Effects of the Experience of Breastfeeding-Friendly Practices and Breastfeeding Intention and Self-Efficacy on Breastfeeding Behavior: A Cohort Study in Taiwan

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Research Article

Keywords: Breastfeeding friendly practice, Self-efficacy, Intention, Breastfeeding behavior

Posted Date: December 29th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-1165666/v1>

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Abstract

Background: Approximately 80% of births occurred in Baby-Friendly-accredited facilities in Taiwan, although the trend of exclusively breastfeeding infants until 6 months of age has stagnated in the last 10 years. To guide breastfeeding promotion interventions during postnatal stays and encourage mothers to continue breastfeeding for the first 6 months, the factors of breastfeeding behavior within 6 months post-delivery must be investigated. This study explored the relationships among breastfeeding intention, experience of breastfeeding-friendly practices, breastfeeding self-efficacy, and breastfeeding behavior at 4 and 6 months after childbirth.

Methods: In this longitudinal cohort study, women who gave birth to healthy newborns at two Baby-Friendly hospitals in Taiwan and who were willing to breastfeed were recruited. Data were collected through a self-developed questionnaire measuring the experience of breastfeeding-friendly practices and through the Chinese version of the Breastfeeding Self-Efficacy Scale-Short Form during hospitalization and at 1, 2, 4, and 6 months after childbirth.

Results: A total of 155 women completed the questionnaires 5 times within 6 months. The determinants of exclusive breastfeeding at 4 months and any breastfeeding at 6 months were longstanding breastfeeding intention during hospitalization, a high score for the experience of breastfeeding-friendly practices, and a high level of breastfeeding self-efficacy during that period. The in-hospital experience of breastfeeding-friendly practices did not predict breastfeeding behavior at 4 and 6 months. Breastfeeding intention (hazard ratio [HR] = 0.40–0.14) and in-hospital breastfeeding self-efficacy (HR = 0.98) were significant as in-hospital risk factors contributing to breastfeeding duration 6 months after childbirth.

Conclusions: Longstanding breastfeeding intention, continuation of the experience of breastfeeding-friendly practices, and maintenance of a high level of breastfeeding self-efficacy were the determinants of breastfeeding at 4 and 6 months. Healthcare professionals in Taiwan must support breastfeeding-friendly practices and consider interactive interventions to promote continued breastfeeding at different stages during the first 6 months after childbirth based on the mother's informed plan of breastfeeding and breastfeeding self-efficacy during their postnatal hospitalization.

Background

Breast milk is the optimal source of nutrition for children in the first 6 months of development. Evidence has verified that breastfeeding has numerous benefits for both mothers and infants [1–3]. The Baby-Friendly movement was launched by the World Health Organization (WHO) and United Nations International Children's Emergency Fund in the 1990s to improve maternal and child health over the course of 30 years [4]. In the 1990s, Taiwan also implemented breastfeeding promotion policies to address the low prevalence rate of breastfeeding and the increase in the use of baby formula based on the global advocacy of breastfeeding [5]. According to statistics published by Taiwan's Ministry of Health and Welfare, the rate of exclusive breastfeeding at 6 months in Taiwan was 46.2% in 2018, with the

objective to reach the WHO goal of at least 50% exclusive breastfeeding for the first 6 months by 2025 and 70% by 2030 [5–7]. In 2020, 73.2% of infants were born in Baby-Friendly-accredited facilities in Taiwan, yet only 10% of infants in the world were born in such facilities [4, 8]. Conversely, the impact of Baby-Friendly-accredited facilities on breastfeeding is lower in last 10 years than before 2011 in Taiwan, and the rate of exclusive breastfeeding at 6 months decreased and stagnated [5, 9]. If Taiwan is to achieve the WHO target of a 70% breastfeeding rate by 2030, improved breastfeeding promotion strategies are warranted.

