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ORIGINAL ARTICLE

Interpregnancy Interval, Intention to Breastfeed and Breastfeeding Initiation Among Women With Pregestational Diabetes Mellitus

Leandro Cordero, MD[1], Michael R Stenger, MD[1], Mark B Landon, MD[2] and Craig A Nankervis, MD[1]*

[1]*Department of Pediatrics, The Ohio State University, USA*

[2]*Department of Obstetrics and Gynecology, The Ohio State University, USA*

***Corresponding author:** *Leandro Cordero, MD, Professor Emeritus, Department of Pediatrics, The Ohio State University Medical Center, N118 Doan Hall, 410 W. 10th Avenue, Columbus, Ohio, USA, 43210-1228, Tel: 614-293-8660, Fax: 614-293-7676*

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Abstract

Background: Interpregnancy intervals (IPI) have been related to adverse perinatal outcomes, however, correlation between IPI and BF initiation among women with pregestational diabetes (PGDM) have not been described.

Objective: To determine associations of short (< 18 months), intermediate (18-59 months) and long (≥ 60 months) IPI with intention to breastfeed (BF) and with exclusive BF, partial BF or formula feeding (FF) at discharge.

Methods: Retrospective cohort study of 205 women with PGDM who delivered (2013-2018) at ≥ 34 weeks GA. IPI was calculated as months elapsed between a live birth (*previous*) and the start of the pregnancy of the next live birth *(subsequent)*.

Results: IPI distribution was 34% short, 42% intermediate and 24% long. Short as compared to long IPI included more type 1 women (41 *vs.* 18%), younger women (31 *vs.* 34y), fewer BMI kg/m^2 ≥ 35 (46 *vs.* 64%) and more NICU admissions (26 *vs.* 2%). Prior BF experience was similar among the groups (short 63%, intermediate 59% and long IPI 54%). Intention to BF was similar for short and intermediate IPI (67 & 65%) and lower for long IPI (44%). At discharge comparing short *vs.* long IPI, exclusive BF was higher (37 *vs.* 18%), partial BF was similar (36 *vs.* 28%) and FF was lower (27 *vs.* 54%).

Conclusions: Among women with PGDM, short IPI is associated with exclusive BF at discharge while long IPI was associated with lower intention to BF, lower rate of exclusive BF and higher rate of FF at discharge. IPI outside recommended guidelines affect perinatal outcomes and increase the risk for BF initiation failure.

Keywords

Pregestational diabetes mellitus, Intention to breastfeed, Breastfeeding initiation, Interpregnancy interval

Background

Birth spacing has been a concern for health care providers for many decades [1-4]. The World Health Organization endorses 24 months between delivery (*previous*) and conception of the next (*subsequent)* pregnancy, while ACOG recommends an interpregnancy interval (IPI) of 18 months to 5 years [5,6]. Healthy People 2020 aims to reduce the proportion of pregnancies that occur within 18 months of each other due to the association of short IPI with adverse maternal, perinatal and neonatal outcomes [7]. Unfortunately, gaps remain in our knowledge of the effects of birth spacing on other important maternal and neonatal outcomes at the time of *subsequent* pregnancies [4].

Breastfeeding (BF) should be considered a desirable maternal and neonatal outcome as it is key to the health and wellbeing of mothers and their infants [8,9]. In 2015, approximately 83% of the general maternal population in the U.S. initiated breastfeeding at discharge from the hospital [10]. In addition to traditionally recognized barriers to BF among healthy women, maternal and neonatal morbidities occurring in pregnancies complicated by pregestational diabetes mellitus (PGDM) may also interfere with or delay BF initia-

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tion or BF duration [11-13]. Women with short IPI may be at increased risk for gestational diabetes and other comorbidities during pregnancy including obesity and PGDM [14,15]. Occurrence and recurrence of diabetes has been associated with long IPI [16-18]. However, the relationship between IPI and intention to BF and infant feeding at discharge among women with PGDM are under reported.

