Combined effects of maternal age and parity on successful initiation of exclusive breastfeeding

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ABSTRACT

Maternal age at first childbirth has increased in most developed countries in the past 20 years. The purpose of this study is to investigate effects of maternal age at delivery and parity on successful initiation of exclusive breastfeeding (EBF). This retrospective study investigated 1193 singleton dyads with vaginal-delivered at 37–42 gestational weeks during January and December in 2011 at one large "Baby-Friendly" certified hospital in Japan. A multivariate logistic regression model was used to evaluate individual and combined effects of maternal age and parity on successful initiation of EBF after adjusted for pre-pregnancy body mass index, gestational weight gain, pregnancy complications, mothers' underlying illness, smoking and alcohol drinking habits, gestational week at delivery, child's sex and nurturing support from grandparents. Success rates of EBF at one month after child delivery was 69.4% in primiparous aged ≥35 (group A: n = 284), 73.5% in multiparous aged ≥35 (group B: n = 268), 74.3% in primiparous aged <35 (group C: n = 432), and 82.3% in multiparous aged <35 (group D: n = 209). Older maternal age and primiparous became independently associated with EBF initiation. The combined effect for successful initiation of EBF was the lowest in group A referent to group D both at discharge and at one month (odds ratio (OR) 5.9, 95% confidence interval (CI): 3.0–11.9, and OR 2.2, 95% CI: 1.4–3.4, respectively). Primiparous mothers in late child-bearing aged 35 years or older are at the greatest risk of EBF initiation.

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Introduction

Breastfeeding has become one of the major initiatives in global health in the 21st century (Bartick and Reinhold, 2010; Jones et al., 2003; Merewood et al., 2005; Reniers et al., 1983). There are not only nutritional and immunological benefits to the child but also infant-mother bonding and preventive effect of breast cancer in mothers at a later age are some of the well-documented aspects of breastfeeding (American Academy of Pediatrics, 2012; Horta and Victora, 2013; Ip et al., 2007; Jones et al., 2003). The World Health Organization (WHO) and UNICEF promote the ten steps to successful breastfeeding and recommended up to six months of exclusive breastfeeding (EBF) for all infants (Kramer and Kakuma, 2012; WHO, 2009).

However, the duration of EBF is still unsatisfactory in both developing and developed countries (WHO, 2013). In Japan, according to the most recent National Infants Nutrition Survey 2005 (a 10-yearly nation-wide sampling survey) by the Ministry of Health, Labor and Welfare, the proportion of EBF at one month after delivery was below 50%, even though during pregnancy, 96% of those women intended to initiate EBF (Ministry of Health, Labor and Welfare, 2006).

Previous studies have found that factors such as socioeconomic and employment status, maternal and child characteristics, maternal/family intention and health care management contributed to breastfeeding initiation and/or duration (Dennis, 2002; Jones et al., 2011; Meedya et al., 2010; Thulier and Mercer, 2009). Among those factors, the effect of maternal age on breastfeeding practice is one of the most interesting research targets. This is because in the past 20 years, increasing maternal age at first childbirth in most developed countries has been observed (OECD, 2012).

Notably, in the previous studies, the effects of maternal age on EBF practice are inconsistent (Kaneko et al., 2006; Lande et al., 2003; Senarath et al., 2010; Forde and Miller, 2010; Fisher et al., 2013; Ludvigsson and Ludvigsson, 2005; Hundalani et al., 2013; Amin et al., 2011; Ekström et al., 2003; Guo et al., 2013). Some studies were targeted at early cessation of breastfeeding among younger mothers (Avery et al.,

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1998; Akter and Rahman, 2010; Hauck et al., 2011; Liu et al., 2013). In addition to older maternal age, the effect of parity on breastfeeding makes the evaluation more complicated together with ethnic and cultural influences (Ekström et al., 2003; Hla et al., 2003; Griffiths et al., 2005; Dennis et al., 2013).

According to Population Census in 2013 in Japan, primiparous mothers of 35 years or older is increasing. Hence, the purpose of this study is to evaluate individual and the combined effects of maternal age and parity, specifically first-time delivery ages 35 years or older on successful EBF initiation. The result of the present study would allow us to assess if there is combined effects of primiparous mothers in late childbearing on EBF practice.

Methods

This study was a retrospective hospital-based cohort study using medical records. This study was approved by the ethics committee of Teikyo University School of Medicine, Tokyo, Japan (TU-COI 13-1592).

Participants

We obtained an anonymous dataset of consecutive deliveries between January 2011 and December 2011 extracted from electronic medical records in the Japanese Red Cross Medical Center located in Tokyo metropolitan area which had the second largest number of deliveries in Japan. This hospital was Baby-Friendly Hospital Initiative (BFHI) accredited in 2000 because it has been actively promoting 10-step guideline for successful breastfeeding (WHO, 1998; Hawkins et al., 2015; Cleminson et al., 2015).