Studies have investigated various associated factors of breastfeeding behavior, including demographical information such as the mother's age, education level, and delivery type [10, 11], maternal psychosocial status such as breastfeeding intention and self-efficacy [12–14], and practice of Ten Steps to Successful Breastfeeding [15]. The related factors of breastfeeding may also differ among countries because of their distinct economic conditions and sociocultural factors [16–18]. In Taiwan, to encourage and support breastfeeding, in-hospital Baby-Friendly practice is implemented in the labor, delivery, peripartum, and maternity hospitalization periods [19, 20]. However, the aggressive implementation of Baby-Friendly practices had become a stressor during maternity hospitalization, and this implementation must be reviewed and updated in an innovative manner in Taiwan [9, 21]. To this end, this study explored the influence of breastfeeding intention, experience of Baby-Friendly practices, and maternal breastfeeding self-efficacy within 6 months on breastfeeding outcomes at 4 and 6 months. The identification of determinants is useful for devising appropriate breastfeeding promotion programs in hospitals and communities to encourage mothers to continue breastfeeding for the first 6 months after childbirth.

This study examined the relationships among breastfeeding intention, experience of breastfeeding-friendly practices, breastfeeding self-efficacy, and breastfeeding behavior at different time points within 6 months after childbirth. The secondary aim was to identify the determinants of breastfeeding behaviors at 4 and 6 months and in-hospital predictors of breastfeeding duration within 6 months after childbirth.

Methods

Study Design and Participants

A longitudinal cohort study was conducted over 6 months after childbirth from September 2019 to August 2020. Experience of breastfeeding-friendly practices and breastfeeding self-efficacy were measured using self-reported questionnaires during maternity hospitalization and at 1, 2, 4, and 6 months after childbirth. This study consecutively recruited women 20 years or older who had given birth to a healthy newborn at a gestational age of 36 to 42 weeks at two Baby-Friendly-accredited hospitals in Taiwan, were willing to breastfeed, and could read or write Traditional Chinese. The exclusion criteria were as follows: (1) abnormal maternal or neonatal health conditions after delivery that required hospital admission; (2) prohibition of breastfeeding according to medical recommendation; and (3) multiple births. The sample size was estimated with the rule of thumb; logistic regression and Cox models should

be used with a minimum of 10 outcome events for each predictor variable [22]. The planned attrition rate was calculated at 20% according to related studies [14], and the estimated sample size was 170.

Instruments

The instruments consisted of four self-reported questionnaires on maternal characteristics, the experience of breastfeeding-friendly practices, breastfeeding self-efficacy, and breastfeeding behavior. The maternal characteristics, including the participant's age, education level, marital status, occupation before childbirth, time of reinstatement, occupation after childbirth, parity, delivery type, experience of breastfeeding, and breastfeeding intention, were recorded using a self-developed questionnaire. Breastfeeding intention was defined as the duration of the mother's willingness to breastfeed, and the responses for breastfeeding intention were grouped into 1–4, 4–6, 6–12, and >12 months [9, 14]. The range of the item content validity index (I-CVI) was 0.9–1; the average content validity index (S-CVI) of scales was 0.99.

The experience of breastfeeding-friendly practices in this study was defined as the mother's experience of the Baby-Friendly practices implemented directly for mothers or infants to support breastfeeding and was measured using a seven-item self-developed questionnaire. In reference to the WHO Ten Steps to Successful Breastfeeding in 2018 [4], the experience of breastfeeding-friendly practices in this study was categorized into the experience of "immediate postnatal care" during maternity hospitalization and "breastfeeding establishment and infant feeding practices" from maternity hospitalization to 6 months after childbirth. Immediate postnatal care comprised the two items of skin-to-skin contact (categorized as Yes and No) and breastfeeding initiation (categorized as <1, 1–4, 4–24, and >24 h). The second section on the experience of breastfeeding-friendly practices was composed of five items that measured breastfeeding establishment and infant feeding practices on a 5-point Likert scale for (1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always); the total score of the experience of breastfeeding-friendly practices was 25 points. Items for breastfeeding establishment and infant feeding practices included the experience of rooming-in, maintaining the production of breast milk, breastfeeding on demand, avoiding feeding bottles and teats, and avoiding the use of pacifiers. The S-CVI of the experience of breastfeeding-friendly practices during hospitalization was 1, and that at 1, 2, 4, and 6 months was 0.96.