Objective

To compare clinical and demographic data of women with PGDM with short (< 18 months), intermediate (18-59 months) or long (≥ 60 months) IPI. The main objective was to determine associations of IPI with intention to BF declared prior to delivery and infant feeding choice [exclusive BF, partial BF or formula feeding (FF)] at discharge from the hospital.

Subjects and Methods

This retrospective cohort investigation was approved by the Institutional Review Board at The Ohio State University Wexner Medical Center. Electronic maternal and neonatal records (2013-2018) were reviewed. Women were diagnosed with PGDM (type 1 and type 2) according to clinical and laboratory criteria [19]. In agreement with WHO guidelines, we categorized women in our investigation as obese (BMI 30-34 kg/m^2), very obese (35-39 kg/m^2) and extremely obese (≥ 40 kg/m^2) [20]. The study population consisted of women with PGDM and their infants if delivered at ≥ 34 weeks. Pregnancies affected by major or fatal malformations were excluded. Upon arrival to labor and delivery, each woman was queried about her past BF experience and her intended infant feeding choice [21].

The IPI was calculated as the time in months elapsed between the delivery of a live birth *(previous*) and the start of the pregnancy that led to another live birth *(subsequent)*. The start of the *subsequent* pregnancy was estimated by subtracting the gestational age in weeks from the date of birth [15,22,23]. Women with intervening obstetrical events such as abortions, ectopic pregnancies, stillbirths, and the birth of non-viable infants between the *previous* and *subsequent* pregnancies were excluded [24]. Of the *previous* pregnancies, 93 delivered in our center whereas 112 delivered elsewhere. All 205 *subsequent* pregnancies delivered at our center.

Depending on the condition of the mother and her infant following delivery, maternal-infant interactions such as holding, skin to skin contact and BF were encouraged. Delivery room and postpartum maternal-infant interactions were observed and documented by the nursing staff.

Per our hospital practice, any symptomatic infants regardless of the mothers' type of diabetes, were directly transferred from the delivery room to the NICU. Admission to the NICU for prevention of hypoglycemia was also an option for infants whose mothers had poorly controlled diabetes [25]. Asymptomatic infants able to feed orally were transferred to the Newborn Nursery for routine care and glucose monitoring. Our family-centered care system has rooming-in available and full-time lactation consultants whose services are offered to all women regardless of their infant feeding preference.

Screening for hypoglycemia (blood glucose < 40 mg/dl) was done via serial point of care testing (Accu-Chek®) or by plasma glucose measurement in the laboratory (Beckman Coulter AU5800, Beckman Coulter Inc., Brea, CA, U.S.A.) starting within the first hour of life after the first feeding and every 2-4 hours thereafter as needed [25]. Asymptomatic infants in the Newborn Nursery with hypoglycemia were promptly BF or FF and those with recurrent hypoglycemia were treated with intravenous (IV) dextrose. On admission to the NICU, most infants were started on IV dextrose and those who were able to feed were BF or FF.

BF was defined as initiated, if at the time of hospital discharge, the infant was exclusively BF [all feedings during the preceding 24 hours were direct from the breast or by expressed breast milk (EBM)] or partially BF (30-90% of the feedings during the preceding 24 hours were direct from the breast or EBM). Due to the study design, no follow-up information was available on infant feeding practices following hospital discharge.

Statistical Analysis

Frequency and percent were used to describe categorical variables and the median and interquartile range (IQR) were used to describe numeric variables. Univariable tests of association with IPI and prior BF experience for each demographic and clinical variable were performed using Fisher's exact test, linear-by-linear association tests (for ordinal variables with 3+ categories), or the Kruskal-Wallis test. Multivariable proportional odds models were used to estimate the adjusted effects of a chosen set of predictors on both intention to BF and BF at discharge. IPI and prior BF experience were pre-selected to be included in the multivariable model. Based on univariable relationship test results, mother's age, BMI and PGDM type were selected for inclusion in the multivariable models. The model for BF at discharge also included intention to BF as a predictor. The importance of each predictor in these multivariable models was visualized using the fraction of explainable outcome variation contributed by each predictors partial chi-square value. Significance was established at a p value < 0.05. Statistical analysis was performed in R (version 3.6.3 URL https://www.R-project.org/).

