal trauma that defined as 3rd or 4th degree perineal laceration or need of anesthesia for repairing), complicated cesarean section (Placenta previa, uterine atony, bladder or bowel injury, uterine rupture defined as disruption of uterine muscle and visceral peritoneum, need of B-Lynch suture, Bakri balloon, hypogastric artery ligation or hysterectomy). To evaluate the number of patients affected by any of the aforementioned complications, an individual parameter was created postulated as obstetric morbidity. Patients with more than one adverse outcome were included in each relevant obstetric morbidity group as one patient.

Postpartum complications were recorded as febrile morbidity, retained placenta, endometritis, abdominal hemorrhage or abscess in the postoperative period, need for transfusion, wound site infection or dehiscence, thromboembolic events, and maternal death.

Neonatal outcomes included; birth weight, 1st and 5th minute APGAR scores, admission to the neonatal intensive care unit (NICU), stillbirth, low birth weight [(LBW)-less than 2.500 gr], and very low birth weight [(VLBW)-less than 1.500 gr].

Statistical Analysis

Statistical analyses were performed using the SPSS software version 24 (Armonk, NY, USA). The Kolmogorov-Smirnov test was used to determine the normal distribution of the variables. Primarily, patients with short IDI (<24 months) were compared with the normal IDI period (>24 months). Secondarily, evaluation of these patients' first deliveries and the characteristics were achieved. Paired student's t-test and chi-square test were used appropriately. A p-value of less than 0.05 was considered as statistically significant.

Results

A total number of 50,938 births were identified on the review of records during the 4-year period. The number of patients who had two subsequent deliveries during the study period was 3.285. Of these, the number of patients with an IDI ≤24 months (short IDI), and above 24 months (normal IDI) was 1.915 and 1.370, respectively.

The characteristics, maternal and neonatal outcomes of first and second pregnancies for the short IDI and normal IDI are shown in Table 1. Women with short IDI were younger and had a lower mean birth weight during their second pregnancy. Neonatal outcomes revealed that rates of stillbirth, LBW, VLBW and admission to NICU were 1.8%, 7%, 0.7%, and

8.7% respectively, in the short IDI group. Maternal outcomes of interest, which were referred to as delivery method (p=0.085), primary cesarean indications, preeclampsia (p=0.740), preterm delivery (p=0.102), GDM (p=0.082), postpartum complications (p=0.566) did not differ significantly in women with short IDI compared with the normal IDI group. Women with both short and normal IDI had approximately 15% obstetric morbidity, which was postulated as an aggregate of the complications.

The overall complications in cesarean section deliveries in all groups are demonstrated in Table 2. Although there was no statistically significant difference between short and normal IDI patients, rates of complications such as cesarean hysterectomy, uterine rupture, and uterine atony was higher in the short IDI group (p=0.078). Despite the small number of patients who underwent two cesarean sections within two years, these patients experienced a 5% rate of surgery-related complications. Individual numbers of complications are depicted on the table.

Table 1. Evaluation of the patients' maternal and neonatal outcomes for the first and the second deliveries, and comparison of patients with the short and normal interdelivery interval