After excluding miscarriage (n = 220), preterm birth (n = 253), multiple pregnancies (n = 81) and stillbirths (n = 10), there were 1618 singleton dyads delivered at 37–42 gestational weeks. The proportion of participants who returned for the health checkup was 99.8% (1614/1618). Among these, we excluded mothers who had delivery by caesarean section (n = 267), a low birth weight baby defined as lower than 2500 g (n = 80) and newborns with illness who were forced to separate from their mothers due to admission (n = 119). After excluding 25 mothers with missing data on breastfeeding at one month after delivery, 1193 vaginal-birth singleton dyads were analyzed in the present study.

Data collection

Items retrieved from medical records were maternal age, parity (primipara or multipara), presence/absence of underlying disease of mothers (e.g. cardiac diseases, renal diseases, neurological diseases including epilepsy, psychiatric diseases, gynecological diseases including myoma uteri), maternal lifestyle (smoking and alcohol drinking habits), self-reported pre-pregnancy body weight, body height measured at first medical checkup, body weight measured at admission for delivery, maternal hypertension including pregnancy-induced hypertension (PIH), maternal hyperglycemic disorders including gestational diabetes mellitus (GDM), gestational week at delivery, child's sex and birth weight and grandparental nurturing support by asking mothers if they would receive nurturing support from their parents.

In the present study, maternal hypertension was defined as high blood pressure (i.e. 140/90 mm Hg or higher) before and/or during pregnancy. Maternal hyperglycemic disorders in pregnancy included GDM and overt diabetes in pregnancy (The Japan Society of Obstetrics and Gynecology, 2014; International Association of Diabetes and Pregnancy Study Groups Consensus Panel, 2010).

Definition of EBF outcome measure

In the present study, breastfeeding practice at hospital discharge within 24 h and at one-month after delivery were measured using three categories (EBF, partial breastfeeding and formula feeding). With reference to WHO/UNICEF definition, EBF is defined as infants who were fed with only breast milk from his/her mother or wet nurse through breast feeding or expressed breast milk and no other liquids or solids (except for drops or syrups with nutritional supplements or medicine) were given to the infants (WHO, 2008). Otherwise, we ascertained as partial breastfeeding excluding formula only fed infants (Labbok and Krasovec, 1990). Because breastfeeding duration is substantially affected by breastfeeding outcomes in the first postpartum month (Baxter et al., 2009), we particularly focused on EBF initiation at the one month after delivery.

In Japan, mother and newborn dyads discharge from hospital around day 5 after delivery and it is compulsory for mothers to make an appointment for health checkup 1-month after delivery at the hospital where they delivered. At the 1-month health checkup visit, nutritional status which includes breastfeeding practice for mothers and child dyads are assessed.

Statistical analyses

Characteristics among four combination of maternal age and parity are statistically compared based on t-test or Wilcoxon rank-sum test for continuous variables and chi-square test for categorical variables: group A in primiparous mothers aged ≥35 (n = 284), group B in multiparous mothers aged ≥35 (n = 268), group C in primiparous mothers aged <35 (n = 432) and group D in multiparous mothers aged <35 (n = 209).

Pre-pregnancy body mass index (BMI) was calculated based on weight in kilograms (kg) divided by height in square meters (sqm). BMI was categorized according to the WHO classification: underweight (<18.5), normal weight (18.5–24.9), overweight (25.0–29.9) and obese (≥30.0). The proportion of Japanese obese adults is small relative to Western countries among the Organization for Economic Cooperation and Development (OECD), therefore, the Japan Society for the Study of Obesity defined obesity as BMI ≥ 25. Based on this definition, in the present study, two higher categories of WHO classification were amalgamated into: overweight and obese (25.0 ≤ BMI). Gestational weight gain (kg) was computed as a difference between pre-pregnancy body weight and body weight at admission for delivery.

To evaluate both individual effects and combined effects of maternal age of 35 years or older and parity, logistic regression models (i.e., did not initiate EBF = 1 vs. successfully initiated EBF = 0) were used to compute odds ratios (ORs) with 95% confidence intervals (CIs). Stepwise multivariate logistic regression models (SLENTRY = 0.20, SLSTAY = 0.20) were used while adjusting for pre-pregnancy BMI, gestational weight gain, maternal hypertension including PIH, maternal hyperglycemia including GDM, underlying illness of mothers, smoking and alcohol drinking habits, gestational week at delivery, child's sex and nurturing support from grandparents.

All data was analyzed using SAS statistical software version 9.3 (SAS Institute Inc.) where two-sided P values of less than 0.05 were considered statistically significant.