Results

The study population consisted of 205 multiparous women with PGDM who on arrival to labor and delivery reported their *previous* BF experience and their choice of infant feeding for the *subsequent* pregnancy. Of the

Table 1: Interpregnancy intervals and maternal outcomes.

Interpregnancy Interval	< 18 Mo.	18-59 Mo.	≥ 60 Mo.	*p*
Mother-Infant Dyads no. (%)	70 (34)	85 (42)	50 (24)	NS
Diabetes mellitus type 1 no. (%)	29 (41)	27 (32)	9 (18)	0.025
Diabetes mellitus type 2 no. (%)	41 (59)	58 (68)	41 (82)	
Race Black no. (%)	14 (20)	25 (29)	16 (32)	NS
White no. (%)	40 (57)	38 (45)	15 (30)	
Hispanic no. (%)	12 (17)	14 (17)	13 (26)	
Other no. (%)	4 (6)	8 (9)	6 (12)	
Mothers age (y) median (IQR)	31 (28-36)	31 (27-34)	34 (31-37)	0.004
BMI kg/m² median (IQR)	34 (31-40)	35 (30-40)	36 (31-43)	NS
BMI kg/m² ≥ 35 no. (%)	32 (46)	44 (52)	32 (64)	NS
Smokers no. (%)	3 (4)	10 (12)	9 (18)	0.02
Never smoked no. (%)	55 (79)	64 (75)	32 (64)	
Former smokers no. (%)	12 (17)	11 (13)	9 (18)	
Percent hemoglobin A1C median (IQR)	6 (5.5-6.9)	6 (5.7-6.9)	6 (5.5-6.7)	NS
Mode of Delivery - Vaginal no. (%)	24 (34)	34 (40)	20 (40)	NS
Primary cesarean no. (%)	4 (6)	10 (12)	8 (16)	
Repeat cesarean no. (%)	42 (60)	41 (48)	22 (44)	
Mother length of stay (d) median (IQR)	4 (3-4)	3 (3-4)	4 (3-4)	NS

Table 2: Interpregnancy intervals and neonatal outcomes.

Interpregnancy Interval	< 18 Mo.	18-59 Mo.	≥ 60 Mo.	*p*
Gender (males) no. (%)	34 (49)	50 (59)	23 (46)	NS
Birth weight (g) median (IQR)	3609 (3227-3991)	3580 (3243-3989)	3553 (2994-4130)	NS
Gestational age (w) median (IQR)	38 (37-39)	38 (37-39)	38 (37-39)	NS
Late preterm no. (%)	14 (20)	9 (11)	31 (11)	NS
Large for gestational age no. (%)	32 (46)	41 (48)	24 (48)	NS
Small for gestational age no. (%)	3 (4)	1 (1)	1 (2)	
Appropriate for gestational age no. (%)	35 (50)	43 (51)	25 (50)	
Direct admission to NICU no. (%)	18 (26)	8 (9)	1 (2)	< 0.001
Admission to Newborn Nursery no. (%)	52 (74)	77 (91)	49 (98)	
Neonatal macrosomia no. (%)	14 (20)	20 (24)	16 (32)	NS
Neonatal hypoglycemia no. (%)	33 (47)	37 (44)	20 (40)	NS
Received IV Treatment no. (%)	20 (29)	17 (20)	8 (40)	NS
Baby length of stay (d) median (IQR)	3 (2-4)	3 (3-4)	3 (2-3)	NS
Discharged home with mother no. (%)	62 (89)	82 (96)	70 (100)	NS

205 pregnancies, there were 70 (34%) with short IPI, 85 (42%) with intermediate IPI and 50 (24%) with long IPI. The median IPI was 27 months (IQR 14-57) while the median age of the mothers was 32 years (IQR 28-36).