	Outcomes of 1st pregnancies in patients with IDI <24 months (n=1.915)	Outcomes of 2nd pregnancies in patients with IDI <24 months (short IDI) (n=1.915)	Outcomes of 1st pregnancies in patients with IDI >24 months (n=1.370)	Outcomes of 2nd pregnancies in patients with IDI >24 months (normal IDI) (n=1370)	Comparison of short IDI and normal IDI p-value
Age	23.6±5.3	25.1±5.4	23.8±4.9	26±4.9	<0.001
Delivery interval	-	17.9±4.1	-	31±5.5	-
Birth weight	3.111±540	3.157±555	3.207±481	3.251±498	<0.001
Hospital stay (median, std)	2±1	2±1	2±1	2±1.1	0.853
APGAR 1st min	8.8±0.8	8.8±0.6	8.8±0.6	8.9±0.4	0.027
APGAR 5th min	9.7±0.7	9.8±0.6	9.7±0.6	9.9±0.3	0.001
Newborn gender					
Male	979	986	636	726	0.395
Female	936	929	734	644	
Stillbirth	44 (2.3%)	35 (1.8%)	7 (0.5%)	10 (0.7%)	0.008
Delivery type					
Vaginal	69.7%	62.5%	70.9%	59.5%	0.085
Cesarean	30.3%	37.5%	29.1%	40.5%	
Primary cesarean section	20%	9.1%	22%	10%	0.378
Macrosomia	68 (3.6%)	81 (4.2%)	54 (3.9%)	84 (6.1%)	0.014
Complicated vaginal delivery	1 (0.1%)	0%	3 (0.2%)	0.1%	0.417
Complicated cesarean section	29 (5%)	36 (5%)	18 (4.5%)	27 (4.8%)	0.851
Obstetric morbidity	297 (15.5%)	288 (15%)	162 (11.8%)	208 (15.2%)	0.910
Preeclampsia	34 (1.8%)	28 (1.5%)	9 (0.7%)	22 (1.6%)	0.740
Preterm delivery	76 (4%)	60 (3.1%)	36 (2.6%)	30 (2.2%)	0.102
Fetal anomaly	8 (0.4%)	13 (0.7%)	5 (0.4)	3 (0.2%)	0.062
Abruptio placenta	10 (0.5%)	13 (0.7%)	2 (0.1%)	3 (0.2%)	0.062
GDM	18 (0.9%)	20 (1%)	11 (0.8%)	24 (1.8%)	0.082
Postpartum complication	36 (1.9%)	43 (2.2%)	30 (2.2%)	35 (2.6%)	0.566
NICU admission	132 (6.9%)	163 (8.7%)	52 (3.8%)	106 (7.8%)	0.368
Birth weight <1.500	29 (1.6%)	13 (0.7%)	8 (0.6)	6 (0.4%)	0.356
Birth weight <2.500	173 (9.3%)	131 (7%)	88 (6.5%)	61 (4.5%)	0.003

IDI: Interdelivery interval, NICU: Neonatal intensive care unit, Std: Standard deviation

Characteristics of the women with stillbirth are demonstrated in Table 3. Ninety-six cases of stillbirth occurred in this study with an incidence of 1.4%. The incidence of stillbirth in the short IDI group was 1.8% and in the normal IDI group was 0.7% and this difference was statistically significant (p=0.048). In the short IDI group, the mean weight weight was lower (p=0.045). However, rates of preterm delivery (p=0.036), placental abruption (p=0.044), and fetal anomaly (p=0.023) were higher than the normal IDI group.

Post partum complications are demonstrated in Table 4. The number of patients who experienced post partum complications was 43 and 35 and this difference was not statistically significant (p=0.088). Only one maternal mortality occurred due to amniotic fluid embolism.

Discussion

The effect of the short IDI on maternal and neonatal outcomes was reviewed. It has been reported that consecutive cesarean deliveries within a short IDI are associated with increased uterine rupture[13,14]. The healing process was the main determinant as depicted that the lower segment of the uterus regenerates gradually and could need at least 6 months to heal completely[15]; a recent study demonstrated that there was no relationship between short IDI and uterine rupture[16]. In our

Table 2. Demonstration of the events that complicated cesarean operations in each group individually

	Outcomes of 1st pregnancies in patients with IDI <24 months	Outcomes of 2nd pregnancies in patients with IDI <24 months (short IDI)	Outcomes of 1st pregnancies in patients with IDI >24 months	Outcomes of 2nd pregnancies in patients with IDI >24 months (normal IDI)	Comparison of outcomes of 2nd pregnancies in short IDI and normal IDI p-value
Frequency	29 (5%)	36 (5%)	18 (4.5%)	27 (4.8%)	0.078
Age	29±5.5	26±4.9	23.8±4.4	26.7±4.4	0.102
Birth weight	2.783±893	2.851±806	3.019±467	2.894±790	0.115
Stillbirth	1	4	0	1	
Abruptio placenta	1	2	0	1	
Placenta previa	8	7	6	5	
Atony	21	18	12	16	
Blood transfusion	3	5	4	4	
Hysterectomy	0	5	0	1	
Uterine rupture	0	6	0	1	
Bladder injury	0	2	0	2	
DIC	0	2	0	0	
B-Lynch suture, bacri balloon	0	4	0	2	