Results

Table 1 shows participants' characteristics based on the four combination groups of maternal age and parity. The mean maternal age difference is 8.1 years (P < 0.001) in primiparous mothers (i.e., Group A minus Group C) is 6.9 years (P < 0.001) in multiparous mothers (i.e., Group B minus Group D). There were significant differences among four groups excluding child's sex. Underlying maternal disease and pregnancy complications were the most frequent in Group A. Mothers in Group A were also more likely to have cigarette smoking and alcohol drinking habits.

In terms of successful initiation of EBF, younger mothers under 35 years had higher success rates of EBF both at discharge (88.5%) and

Table 1
Characteristics of the four combination groups of maternal age and parity (n = 1193).

	Group A ≥35 and primiparous n = 284		Group B ≥35 and multiparous n = 268		Group C <35 and primiparous n = 432		Group D <35 and multiparous n = 209		P-value
Maternal age, years	37.7 ± 2.3		38.0 ± 2.5		29.6 ± 3.4		31.1 ± 2.8		<0.001
Prepregnancy BMI, kg/m^2	20.4 ± 2.4		20.4 ± 2.4		19.7 ± 2.5		20.1 ± 2.7		0.001
<18.5, n (%)	50	(17.6)	45	(16.8)	136	(31.5)	51	(24.4)	
18.5–24.9, n (%)	218	(76.8)	209	(78.0)	280	(64.8)	149	(71.3)	<0.001
≥25.0, n (%)	16	(5.6)	14	(5.2)	16	(3.7)	9	(4.3)	
Gestational weight gain, kilograms	10.2 ± 3.6		10.1 ± 3.2		10.9 ± 3.4		10.1 ± 3.5		0.002
<7.5, n (%)	58	(20.4)	43	(16.0)	56	(13.0)	44	(21.1)	
7.5–13.0, n (%)	178	(62.7)	182	(67.9)	278	(64.4)	129	(61.7)	0.024
>13.0, n (%)	48	(16.9)	43	(16.0)	98	(22.7)	36	(17.2)	
Pregnancy complications									
Pregnancy induced hypertension, n (%)	18	(6.3)	5	(1.9)	13	(3.0)	1	(0.5)	0.001
Gestational diabetes mellitus, n (%)	16	(5.6)	8	(3.0)	6	(1.4)	5	(2.4)	0.011
Maternal underlying disease, n (%)	58	(20.4)	36	(13.4)	59	(13.7)	22	(10.5)	0.011
Maternal lifestyle									
Cigarette smoking habit, n (%)	67	(23.6)	39	(14.6)	89	(20.6)	33	(15.8)	0.024
Alcohol drinking habit*, n (%)	72	(25.6)	50	(18.7)	102	(23.7)	31	(14.9)	0.013
Gestational week at delivery, weeks	39.5 ± 1.1		39.3 ± 1.0		39.4 ± 1.0		39.1 ± 0.92		<0.001
37, n (%)	8	(2.8)	13	(4.9)	17	(3.9)	12	(5.7)	
38, n (%)	41	(14.4)	50	(18.7)	59	(13.7)	38	(18.2)	
39, n (%)	90	(31.7)	86	(32.1)	140	(32.4)	95	(45.5)	<0.001
40, n (%)	91	(32.0)	96	(35.8)	154	(35.6)	55	(26.3)	
41–42, n (%)	54	(19.0)	23	(8.6)	62	(14.4)	9	(4.3)	
Child									
Males, n (%)	156	(54.9)	136	(50.7)	204	(47.2)	107	(51.2)	0.248
Birth weight, g	3090 ± 309		3164 ± 347		3057 ± 304		3095 ± 317		<0.001
Nurturing support by grandparents*, n (%)									
No	40	14.7	46	18.5	36	8.6	18	9.0	0.001

* Missing: alcohol drinking (n = 6), support by grandparents (n = 51).

at one month (76.9%) (P = 0.001 and P = 0.029, respectively). A similar trend was observed for multiparous mothers (89.7% at discharge and 77.4% at one month; P < 0.001 and P = 0.052, respectively). Table 2 shows the transition of EBF practice at time of discharge and one month after delivery. Among mothers who succeeded EBF at one month, the success rates was the highest (i.e. 82.3% (172/209)) in group D; followed by group C (i.e. 74.3% (321/432)), group B (i.e. 73.5% (197/268)) and group A (i.e. 69.4% (197/284)). If mothers succeeded in EBF at discharge, they were more likely to succeed in EBF at one month after delivery and this trend was consistently observed in all four groups. The proportions of mothers who succeeded EBF at one month, even though did not initiate EBF at discharge were 29.7% in group A, 17.9% in group B, 28.1% in group C, and 30.0% in group D.