Interpregnancy intervals and maternal outcomes

Clinical and demographic characteristics of the IPI groups are displayed in Table 1. Mothers in the short and intermediate IPI groups were younger than those in the long IPI group. As the IPI increased, the prevalence of type 1 diabetes decreased (41 *vs.* 18%) while that of type 2 diabetes increased (59 vs 82%). Median maternal age was higher in the long IPI group compared to the short and intermediate group. There were 29 (14%) women on medication for chronic hypertension and 19 (9%) others with preeclampsia with severe features during the third trimester. Ten of the 19 (53%) patients with preeclampsia delivered after a short IPI as compared to 5 (26%) of the intermediate and 4 (2%) of the long IPI. Three of 70 (4%) women in the short, 10 of 85 (12%) in the intermediate and 9 of 50 (18%) in the long IPI group acknowledged smoking during the *subsequent* pregnancy.

Interpregnancy intervals and neonatal outcomes

Most neonatal outcomes were similar across the three IPI groups (Table 2). The number of asymptomatic infants admitted to the Newborn Nursery increased from 74% in the short IPI group to 91% in the intermediate and 98% in the long IPI group. Conversely, direct admissions from the delivery room to the NICU declined significantly from 18 infants (26%) in the short IPI to 8 (9%) in the intermediate and 1 (2%) in the long IPI. Statistical analysis showed that for each week increase in GA there was 50% lower chance of NICU admission. NICU admission diagnoses included respiratory distress (5), hypoglycemia in the delivery room (5), prevention of hypoglycemia (8), prematurity (4), macrosomia (2) and others (3). Median length of hospital stay among NICU admissions was 4 days (IQR 3-7).

Interpregnancy intervals, intention to BF and infant feeding at discharge

Intention to BF was similar for short and intermediate groups but declined from 67% in the short to 44% in the long IPI group (Table 3). At the time of discharge from the hospital, exclusive BF was more common among women in the short IPI group than in the other two groups. Of the 56 instances of exclusive BF for the entire population at discharge, 50 were by direct BF and 6 from exclusive EBM. The rate of FF increased from the short IPI (27%) to the intermediate (45%) and to the long IPI group (54%). Multivariable analysis showed that prior BF experience was the strongest predictor of intention to BF (OR 6.44; CI 3.4-12.0).

Prior BF experience and BF at discharge

Prior BF experience was declared prenatally at a similar rate for the three IPI groups (Table 3). Of the 121 women with prior BF experience combined, 74% intended to BF, 22% intended to BF partially while 4% intended FF only (Table 4). In contrast, of the 84 women with no prior BF experience, 40% intended BF, 18% intended partial BF and 42% intended FF. As expected, at discharge women with prior BF experience BF exclusively and BF partially more often than those without prior BF experience. Multivariable analysis showed that the stronger predictors of BF at discharge were prior BF experience (OR 4.49; CI 2.31-8.71) and intention to BF (OR 7.21; CI 3.64-14.27).

Table 3: Interpregnancy intervals, intention to breastfeed and infant feeding at discharge.

Interpregnancy Interval	< 18 Mo.	18-59 Mo.	≥ 60 Mo.	*p*
Mother-Infant Dyads no. (%)	70 (34)	85 (42)	50 (24)	NS
Prior breastfeeding experience no. (%)	44 (63)	50 (59)	27 (54)	NS
Living children before median (range)	1 (1-7)	1 (1-7)	2 (1-5)	NS
Subsequent Pregnancy				
Intention to breastfeed no. (%)	47 (67)	55 (65)	22 (44)	0.02
Intention to feed formula no. (%)	11 (16)	14 (16)	14 (28)	
Intention to feed both no. (%)	12 (17)	16 (19)	14 (28)	
First feeding by breast no. (%)	39 (56)	44 (52)	22 (44)	NS
Received lactation consults no. (%)	60 (86)	69 (81)	38 (76)	NS
Infant Feeding at Discharge				
Exclusive breastfeeding no. (%)	26 (37)	21 (25)	9 (18)	0.02
Partial breastfeeding no. (%)	25 (36)	26 (30)	14 (28)	
Formula feeding no. (%)	19 (27)	38 (45)	27 (54)	

Table 4: Prior breastfeeding experience and breastfeeding at discharge.