IDI: Interdelivery interval

Table 3. Outcomes of patients who experienced a stillbirth

	1st pregnancy outcomes of patients IDI <24 months	IDI <24 months (short IDI)	1st pregnancy outcomes of patients IDI >24 months	IDI >24 months (normal IDI)	Comparison of short IDI and normal IDI p-value
Frequency	44 (2.3%)	35 (1.8%)	7 (0.5%)	10 (0.7%)	0.048
Age	24.4±5	27.1±7	22.4±6	25.7±4	0.069
Birth weight	1.677±1.167	1.812±984	1.826±1.025	2.177±993	0.045
Preterm delivery (n-%)	28 (65%)	22 (65%)	4 (57%)	4 (40%)	0.036
Abruptio placenta	2 (5%)	6 (17%)	2 (28%)	1 (10%)	0.044
Fetal anomaly	1 (3%)	6 (17%)	0	1 (10%)	0.023
Delivery interval	-	17±3.6	-	31±5	-

IDI: Interdelivery interval

study, six patients in the short IDI group experienced uterine rupture, whereas only one uterine rupture occurred in the normal IDI group. Evaluation of these rupture cases revealed that all cases that were incomplete rupture were detected during the operation, and none of the patients underwent hysterectomy. Thus, it is difficult to associate the uterine rupture with pregnancy interval[16].

To evaluate further, a subgroup was formed to include complicated cesarean section deliveries. There was no statistical difference between the short and normal IDI groups. However, the need for uterus conserving interventions (such as B-Lynch suture, Bakri balloon placement, or hypogastric artery ligation), number of uterine ruptures, and hysterectomy procedures were higher in the short IDI group. These could be clinically important despite the statistically insignificant results.

The relationship between long IPI and primary cesarean delivery rate has been revealed[17,18]. However, limited data exists about short IDI and cesarean frequency. This study shows that there is no association between the primary cesarean delivery frequency and IDI intervals. Short IDI might be suggested to complicate the vaginal delivery such as dystocia, need for operative delivery, or perineal trauma; yet, none of the patients experienced such complications in this study. Post-partum complications were also evaluated and no significant difference was found between the groups.

In this study, a unique group was composed to determine each patient affected by any complications. The results showed that no significant difference occurred between the patients with short and normal IDI. Approximately 15% of women experienced at least one complication. Statistical analysis did not reveal any significant difference between the groups in terms of preeclampsia, preterm delivery, fetal anomaly, abruptio placenta, and GDM. Patients with short IDI might have adverse perinatal outcomes and fetal anomalies due to the folate depletion hypothesis. Despite there being no statistically significant difference within the groups, more women in the short IDI group had newborns with fetal anomaly and most of the anomalies consisted of neural tube defects, which might be related to the folate depletion hypothesis[8]. Hanley et al.[19] depicted that short IDI could be a risk factor for GDM. They stated that obesity before conception might be associated with increased GDM rates, which was contrary to the hypothesis of maternal nutrition depletion[7]. The most important point to emphasize is that maternal nutrition and obesity are the circumstances which can be managed during the period between consecutive pregnancies to avoid adverse outcomes.

The IDI was not detected as a risk factor for GDM in this study, by the way, women with normal IDI had a higher mean birth weight and more women had newborns with macrosomia. The frequency of preeclampsia, which was one of the major reasons for maternal morbidity, was not affected by short IDI in this study. The current literature has conflicting data on this issue, there are studies stating that either the short IDI[20,21], or the long IDI are associated with preeclampsia[19,22,23]. Preeclampsia is a multifactorial disease which may not be directly linked to interpregnancy interval. However, long IDI might be associated with an increased risk of preeclampsia due to advancing age. Abnormal healing processes in the endometrial cavity, suboptimal vascular regeneration, or defective implantation might be the reason for placental abruption or placenta previa. Contemporary studies focused on the effect of short IDI and these placental pathologies and stated that short IDI increases the risk factors of placenta abruption and placenta previa[9,21,24]. More repeat cesarean deliveries within a short time interval would inevitably increase the rate of placenta previa and placental invasion anomalies[25]. Placenta previa and placenta