Table 3 shows the effects of maternal age and parity on mothers who did not initiate EBF at discharge. Adjusting for pre-pregnancy BMI and cigarette smoking computed by stepwise model selection, multivariate logistic model showed that individual effects of maternal age and parity were 1.99 (95% CI: 1.42–2.78 for maternal age of 35 years or older;

P < 0.001) and 2.20 (95% CI: 1.53–3.16 for primiparous mothers; P < 0.001), respectively, but statistical interaction between maternal age and parity was not significant (P = 0.09). In a multivariate model for the combined effect of maternal age and parity, adjusting for pre-pregnancy BMI and cigarette smoking habit computed by stepwise model selection, the combined effect of maternal age and parity was the highest (OR 5.91, 95% CI: 2.95–11.86; P < 0.001) in group A followed by group C (OR 3.54, 95% CI: 1.78–7.07; P = 0.001) and B (OR 3.38, 95% CI: 1.64–6.96; P < 0.001) referent to group D.

Table 4 shows the effects of maternal age and parity on mothers who did not initiate EBF at one month. Adjusting for underlying maternal disease and gestational week at delivery computed using stepwise model selection, multivariate logistic model showed that individual effects of maternal age and parity were 1.42 (95% CI: 1.08–1.86 for maternal age of 35 years or older; P = 0.011) and 1.47 (95% CI: 1.11–1.95 for primiparous mothers; P = 0.008), respectively, but statistical interaction between maternal age and parity was not significant (P = 0.37). Adjusting for maternal underlying disease and gestational week at delivery computed by stepwise model selection, multivariate

Table 2
Exclusive breastfeeding (EBF) practice between at discharge and at 1-month (n = 1193).

	EBF at discharge	EBF at 1 month		P-value*
Group A (n = 284)		Successfully initiate (n = 197)	Did not initiate (n = 87)	
Primiparous, ≥35 years	Successfully initiate (n = 220)	178 (80.9%)	42 (19.1%)	<0.001
	Did not initiate (n = 64)	19 (29.7%)	45 (70.3%)	
Group B (n = 268)		Successfully initiate (n = 197)	Did not initiate (n = 71)	
Multiparous, ≥35 years	Successfully initiate (n = 229)	190 (83.0%)	39 (17.0%)	<0.001
	Did not initiate (n = 39)	7 (17.9%)	32 (82.1%)	
Group C (n = 432)		Successfully initiate (n = 321)	Did not initiate (n = 111)	
Primiparous, <35 years	Successfully initiate (n = 368)	303 (82.3%)	65 (17.7%)	<0.001
	Did not initiate (n = 64)	18 (28.1%)	46 (71.9%)	
Group D (n = 209)		Successfully initiate (n = 172)	Did not initiate (n = 37)	
Multiparous, <35 years	Successfully initiate (n = 199)	169 (84.9%)	30 (15.1%)	<0.001
	Did not initiate (n = 10)	3 (30.0%)	7 (70.0%)	

* Fisher's exact test.

Table 3

Proportion and odds ratio (OR) with 95% confidence interval (CI) for mothers who did not initiate exclusive breastfeeding (EBF) at discharge (n = 1193).

	Mothers who did not initiate EBF at discharge	Logistic regression models				P-value
		Crude OR (95% CI)	Multivariate stepwise models[*]			
			Adjusted OR	95% CI		
	n (%)			Lower	Upper	
Individual						
Maternal age, years						
<35	74 (11.5)	1.00	1.00			
≥35	103 (18.7)	1.76 (1.27, 2.43)	1.99	1.42	2.78	<0.001
Parity						
Multiparous	49 (10.3)	1.00	1.00			
Primiparous	128 (17.9)	1.90 (1.34, 2.70)	2.20	1.53	3.16	<0.001
Combined						
Group A (n = 284)						
≥35, primiparous	64 (22.5)	5.79 (2.89, 11.58)	5.91	2.95	11.86	<0.001
Group B (n = 268)						
≥35, multiparous	39 (14.6)	3.39 (1.65, 6.96)	3.38	1.64	6.96	0.001
Group C (n = 429)						
<35, primiparous	64 (14.8)	3.46 (1.74, 6.89)	3.54	1.78	7.07	<0.001
Group D (n = 208)						
<35, multiparous	10 (4.8)	1.00	1.00			

[*] Individual or combined risks of maternal age and parity were computed adjusted for pre-pregnancy BMI, and cigarette smoking.

logistic model demonstrated that the combined effect was the highest (OR 2.20, 95% CI: 1.41–3.44; P = 0.001) in group A followed by group C (OR 1.73, 95% CI: 1.13–2.64; P = 0.019) and B (OR 1.72, 95% CI: 1.09–2.70; P = 0.011) referent to group D.