	Prior BF	No Prior BF	*p*
Mother-Infant Dyads no. (%)	121 (59)	84 (41)	NS
Subsequent Pregnancy			
Intention to breastfeed no. (%)	90 (74)	34 (40)	0.0001
Intention to feed both no. (%)	27 (22)	15 (18)	
Intention to feed formula no. (%)	4 (4)	35 (42)	
First feeding by breast no. (%)	77 (64)	28 (33)	0.0001
Received lactation consults no. (%)	116 (96)	51 (61)	0.0001
Infant Feeding at Discharge			
Exclusive breastfeeding no. (%)	44 (77)	12 (14)	< 0.0001
Partial breastfeeding no. (%)	50 (41)	15 (18)	
Formula feeding no. (%)	27 (22)	57 (68)	

Discussion

Following changes in policies and in hospital practices, improvements in intention to BF and BF initiation for healthy U.S. populations have been reported [10]. Unfortunately, progress made in increasing BF rates for women with complex pregnancies including women with PGDM have been modest [26,27]. Variables associated prenatally with intention to BF and postnatally with BF initiation and duration have been described, however, prior BF experience among women with PGDM has been examined less frequently and, pertinent to our study, BF initiation and IPI have not been previously investigated [21,23,28,29].

Various methods have been utilized to assess the intervals between pregnancies [23]. We employed the most frequently used that determined the time in months elapsed from the date of the *previous* live birth to the onset of the pregnancy of the *subsequent* live birth [23]. If intervening obstetrical events such as stillbirth, miscarriages and induced abortions are ignored, the distribution of short IPI and the association of risk factors and IPI length could be affected [24,29-31]. Thus, to facilitate interpretation of our data, we included only women without intervening obstetrical events between their *previous* and *subsequent* pregnancies. Like other investigators, we categorized IPI as short (< 18 months), intermediate (18-59 months) or long IPI (≥ 60 months) because many adverse maternal and neonatal outcomes have been associated with short and long IPI [14-16,18]. It is worth noting that recent studies suggest that adverse associations from short IPI from high resource settings may be limited to very short IPI (< 6 months or possibly 6-11 months) as opposed to the 18 or 24 month IPI for lower-resources settings [32,33]. Thus, it is possible that recommendations from the World Health Organization for optimal birth spacing to reduce adverse outcomes may not be appropriate for women in high resource settings such as the U.S., Canada and Europe [32,33].

Among healthy U.S. populations, it has been reported that the median IPI was 29 months (range 25-32 months) and that the IPI increased with mother's age [30]. The number of women with PGDM and short IPI occurred at asimilar rate to that reported for other populations [14,15,22,24,29,31]. Our data showed that 59% of women with PGDM delivered earlier or later than the ACOG recommendations [6]. Women who deliver after long IPI experience a higher rate of chorioamnionitis, cesarean deliveries, preeclampsia and premature births [14,32-34]. In our study population obesity, macrosomia, chronic hypertension and severe preeclampsia were common; however, our data did not reveal any relationship between IPI length and these morbidities.

The relation of birth spacing with diabetes in pregnancy has been well described [14-18]. Studies on occurrence and recurrence of diabetes in pregnancy have confirmed that short as well as long IPI are independent risk factors for the development of diabetes and preeclampsia at the time of the *subsequent* pregnancy [14-16]. After controlling for confounding factors, a long IPI remained associated with PGDM at the time of *subsequent* delivery [18]. Since IPI is a potentially modifiable risk factor, it has been suggested that shorter IPI may allow some women to complete childbearing before they develop diabetes or their disease worsens [18]. However, it has been recognized that contraception and family planning, key for these purposes, may be difficult since women with gestational or PGDM may be less likely to effectively use contraception than women without diabetes [18,35,36]. Furthermore, a national survey suggests that 20-40% of pregnancies following long IPI are unintentional [37].