Breastfeeding self-efficacy was defined as a mother's perceived confidence in her ability to breastfeed her infant [23] and was measured using the traditional Chinese version of the Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF), as translated by Hu [24]. The original Breastfeeding Self-Efficacy Scale (BSES) was developed by Dennis and Faux in 1999 and is based on breastfeeding self-efficacy theory. In 2003, Dennis revised the original 33-item BSES into the 14-item BSES-SF, and psychometrically, the revised BSES-SF was divided into two domains, namely technical and intrapersonal thoughts [25]. The BSES-SF employed a 5-point Likert scale, with the score of each item ranging from 1 (not at all confident) to 5 (always confident). The total BSES-SF score ranged from 14 to 70, with a higher score representing a higher level of maternal self-efficacy in breastfeeding. Cronbach's alpha was 0.94 for the original BSES-

SF ($N = 667$) [25] and 0.93 ($N = 181$) for the traditional Chinese version of the 14-item BSES-SF [24]. In this study, Cronbach's alpha for the traditional Chinese version BSES-SF was 0.95 ($N = 155$).

Breastfeeding behavior was assessed using a structured questionnaire developed by the authors. Based on the definition of breastfeeding indicators by the WHO in 2008 and standardized indicators of breastfeeding described by Greiner in 2014, breastfeeding behavior was measured using point-in-time data and lifelong data [26, 27]. The indicators of breastfeeding behavior in this study included feeding patterns and the duration of breastfeeding, and three types of breastfeeding patterns were referenced. Exclusive breastfeeding indicated that the infant was fed no other food or drink, not even water, other than breast milk, although they may have received prescribed medicines, oral rehydration solutions, or vitamins and minerals [28]. Partial breastfeeding was defined as the feeding pattern in which the infant receives breast milk supplemented with baby formula or solid or semisolid foods. Replacement feeding referred to the feeding pattern in which the infant receives baby formula milk or solid or semisolid foods without breast milk [26, 29]. Exclusive breastfeeding and partial breastfeeding were grouped under "any breastfeeding." Breastfeeding duration was defined as the length (in weeks) of any breastfeeding within 6 months after childbirth. The both I-CVI and S-CVI calculated by five experts of maternal nursing and instrument development were 1.

Data Collection and Study Procedure

After approval to conduct the study was obtained from the institutional review boards of the two participating institutions, eligible women were recruited from these hospitals. Women who met the eligibility criteria were approached by the researcher 2 to 4 days after giving birth in the respective maternity wards. The study participants provided informed consent after a verbal explanation of the study procedure and objectives was provided. An online survey system was used to deliver the questionnaire through e-mail or mobile instant messaging applications during participant hospitalization and at the follow-ups of 1, 2, 4, and 6 months after childbirth. The first survey was completed 3 to 5 days after childbirth during the hospitalization period, and it comprised questions on maternal characteristics, experience of breastfeeding-friendly practices, breastfeeding self-efficacy, and breastfeeding behavior. Follow-ups at 1, 2, 4, and 6 months after childbirth were conducted for data collection on the experience of breastfeeding-friendly practices, breastfeeding self-efficacy, and breastfeeding behavior.

Data Analysis

Statistical analysis was performed using R software v4.0.5, and descriptive statistics were obtained to explain the demographic data. The associated factors of breastfeeding behaviors in different periods after childbirth were examined using one-way analysis of variance (ANOVA) and the Kruskal–Wallis, chi-square, Fisher exact test, and Wilcoxon rank sum tests based on the data type of the variables. Multinomial logistic regression was conducted to explore determinants at 4 and 6 months after childbirth. In addition, Cox regression analyses were performed to identify factors associated with the breastfeeding duration; a nomogram measuring the probability of breastfeeding termination at 6 months was also generated. A p value of less than 0.05 represented the level of significance.