Discussion

We investigated the combined effects of maternal age and parity on EBF practice and indicated the following findings: (1) success rates of EBF initiation both at discharge and at one month after delivery were the lowest in primiparous mothers aged 35 years or older and (2) maternal age and parity have combined effect on EBF initiation. Therefore, the first-time mothers in late child-bearing age of ≥35 years had the greatest risk of EBF initiation both at discharge and at one month, even though they had the antenatal intention to EBF and had purposefully chosen BFHI. These findings demonstrated that primiparous mothers aged 35 years or older may be the most vulnerable population who may need active interventions to improve the success rate of EBF at

discharge that correlated positively with success rate of EBF at one month after delivery. To the best of our knowledge, this is the first study to examine the combined effects of maternal age and parity on successfully initiated EBF practice both at discharge and at one month after delivery.

The present findings that both older maternal age of ≥35 and primipara were negative factors of success of EBF initiation, which are consistent with the results from the Longitudinal Survey of Babies in 21st Century conducted by the Ministry of Health, Labor and Welfare in Japan (Kaneko et al., 2006). However, several studies favored older maternal age group with studies in Norway (Lande et al., 2003), Philippines (Senarath et al., 2010) and Australia (Forde and Miller, 2010) where they defined mothers aged of 35 years or older while another study in Australia (Fisher et al., 2013) defined mother age of 37 years or older. All these studies agreed that mothers within these older age range significantly succeeded in EBF practice. Some studies showed that younger mothers, when compared to older mothers, are at an increased risk of early cessation of EBF (Ludvigsson and

Table 4

Proportion and odds ratio (OR) with 95% confidence interval (CI) for mothers who did not initiate exclusive breastfeeding (EBF) at 1 month (n = 1193)

	Mothers who did not initiate EBF at 1-month	Logistic regression models				
		Crude OR (95% CI)	Multivariate stepwise models[*]			
			Adjusted OR	95% CI		P-value
	n (%)			Lower	Upper	
Individual						
Maternal age, years						
<35	148 (23.1)	1.00	1.00	–	–	
≥35	158 (28.6)	1.34 (1.03, 1.73)	1.42	1.08	1.86	0.011
Parity						
Multiparous	108 (22.6)	1.00	1.00	–	–	
Primiparous	198 (27.7)	1.31 (1.00, 1.71)	1.47	1.11	1.95	0.008
Combined						
Group A (n = 284)						
≥35, primiparous	64 (22.5)	2.05 (1.33, 3.17)	2.20	1.41	3.44	0.001
Group B (n = 268)						
≥35, multiparous	39 (14.6)	1.68 (1.07, 2.62)	1.72	1.09	2.70	0.019
Group C (n = 429)						
<35, primiparous	64 (14.8)	1.61 (1.06, 2.44)	1.73	1.13	2.64	0.011
Group D (n = 208)						
<35, multiparous	10 (4.8)	1.00	1.00	–	–	

[*] Individual or combined risks of maternal age and parity were computed adjusted for maternal underlying disease and gestational week at delivery.

Ludvigsson, 2005; Amin et al., 2011) or shorter duration of breastfeeding (Ever-Hadani et al., 1994; Hromi-Fiedler and Pérez-Escamilla, 2006; Tarrant et al., 2010; Dennis et al., 2013). Based on these previous literatures, the number of studies carried out on mothers aged 35 years or older was still relatively limited therefore the older age effect on EBF initiation remains to be elucidated.

The relationship between parity or birth order and breastfeeding is also inconsistent among prior studies. Some studies found that multiparous significantly associated with longer EBF (Kaneko et al., 2006; Forde and Miller, 2010; Lande et al., 2003; Amin et al., 2011) which are consistent with the present finding. However, some studies in Sweden (Ekström et al., 2003) and China (Guo et al., 2013) found no association while some reported the opposite association that primiparous mothers were more likely to initiate EBF at discharge (Forde and Miller, 2010; Hundalani et al., 2013) or more likely to continue breastfeeding (Ever-Hadani et al., 1994; Tarrant et al., 2010).

Hence, the discrepancies in tendency and significance of maternal age and parity on EBF practice in previous literatures may be explained by the various aspects such as age, parity and ethnicity of study participants. Regarding ethnicity, Caucasian mothers were reported less likely to breastfeed than mothers from all other ethnic groups (Griffiths et al. (2005)). One study in Hawaii reported that older maternal age of 35 years or older was against early cessation of breastfeeding among Japanese in Hawaii but not significant among Caucasians in Hawaii (Hla et al., 2003). As such, the inconsistent results of the present study in comparison with the previous studies may be because of ethnicity as the study was conducted in Japan.