Short IPI have been associated with prematurity, low birth weight, small for gestational age, infant admission to NICU and increased infant mortality [14,22,31,34,38,39]. Our data showed that a high rate of NICU admissions associated with short IPI may be partially related to GA. Regardless of diagnoses, admission to the NICU may prolong hospitalization and disrupt critical physiological mother-infant interactions that could potentially affect BF [11,25,40,41]. In the current study, despite those obstacles, BF initiation was better among infants in the short IPI group [21,25-27]. Infants born to women with PGDM are also challenged by morbidities directly or indirectly related to their mother's illness, and it is very difficult to ascertain which factors if any are specifically related to IPI [11,25,34].

In our experience the rate of women with PGDM who intended to BF ranges from 66 to 79% [11,26]. Like others, we noted that intention to BF and prior BF experience are strong predictors of exclusive or partial BF at discharge from the hospital [8,11,26,27,42-45]. Unfortunately, the rate of women healthy or otherwise who do not intend to BF remained consistent [11,16,26,27]. The data presented here showed a decline in the rate of intention to exclusively BF and an increase in the rate of intention to feed formula and BF combined among women who delivered after a long IPI.

Regardless of mode of delivery, many of the maternal and neonatal morbidities that affect women with complex pregnancies and their infants are permanent or temporary obstacles for BF initiation [25,27]. The decline in exclusive BF at discharge and the increase in the rate of women who FF in the long IPI group, although disappointing, was not unexpected. In our experience women who intend to FF seldom change their mind and initiate BF [11,26,27].

Limitations of the study are those inherent to a retrospective design and the lack of follow up information on infant feeding following discharge. The strengths of the present investigation included the definition of BF at discharge and that the data from mothers and infants was obtained directly from medical records and not from maternal recall questionnaires. More importantly, to our knowledge this is the first study which attempts to relate BF initiation to IPI in a population of women with PGDM.

In conclusion, among women with PGDM, intention to BF at discharge is less frequent following a long IPI. Short IPI is associated with type 1 diabetes and younger age, whereas long IPI occurred more often in older women with type 2 diabetes. Short IPI is associated with exclusive BF at discharge, while a long IPI is associated with lower intention to BF, lower rate of exclusive BF and higher rate of FF. IPI outside the recommended guidelines for women with PGDM become and additional risk factors for BF initiation failure and identify a group of women in need of specific and sustained support for BF success.