Results

A total of 170 participants were recruited into this study, of which 155 completed the questionnaires 5 times over the course of 6 months, representing an attrition rate of 9%. The majority of the women were married, had college degrees, full-time jobs before childbirth, and delivered vaginally. Approximately half of the women were first-time mothers. None of the women intended to breastfeed their infants for less than 1 month (Table 1). No significant difference in maternal and neonatal characteristics was noted between the two hospitals.

The breastfeeding patterns revealed the exclusive breastfeeding rate of the participants to be 44.5% (n = 69) during hospitalization and 31.6% (n = 49) and 10.3% (n = 16) at 4 and 6 months after childbirth, respectively. The rate of partial breastfeeding was 43.9% (n = 68) during hospitalization and 33.5% (n = 52) and 45.2% (n = 70) at 4- and 6-month follow-up, respectively. Thirty-five women (22.6%) exclusively breastfed their infants and introduced supplementary food with breastfeeding within 6 months. Table 2 lists the associated factors of breastfeeding patterns at each time point after childbirth. At each time point, longstanding breastfeeding, high score of the experience of breastfeeding-friendly practice, and high level of breastfeeding self-efficacy were all positively associated with exclusive breastfeeding. Maternal occupation, the duration of reinstatement, and parity were not associated with the three breastfeeding patterns at any time point after childbirth (Table 2).

Table 1
Maternal characteristics of the participants (*N* = 155)

Variables		N(%) / mean ± SD
Age (years)		35 ± 5
Education	Senior high or below	13 (8.4)
	College	106 (68.4)
	Graduate school or above	36 (23.2)
Marital Status	Married and living with spouse	154 (99.4)
	Unmarried	1 (0.6)
Occupation before childbirth	Full-time job	114 (73.5)
	homemaker	35 (22.6)
	Part-time job	5 (3.2)
	Student	1 (0.6)
Reinstatement	<2 months after childbirth	43 (27.7)
	2-6 months after childbirth	23 (21.3)
	> 6 months after childbirth	48 (31.0)
	Not employed	31 (20.0)
Occupation after childbirth	Full-time job	85 (54.8)
	homemaker	32 (20.6)
	Part-time job	3 (1.9)
	Parental leave	35 (22.6)
Parity	1	81 (52.3)
	2	58 (37.4)
	≥ 3	16 (10.3)
Delivery Type	Vaginal	84 (54.2)
	Caesarean	71 (45.8)
Experience of breastfeeding	Yes	74 (47.7)
Breastfeeding intention	1-4 months	22 (14.1)
	4-6 months	41 (26.5)
SD: Standard deviation		

Variables		N(%) / mean $\pm$ SD
	6-12 months	55 (35.5)
	>12 months	37 (23.9)
Skin-to-skin contact	Yes	110 (71.0)
Breastfeeding initiation	1-4 hours	54 (34.8)
	5-24 hours	62 (40.0)
	>24 hours	39 (25.2)
SD: Standard deviation		

Table 2

Association between factors and breastfeeding patterns at different follow-up times after childbirth ($N=155$)

Feeding patterns					
Exclusive BF/ Partial breastfeeding/ Replacement feeding					
	Hospitalization	1st month	2nd month	4th month	6th month
Factors recorded during hospitalization					
Age ^a		**	*		
Education ^{c, d}		*			
Delivery Type ^d		*			
BF intention ^c	*	***	***	***	***
Time to initiate BF ^{c, d}	**		*	*	
Factors recorded in different periods					
Experience of BF friendly practices ^{a, b}	***	***	***	***	***
BF self-efficacy ^{a, b}	***	***	***	***	***
^a Analyzed using one-way ANOVA; ^b Analyzed using the Kruskal–Wallis test; ^c Analyzed using the chi-square test; ^d Analyzed using the Fisher exact test					

BF: Breastfeeding

* $p < 0.01$; ** $p < 0.01$, *** $p < 0.001$

To identify the determinants of breastfeeding behavior at 4- and 6-month follow-up, variables that exhibited a significant association with feeding patterns at these time points were included in multinomial logistic regression models. Participants who began breastfeeding within 5–24 h after giving birth (odds ratio [OR] = 4.35, $p < 0.05$) and had a high total score of self-efficacy (OR = 1.12, $p < 0.01$) at 4 months were more likely to exclusively breastfeed than partially breastfeed at 4 months postpartum. Mothers with the intention to breastfeed for over 6 months (OR = 14.3 and 20, $p < 0.05$) and who had a high total score of the experience of breastfeeding-friendly practices (OR = 1.35, $p < 0.05$) and self-efficacy at 4 months (OR = 1.15, $p < 0.05$) were more likely to exclusively breastfeed than provided food or formula feeding at 4 months postpartum (Table 3).