In our study, 20–30% of mothers who did not initiate EBF at the time of discharge eventually turned out to have successful initiation at one month. Dewey et al. (2003) indicated that lactation difficulties during the first week postpartum are not uncommon, even among women who are highly motivated to breastfeed exclusively and receive good lactation guidance; and that early lactation success is strongly influenced by parity, but may also be affected by potentially modifiable factors such as labor medications; therefore, all breastfeeding mother-infant pairs should be evaluated at 72 to 96 hours' postpartum. Maternal age and parity are highly correlated and their individual effects on postpartum lactogenesis are often difficult to distinguish (Kaneko et al., 2006). However, there have been few studies on postpartum lactogenesis or EBF practice among first-time mothers in late child-bearing age. Griffiths et al. (2005) reported that mothers who are young at first motherhood (rather than age at birth of the cohort baby) were less likely to initiate any breastfeeding. More evidence is still required to be accumulated on first-time mothers in late child-bearing age of ≥35 years.

This study has some limitations. First, the generalizability of our study participants may be limited. The study was conducted at a large and established BFH located in Tokyo metropolitan area. There were only 72 BFHs in 2015 (Japan Breastfeeding Association 2010), out of 1126 hospitals for labour according to the latest Survey of Medical Institutions. In addition, patients are free to select physicians or facilities of their choice in Japan. Thus, our participants may be more interested in breastfeeding. Second, several socioeconomic and cultural variables which were reported as potential influencing factors on EBF and/or any breastfeeding could not be investigated (with the exception for grandparental nurturing support) in this study. These included mother's education level (Riva et al., 1999; Kehler et al., 2009; Tarrant et al., 2010; Hornbeak et al., 2010; Taylor et al., 2006), maternal employment status (Kaneko et al., 2006; Kehler et al., 2009; Tarrant et al., 2010), marital status (Griffiths et al., 2005; Hromi-Fiedler and Pérez-Escamilla, 2006), assisted conception (Fisher et al., 2013), unintended pregnancies Hromi-Fiedler and Pérez-Escamilla (2006)), maternal psychological factors (Barnes et al., 1997; Kehler et al., 2009), mothers having been breastfed themselves (Riva et al., 1999), late hospital discharge (Ekström et al., 2003), partner's preference for breastfeeding (Barnes et al., 1997; Tarrant et al., 2010) and childcare advisors' influences

(Riva et al., 1999; Kaneko et al., 2006). Third, the mother's actual duration of EBF was not followed in this study and the combined effect of maternal age and parity on continuity of EBF up to six months of age could not be examined.

In spite of these limitations, the strength of our study is that we had a large group of primiparous mothers ages 35 years or older to examine the combined effect size of maternal age and parity on initiation of EBF under the standardized methods of BFHI.

Conclusion

The present study demonstrated that both maternal age and parity were significantly associated with EBF initiation and the primiparous mothers aged 35 years or older group was most strongly associated with not being able to initiate EBF both at hospital discharge and at one-month after delivery. These results may suggest that first-time mothers in late child-bearing age are at greater risk of not being able to initiate EBF. Considering more mothers are entering the workforce (Mills et al., 2011) and that age and parity are fixed characteristics, more efforts should be made by health policy makers as well as health professionals to address the high risk group for mothers who did not initiate EBF.

Conflict of interest

None of the authors had a conflict of interest to disclose.

Acknowledgments

References

Akter, S., Rahman, M., 2010. The determinants of early cessation of breastfeeding in Bangladesh. World Health Popul. 11, 5–12.
American Academy of Pediatrics, 2012. Breastfeeding and the use of human milk. Pediatrics 129, e827–e841.
Amin, T., Hablas, H., Qader, A.A.A.I., 2011. Determinants of initiation and exclusivity of breastfeeding in Al Hassa, Saudi Arabia. Breastfeed. Med. 6, 59–68.
Avery, M., Duckett, L., Dodgson, J., Savik, K., 1998. Factors associated with very early weaning among primiparas intending to breastfeed. Matern. Child Health J. 1998 (2), 167–179.
Barnes, J., Stein, A., Smith, T., Pollock, J.I., ALSPAC Study Team, 1997. Extreme attitudes to body shape, social and psychological factors and a reluctance to breast feed. J. R. Soc. Med. 90, 551–559.
Bartick, M., Reinhold, A., 2010. The burden of suboptimal breastfeeding in the United States: a pediatric cost analysis. Pediatrics 125, e1048–e1056.
Baxter, J., Cooklin, A.R., Smith, J., 2009. Which mothers wean their babies prematurely from full breastfeeding? An Australian cohort study. Acta Paediatr. 95, 1274–1277.
Cleminson, J., Oddie, S., Renfrew, M.J., McGuire, W., 2015. Being baby friendly: evidence-based breastfeeding support. Arch. Dis. Child. Fetal Neonatal Ed. 100, F173–F178.
Dewey, K.G., Nommsen-Rivers, L.A., Heinig, M.J., Cohen, R.J., 2003. Risk factors for suboptimal infant breastfeeding behavior, delayed onset of lactation, and excess neonatal weight loss. Pediatrics 112, 607–619.
Horta, B.L., Victora, C.G., 2013. Long-term Effects of Breastfeeding: A Systematic Review. World Health Organization, Geneva, Switzerland.