References

1. Brown RE (1982) Breast-feeding and family planning: A review of the relationships between breast-feeding and family planning. Am J Clin Nutr 35: 162-171.
2. Klebanoff MA (1999) The interval between pregnancies and the outcome of subsequent births. N Engl J Med 340: 643-644.
3. Conde-Agudelo A, Rosas-Bermúdez A, Kafury-Goeta AC (2007) Effects of birth spacing on maternal health: A systematic review. Am J Obstet Gynecol 196: 297-308.
4. Ahrens KA, Hutcheon JA (2018) Optimal birth spacing: What can we measure and what do we want to know? Paediatr Perinat Epidemiol 32: 149-151.
5. (2006) Report of a WHO Technical Consultation on Birth Spacing: Geneva, Switzerland 13-15 June 2005. Department of Reproductive Health and Research (RHR). Geneva, Switzerland World Health Organization.
6. (2018) ACOG Committee Opinion ACOG Committee Opinion No. 736: Optimizing Postpartum Care. Obstet Gynecol 131: e140-e150.
7. (2019) US Department of Health and Human Services. Healthy People 2020 Objectives: Family Planning. Washington, DC.
8. Steube AM, Bonuck K (2011) What predicts intent to breastfeed exclusively? Breastfeeding knowledge, attitudes, and beliefs in a diverse urban population. Breastfeed Med 6: 413-420.
9. Gunderson EP, Hurston SR, Ning X, Lo JC, Crites Y, et al. (2015) Lactation and progression to type 2 diabetes mellitus after gestational diabetes mellitus: A prospective cohort study. Ann Intern Med 163: 889-898.
10. Centers for Disease Control and Prevention (2018) Breastfeeding report card: United States 2018. Atlanta, GA: Centers for Disease Control and Prevention.
11. Cordero L, Thung S, Landon MB, Nankervis CA (2014) Breastfeeding initiation in women with pregestational diabetes mellitus. Clin Pediatr 53: 18-25.
12. Finkelstein SA, Keely E, Feig DS, Tu X, Yasseen III, et al. (2013) Breastfeeding in women with diabetes: Lower rates despite greater rewards. A population-based study. Diabet Med 30: 1094-1101.
13. Stevens DR, Taylor SN, Roberts JR, Neelon B, Newman RB, et al. (2019) Breastfeeding initiation as related to the interaction of race/ethnicity and maternal diabetes. Breastfeed Med 14: 630-639.
14. McKinney D, House M, Chen A, Muglia L, DeFranco E (2017) The influence of interpregnancy interval on infant mortality. Am J Obstet Gynecol 216: 316.e1-316.e9.
15. Hanley GE, Hutcheon JA, Kinniburgh BA, Lee L (2017) Interpregnancy interval and adverse pregnancy outcomes: An analysis of successive pregnancies. Obstet Gynecol 129: 408-415.
16. Holmes HJ, Lo JY, McIntire DD, Casey BM (2010) Prediction of diabetes recurrence in women with class A1 (diet-treated) gestational diabetes. Am J Perinatol 27: 47-52.
17. Khambalia AZ, Ford JB, Nassar N, Shand AW, McElduff A, et al. (2013) Short report: Epidemiology occurrence and recurrence of diabetes in pregnancy. Diabet Med 30: 452-456.
18. Dude AM, Battarbee A, Yee LM (2019) Interdelivery interval and diabetes mellitus in a subsequent pregnancy. Am J Perinatol 36: 1039-1044.
19. Bennett SN, Tita A, Owen J, Biggio JR, Harper LM (2015) Assessing White's classification of pregestational diabetes in a contemporary diabetic population. Obstet Gynecol 125: 1217-1223.
20. (2000) Obesity: Preventing and managing the global epidemic. Report of a WHO Consultation. World Health Organ Tech Rep Ser 894: i-xii.
21. Cordero L, Stenger MR, Blaney SD, Finneran MM, Nankervis CA (2019) Prior breastfeeding experience and infant feeding at discharge among women with pregestational diabetes mellitus. J Neonatal Perinatal Med. Doi:10.3233/npm.190308.
22. Chen I, Jhangri GS, Lacasse M, Kumar M, Chandra S (2015) Relationship between interpregnancy interval and adverse perinatal and neonatal outcomes in northern Alberta. J Obstet Gynaecol Can 37: 598-605.
23. Ahrens KA, Hutcheon JA, Ananth CV, Basso O, Briss PA, et al. (2018) Report of the office of population affairs' expert work group meeting on short birth spacing and adverse pregnancy outcomes: Methodological quality of existing studies and future directions for research. Paediatr Perinat Epidemiol 33: 1-10.
24. Conzuelo-Rodriguez G, Naimi AI (2018) The impact of computing interpregnancy intervals without accounting for intervening pregnancy events. Paediatr Perinat Epidemiol 32: 141-148.
25. Cordero L, Oza-Frank R, Stenger MR, Landon MB, Nankervis CA (2018) Decreasing NICU admissions of asymptomatic infants of women with pregestational diabetes mellitus improves breastfeeding initiation rates. J Neonatal Perinatal Med 11: 155-163.
26. Cordero L, Bajwa A, Prasad MR, Oza-Frank R, Landon MB, et al. (2016) Breastfeeding at hospital discharge among high risk obstetrical patients. Int J Womens Health Wellness 2: 031.
27. Cordero L, Oza-Frank R, Moore-Clingenpeel M, Landon MB, Nankervis CA (2016) Failure to initiate breastfeeding among high risk obstetrical patients who intended to breastfeed. J Neonatal Perinatal Med 9: 401-409.
28. Bai DL, Fong DYT, Tarrant M (2015) Previous breastfeeding experience and duration of any and exclusive breast-

feeding among multiparous mothers. Birth 42: 70-77.