Table 3
Determinants of exclusive breastfeeding at 4 months ($N = 155$)

		Partial breastfeeding		Replacement feeding	
		Base outcome: Exclusive BF			
		Coefficient	(SE)	Coefficient	(SE)
BF intention	4-6 months	-0.84	(1.33)	-2.14	(1.36)
	6-12 months	-0.68	(1.25)	-2.64*	(1.30)
	≥ 12 months	-0.76	(1.29)	-2.98*	(1.46)
	Reference: 1-4 months				
BF initiation	5-24hours	-1.48*	(0.58)	-0.80	(0.79)
	>24 hours	-0.48	(0.71)	0.69	(0.90)
	Reference: 1-4 hours				
Experience of BF friendly practices at 4 months		0.05	(0.09)	-0.30**	(0.12)
BF self-efficacy at 4 months		-0.12**	(0.03)	-0.14**	(0.03)
Constant		6.77**	(2.06)	13.60**	(2.42)
Akaike information criterion		232.0		232.0	
Analyzed through multinomial logistic regression					
BF: Breastfeeding; SE: Standard error					
* <i>p</i> < 0.05; ** <i>p</i> < 0.01					

Because of the considerable reduction in the exclusive breastfeeding rate and the unbalanced distribution of participants in terms of the breastfeeding patterns at 6 months, logistic regression models were applied to identify the determinants of any breastfeeding at 6 months. Mothers with the intention to breastfeed for over 6 months (OR = 0.04, $p < 0.01$) and who had a high score of the experience of breastfeeding-friendly practices (OR = 0.69, $p < 0.01$) and self-efficacy at 6 months (OR = 0.94, $p < 0.001$) were less likely to replace any breastfeeding with alternative feeding at 6 months postpartum (Table 4).

Table 4
Determinants of any breastfeeding at 6 months ($N = 155$)

	Estimate	SE	Z	OR	95% CI
(Intercept)	10.95	2.09	5.23***		
BF intention					
Reference: 1-4 months					
4-6 months	-2.19	1.15	-1.90	0.11	(0.01, 0.90)
6-12 months	-3.24	1.14	-2.83**	0.04	(0.00, 0.30)
≥ 12 months	-4.58	1.36	-3.38***	0.01	(0.00, 0.11)
Experience of BF friendly practices at 6 months	-0.38	0.11	-3.30***	0.69	(0.53, 0.84)
BF self-efficacy at 6 months	-0.06	0.02	-2.60**	0.94	(0.89, 0.98)
Analyzed through logistic regression					
BF: Breastfeeding; CI: Confidence interval					
** $p < .01$; *** $p < .001$					

Univariate analysis of the Cox proportional hazard model revealed that parity, intention to breastfeed, time of initiation of breastfeeding, and in-hospital breastfeeding self-efficacy were associated with breastfeeding duration within 6 months after childbirth. The in-hospital predictors of breastfeeding duration within 6 months were next analyzed through multivariate Cox regression analysis. Participants who expressed an intention to breastfeed for 4–6 months had a 60% lower risk (hazard ratio [HR] = 0.40, standard error [SE] = 0.30) of ceasing breastfeeding at any time point compared with those who intended to breastfeed for 1–4 months following adjustment for confounders. Women with the intention to breastfeed for 6–12 months and more than 12 months had 86% and 92% lower risks (HR = 0.14 and 0.08 and SE = 0.34 and 0.48, respectively) of ceasing breastfeeding at any time point compared with women who intended to breastfeed for 1–4 months after adjustment for confounders. The HR of breastfeeding termination within 6 months was significantly lower when participants had a high level of breastfeeding self-efficacy during hospitalization (HR = 0.98, SE = 0.01; Table 5).