Table 4. Evaluation of the post-partum complications of the patients in each group

	1st pregnancy outcomes of patients IDI <24 months	IDI <24 months (short IDI)	1st pregnancy outcomes of patients IDI >24 months	IDI >24 months (normal IDI)	Comparison of outcomes of 2nd pregnancies in short IDI and normal IDI p-value
Frequency	36 (1.9%)	43 (2.2%)	30 (2.2%)	35 (2.6%)	0.088
Wound site infection	6	5	9	4	
Blood component transfusion	24	28	18	26	
Endometritis	1	2	0	1	
Retained placenta	3	2	3	1	
Post-operative intraabdominal abscess or hematoma	2	2	1	1	
Disseminated intravascular coagulation	0	4	1	1	
Febrile morbidity	1	1	0	1	
Maternal mortality	0	0	0	1	

IDI: Interdelivery interval

accreta spectrum, which resulted in hysterectomy, were higher in patients with short IDI. Placental abruption was detected in 0.7% of the short IDI group whereas in the normal IDI group the rate was 0.2%. Although the results did not significantly differ, they were clinically important because each of these complications severely impacts maternal and fetal morbidity and mortality.

Even although most of the maternal outcomes did not differ statistically significantly between patients with short and normal IDI, there was a remarkable difference in neonatal results. Mean birth weight, APGAR 1st, and 5th minute scores differed significantly, although the results were supposed to be clinically insignificant. The number of newborns with low birth weights and very low birth weights were higher in the short IDI group. Additionally, the results worsened in patients with 12 months delivery interval. These outcomes were compatible with recent studies in the literature[2,4,6,19,26]. The most crucial data of this study was the higher incidence of stillbirth. Women with short IDI experienced stillbirth at a rate of 18.2 per 1.000 births. This increase was statistically significant compared to the normal IDI patients. A recent study declared that the stillbirth rate was 11.2 per 1.000 births in the same hospital[27]. The delivery interval might not be the only explanation for the increased rate of stillbirth. This was one of the most important findings of this study. Evaluating of patients who had a stillbirth revealed that the main reason was the preterm deliveries, placental abruption, and fetal anomaly. Contemporary studies revealed that women with an IPI of 6 months, which was approximately 12 months of IDI, were at risk of stillbirth[28,29]. However, contrary to these studies, Stephansson et al.[30] stated that short IPI was not associated with stillbirth after adjusting the maternal characteristics and previous pregnancy outcomes. According to the findings of this study, patients with short IDI experienced more stillbirths than women with normal IDI. Thus that should be kept in mind that patients should be informed about stillbirth as a possible adverse outcome of short IDI.

Study Limitations

The retrospective nature of this study stands as a major limitation.

Conclusion

Despite the difficulty in defining a universally accepted period for birth spacing after a delivery, patients with short interdelivery intervals should be considered high-risk pregnancies. The interval of two years seems as an appropriate period and is recommended by many studies. However, approximately 30% of the women conceive in that period. Appropriate contraceptive methods should be used to prevent unintended pregnancies. Women with consecutive deliveries less than 2 years apart might be at risk of stillbirth, preterm delivery, intrauterine growth restriction, and low birth weight. It is important to emphasize that pregnancies with short interdelivery intervals should never be understated and should be managed appropriately.

Ethics

Ethics Committee Approval: Ethical approval was obtained from the Institutional Review Board at University of Health Sciences Turkey, Bursa Yüksek İhtisas Training and Research Hospital (approval number: 2011-KAEK-25 2020/06-23, date: 10.06.2020).

Informed Consent: Retrospective study.

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Authorship Contributions

Techinal Assistance: A.D., Data Collection or Processing: S.Ü., O.İ., Analysis or Interpretation: M.İ., G.Ö., Editing: A.G.İ., B.D., Writing: M.İ., D.Ş.

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