Dennis, C.L., 2002. Breastfeeding initiation and duration: a 1990–2000 literature review. J. Obstet. Gynecol. Neonatal. Nurs. 31, 12–32.

Dennis, C.L., Gagnon, A., Van Hulst, A., Dougherty, G., Wahoush, O., 2013. Prediction of duration of breastfeeding among migrant and Canadian-born women: results from a multi-center study. J. Pediatr. 162, 72–79.

Ekström, A., Widström, A.M., Nissen, E., 2003. Duration of breastfeeding in Swedish primiparous and multiparous women. J. Hum. Lact. 19, 172–178.

Ever-Hadani, P., Seidman, D.S., Manor, O., Harlap, S., 1994. Breast feeding in Israel: maternal factors associated with choice and duration. J. Epidemiol. Community Health 48, 281–285.

Fisher, J., Hammarberg, K., Wynter, K., et al., 2013. Assisted conception, maternal age and breastfeeding: an Australian cohort study. Acta Paediatr. 102, 970–976.

Forde, K.A., Miller, L.J., 2010. 2006–07 north metropolitan Perth breastfeeding cohort study: how long are mothers breastfeeding? Breastfeed. Rev. 18, 14–24.

Griffiths, L.J., Tate, A.R., Dezateux, C., The Millenium Cohort Study Child Health Group, 2005. The contribution of parental and community ethnicity to breastfeeding practices: evidence from the Millennium Cohort Study. Int. J. Epidemiol. 34, 1378–1386.

Guo, S., Fu, X., Scherpbier, R.W., et al., 2013. Breastfeeding rates in central and western China in 2010: implications for child and population health. Bull. World Health Organ. 91, 322–331.

Hauck, Y.L., Fenwick, J., Dhaliwal, S.S., Butt, J., 2011. A Western Australian survey of breastfeeding initiation, prevalence and early cessation patterns. Matern. Child Health J. 15, 260–268.

Hawkins, S.S., Stern, A.D., Baum, C.F., Gillman, M.W., 2015. Evaluating the impact of the Baby-Friendly Hospital Initiative on breast-feeding rates: a multi-state analysis. Public Health Nutr. 18, 189–197.

Hla, M.M., Novotny, R., Kieffer, E.C., Mor, J., 2003. Early weaning among Japanese women in Hawaii. J. Biosoc. Sci. 35, 227–241.

Hornbeak, M.D., Dirani, M., Sham, W.K., et al., 2010. Emerging trends in breastfeeding practices in Singaporean Chinese women: findings from a population-based study. Ann. Acad. Med. Singap. 39, 88–94.

Hromi-Fiedler, A.J., Pérez-Escamilla, R., 2006. Unintended pregnancies are associated with less likelihood of prolonged breast-feeding: an analysis of 18 demographic and health surveys. Public Health Nutr. 9, 306–312.

Hundalani, S.G., Irigoyen, M., Braitman, L.E., Matam, R., Mandakovic-Falconi, S., 2013. Breastfeeding among inner-city women: from intention before delivery to breastfeeding at hospital discharge. Breastfeed. Med. 8, 68–72.

International Association of Diabetes and Pregnancy Study Groups Consensus Panel, 2010G. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care 33, 676–682.

Ip, S., Chung, M., Raman, G., et al., 2007. Breastfeeding and maternal and infant health outcomes in developed countries. Evid. Rep. Technol. Assess. 153, 1–186.

Jones, G., Steketee, R.W., Black, R.E., Bhutta, Z.A., 2003. How many child deaths can we prevent this year? Lancet (British edition) 362, 65–71.

Jones, J.R., Kogan, M.D., Singh, G.K., Dee, D.L., Grummer-Strawn, L.M., 2011. Factors associated with exclusive breastfeeding in the United States. Pediatrics 128, 1117–1125.

Kaneko, A., Kaneita, Y., Yokoyama, E., et al., 2006. Factors associated with exclusive breast-feeding in Japan: for activities to support child-rearing with breast-feeding. J. Epidemiol. 16, 57–63.

Kramer, M.S., Kakuma, R., 2012. Optimal duration of exclusive breastfeeding. Cochrane Database of Systematic Review 2012, Issue 8. Art. No.: CD003517 http://dx.doi.org/ 10.1002/14651858 CD003517.pub2.