Table 5
Multivariable Cox proportional hazard model for breastfeeding duration at 6 months (N = 155)

	Coefficient	HR	SE	Z	p
BF intention					
Reference: 1-4 months					
4-6 months	-0.92	0.40	0.30	-3.10	0.002
6-12 months	-1.97	0.14	0.34	-5.78	<0.0001
≥ 12 months	-2.51	0.08	0.48	-5.14	<0.0001
BF self-efficacy during hospitalization	-0.02	0.98	0.01	-2.05	0.0039
BF: Breastfeeding; HR: Hazard ratio, SE: Standard error					

To develop and validate the nomogram for predicting the probability of breastfeeding termination within 6 months from maternal hospitalization, the in-hospital predictors of breastfeeding duration at 6 months were included in the nomogram. The data of all participants were separated into the training dataset (n = 125) and validation dataset (n = 30). Logistic regression was applied to construct the prediction nomogram according to the variables of breastfeeding intention and breastfeeding self-efficacy in the training dataset. The validation dataset was used to test and evaluate the trained model; from the confusion matrix, accuracy, specificity, and sensitivity were 0.76, 0.86, and 0.69, respectively. To obtain the prediction of the probability of breastfeeding termination within 6 months, participants' values at each axis were first identified, and the sum of the two scores was plotted on the Total Points line to evaluate the probability of breastfeeding termination on the "Predict the probability of breastfeeding termination" line, as illustrated in Fig. 1. For example, for a woman intending to breastfeed for 6–12 months (categorized in Group 3, 23 points) with a total score of 30 for breastfeeding self-efficacy (41 points), the sum was 64 points, and the probability of breastfeeding termination within 6 months was approximately 39% (Fig. 1). The predictive ability of the nomogram was evaluated through analysis of the receiver operating characteristic with an area under the curve of 0.87 and cut-off point of 0.65 (specificity = 0.88 and sensitivity = 0.79).

Discussion

This study revealed the determinates of breastfeeding within 6 months after childbirth in Taiwan. The cohort of women demonstrated a low prevalence of exclusive breastfeeding and a high prevalence of partial breastfeeding in the 6 months after childbirth, which is consistent with the findings of other studies in Taiwan [14] and those in other high-income countries [16, 30]. Exclusive breastfeeding within 6 months in this study exhibited a sharp decrease from 31.6% at 4 months to 10.3% at 6 months. Similar results were reported in a Taiwanese study surveying 300 primiparous mothers [14]. Regarding the

introduction of supplementary food, the WHO and American Academy of Pediatrics have advised that infants be exclusively breastfed for the first 6 months, with continued breastfeeding alongside the introduction of suitable complementary foods up to 2 years of age or beyond [2, 28]. The Taiwan Pediatric Association (2016) recommended that infants be exclusively breastfed for the first 4–6 months, with complementary foods introduced at 4–6 months [31]. This recommendation may have affected the marked shift in the feeding pattern from exclusive to partial breastfeeding.

The association between demographic attributes and exclusive breastfeeding was limited to within 2 months after childbirth with respect to the mothers' college education level, younger age, and multipara status. These results are partially consistent with those of another Taiwanese study [32]. Returning to the workplace after childbirth in the past may have affected the effectiveness of breastfeeding promotion for these women within 6 months postpartum [32, 33]. Occupational types and the expected time of reinstatement were not associated with breastfeeding behavior at any time point within 6 months, perhaps in view of the effectiveness of Taiwan's enforcement of laws and regulations regarding women's employment rights in the last 5–10 years. In 2016, amendments to the provisions for parental leave in the Act of Gender Equality in Employment may have affected the relationship between employment and breastfeeding behavior within 6 months postpartum [34].