29. Gemmill A, Lindberg LD (2013) Short interpregnancy intervals in the United States. Obstet Gynecol 122: 64-71.

30. Copen CE, Thoma ME, Kirmeyer S (2015) Interpregnancy intervals in the United States: Data from the birth certificate and the national survey of family growth. Natl Vital Stat Rep 64: 1-10.

31. Zhang L, Shen S, He J, Chan F, Lu J, et al. (2018) Effect of interpregnancy interval on adverse perinatal outcomes in southern china: A retrospective cohort study, 2000-2015. Paediatr Perinat Epidemiol 32: 131-140.

32. Ahrens KA, Nelson H, Stidd RL, Moskosky S, Hutcheon JA (2019) Short interpregnancy intervals and adverse perinatal outcomes in high-resource settings: An updated systematic review. Paediatr Perinat Epidemiol 33: 025-047.

33. Hutcheon JA, Nelson HD, Stidd R, Moskosky S, Ahrens KA (2019) Short interpregnancy intervals and adverse maternal outcomes in high-resource settings: An updated systematic review. Paediatr Perinat Epidemiol 33: 048-059.

34. Conde-Agudelo A, Rosas-Bermudez A, Castaño F, Norton MH (2012) Effects of birth spacing on maternal, perinatal, infant, and child health: A systematic review of causal mechanisms. Stud Fam Plann 43: 93-114.

35. Perritt JB, Burke A, Jamshidli R, Wang J, Fox M (2013) Contraception counseling, pregnancy intention and contraception use in women with medical problems: An analysis of data from the Maryland pregnancy risk assessment monitoring system (PRAMS). Contraception 88: 263-268.

36. Schwarz EB, Braughton MY, Riedel JC, Cohen S, Logan J, et al. (2017) Postpartum care and contraception provided to women with gestational and preconception diabetes in California's medicaid program. Contraception 96: 432-438.

37. Ahrens KA, Thoma ME, Rossen LM (2017) Interpregnancy interval and adverse pregnancy outcomes: An analysis of successive pregnancies. Obstet Gynecol 130: 464.

38. Cohen SS, Alexander DD, Krebs NF, Young BE, Cabana MD, et al. (2018) Factors associated with breastfeeding initiation and continuation: A meta-analysis. J Pediatr 203: 190-196.

39. Yee LM, Truong YN, Caughey AB, Cheng YW (2016) The association between interdelivery interval and adverse perinatal outcomes in a diverse US population. J Perinatol 36: 593-597.

40. Bystrova K, Ivanova V, Edhborg M, Matthiesen AS, Ransjö-Arvidson AB, et al. (2009) Early contact versus separation: Effects on mother-infant interaction one year later. Birth 36: 97-109.

41. Metha UJ, Siega-Riz AM, Herring AH, Adair LS, Bentley ME (2012) Pregravid body mass index, psychological factors during pregnancy and breastfeeding duration: Is there a link? Matern Child Nutr 8: 423-433.

42. Wagner S, Kersuzan C, Gojard S, Tichit C, Nicklaus S, et al. (2019) Breastfeeding initiation and duration in France: The importance of intergenerational and previous maternal breastfeeding experiences - results from the nationwide ELFE study. Midwifery 69: 67-75.

43. Waldrop J (2013) Exploration of reasons for feeding choices in Hispanic mothers. MCN Am J Matern Child Nurs 38: 282-288.

44. Garrett CC, Azimov M, Campwala K, Sarmiento M, Linton KF (2018) Breastfeeding practices among Hispanic and non-hispanic women at the postpartum visit. J Hum Lact 34: 485-493.

45. Bigman G, Wilkinson AV, Pérez A, Homedes N (2018) Acculturation and breastfeeding among Hispanic American women: A systematic review. Matern Child Health J 22: 1260-1277.

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