Kehler, H.L., Chaput, K.H., Tough, S.C., 2009. Risk factors for cessation of breastfeeding prior to six months postpartum among a community sample of women in Calgary, Alberta. Can. J. Public Health 100, 376–380.

Labbok, M., Krasovec, K., 1990. Toward consistency in breastfeeding definitions. Stud. Fam. Plan. 21, 226–230.

Lande, B., Andersen, L.F., Bærug, A., et al., 2003. Infant feeding practices and associated factors in the first six months of life: the Norwegian Infant Nutrition Survey. Acta Paediatr. 92, 152–161.

Liu, P., Qiao, L., Xu, F., Zhang, M., Wang, Y., Binns, C.W., 2013. Factors associated with breastfeeding duration: a 30-month cohort study in northwest China. J. Hum. Lact. 29, 253–259.

Ludvigsson, J.F., Ludvigsson, J., 2005. Socio-economic determinants, maternal smoking and coffee consumption, and exclusive breastfeeding in 10,205 children. Acta Paediatr. 94, 1310–1319.

Meedya, S., Fahy, K., Kable, A., 2010. Factors that positively influence breastfeeding duration to 6 months: a literature review. Women Birth 23, 135–145.

Merewood, A., Mehta, S.D., Chamberlain, L.B., Philipp, B.L., Bauchner, H., 2005. Breastfeeding rates in US Baby-Friendly hospitals: results of a national survey. Pediatrics 116, 628–634.

Mills, M., Rindfuss, R.R., McDonald, P., te Velde, E., ESHRE Reproduction and Society Task Force, 2011. Why do people postpone parenthood? Reasons and social policy incentives. Hum. Reprod. Update 17, 848–860.

Ministry of Health, Labor and Welfare, 2006. Report on Infant Feeding Survey in Japan, 2005. Ministry of Health, Labor and Welfare, Tokyo (in Japanese) http://www. mhlw.go.jp/toukei/list/83-1.html (Accessed July 29, 2015).

OECD, 2012. OECD Family Database. OECD, Paris http://www.oecd.org/social/family/ database.htm (Accessed July 29, 2015).

Reniers, J.R., Peeters, R.F., Meheus, A.Z., 1983. Breastfeeding in the industrialized world. Rev. Epidemiol. Sante Publique 31, 375–407.

Riva, E., Banderali, G., Agostoni, C., Silano, M., Radaelli, G., Giovannini, M., 1999. Factors associated with initiation and duration of breastfeeding in Italy. Acta Paediatr. 88, 411–415.

Senarath, U., Dibley, M.J., Agho, K.E., 2010. Factors associated with nonexclusive breastfeeding in 5 East and Southeast Asian countries: a multilevel analysis. J. Hum. Lact. 26, 248–257.

The Japan Society of Obstetrics and Gynecology, 2014. Screening methods for glucose intolerance during pregnancy. Guideline for Obstetrical Practice in Japan 2014, pp. 19–23 Tokyo.

Tarrant, R.C., Younger, K.M., Sheridan-Pereira, M., White, M.J., Kearney, J.M., 2010. The prevalence and determinants of breast-feeding initiation and duration in a sample of women in Ireland. Public Health Nutr. 13, 760–770.

Taylor, J.S., Risica, P.M., Geller, L., Kirtania, U., Cabral, H.J., 2006. Duration of breastfeeding among first-time mothers in the United States: results of a national survey. Acta Paediatr. 95, 980–984.

Thulier, D., Mercer, J., 2009. Variables associated with breastfeeding duration. J. Obstet. Gynecol. Neonatal. Nurs. 38, 259–268.

World Health Organization, 1998. Evidence for the Ten Steps to Successful Breastfeeding. World Health Organization, Genova (http://www.who.int/maternal_child_adolescent/ documents/9241591544/en/ (Accessed July 29, 2015).

World Health Organization, 2008. Indicators for assessing infant and young child feeding practices: Part I Definitions: conclusions of a consensus meeting held 6–8 November 2007 in Washington D.C., USA. World Health Organization, Genova (http://www. who.int/nutrition/publications/infantfeeding/9789241596664/en/ (Accessed July 29, 2015).

World Health Organization, 2009. Baby-Friendly Hospital Initiative: Revised, Updated and Expanded for Integrated Care. World Health Organization, Genova (http://www.who. int/nutrition/publications/infantfeeding/bfhi_trainingcourse/en/ (Accessed July 29, 2015).

World Health Organization, 2013. World Health Statistics 2013. World Health Organization, Genova, Geneva (http://www.who.int/gho/publications/world_health_ statistics/2013/en/ (Accessed July 29, 2015).