The high score of the experience of breastfeeding-friendly practices was attributable to the determinates of exclusive breastfeeding at 4 months and any breastfeeding at 6 months in this study, although the association between the experience of immediate postnatal care (including skin-to-skin contact and early initiation of breastfeeding within 4 h) and breastfeeding behavior did not extend to 4–6 months postpartum. Breastfeeding early after birth can be physiologically enabled through physical closeness of the mother and infant, skin-to-skin contact immediately after childbirth, ongoing rooming-in, and feeding of the infants on demand [35]. Contrary to the common perception of the effectiveness of breastfeeding-friendly practices on breastfeeding behavior [36], studies have indicated that Taiwanese women's experience of skin-to-skin contact and early breastfeeding only contribute to their breastfeeding behavior for 1 month after delivery, with limited effects on breastfeeding at 6 months [9, 14]. The authors assumed that insufficient time, lack of promotion of the early initiation of breastfeeding when performing skin-to-skin contact, and the traditional practices of postpartum confinement in Taiwan, including that postpartum women may be advised to rest to facilitate recovery in the first few months after childbirth, may weaken the effects of the practices of immediate postnatal care on long-term breastfeeding [9, 14].

The intention to breastfeed for over 6 months during hospitalization and a high level of breastfeeding self-efficacy were key determinates in mothers who breastfed their infants at the 4- and 6-month follow-up. In-hospital breastfeeding self-efficacy is also a critical associated factor and predictor of breastfeeding outcomes within 6 months, as reported by many other researchers [12–14, 37]. This study verified and extended the results of other studies indicating that the maintenance of a high level of breastfeeding self-efficacy was a crucial determinant at 4 months of exclusive breastfeeding and at 6 months of any breastfeeding. Therefore, more specific and stronger interventions are required in Taiwan based on the status of breastfeeding self-efficacy to encourage breastfeeding exclusively for the first 6

months postpartum. Further research is warranted to assist in the implementation of appropriate interventions, which should incorporate the multifaceted factors of breastfeeding at each time point in the first 6 months to support successful breastfeeding.

This study had some limitations. Employing convenience sampling, drawing participants from a single region in Taiwan, and applying a hospital setting may limit the generalizability of these findings. In addition, breastfeeding behavior was recorded through 24-h recalls; thus, self-reporting and social desirability may bias the result.

Implications for Practice

Breastfeeding intention and self-efficacy were the major in-hospital predictors of breastfeeding duration within the first 6 months postpartum, reflecting similar results of studies in Taiwan and other high-income countries [9, 13, 14, 38]. Maternal and pediatric health care professionals must assess the probability of breastfeeding termination within these initial 6 months, recognize the main factors affecting breastfeeding at each stage, and support the extension of breastfeeding duration up to 6 months according to the factors at each stage. In-hospital breastfeeding intention and breastfeeding self-efficacy could be used to pre-estimate breastfeeding behavior in the initial 6 months after delivery, and health care professionals must provide breastfeeding-friendly practices and educational intervention to promote breastfeeding at different stages within these 6 months based on these pre-estimations. Discharge support and individualized interactive educational interventions for breastfeeding are also required to address the family's particular needs and ensure the provision of effective breastfeeding-friendly practices [39].

Conclusions

This study demonstrated the influence of breastfeeding intention, the experience of breastfeeding-friendly practices, and breastfeeding self-efficacy on breastfeeding behavior within 6 months after childbirth in Taiwan. With the universalization of Baby-Friendly-accredited institutions and the popularization of breastfeeding-friendly practices in Taiwan, the continuation of the implementation of breastfeeding-friendly practices after discharge and maintenance of improved breastfeeding self-efficacy are key factors at 4–6 months for exclusive breastfeeding and any breastfeeding. Breastfeeding promotion policies and Baby-Friendly practices have been implemented in Taiwan for 30 years. In response to ongoing societal changes, the government and health care systems must continue to reassess and regulate breastfeeding promotion policies. For achieving the WHO target of exclusive breastfeeding, the findings of this study indicated that breastfeeding intention and self-efficacy can be used to pre-estimate breastfeeding behavior within 6 months postpartum. Health care professionals must therefore provide breastfeeding-friendly and educational interventions to support breastfeeding at different stages based on individual pre-estimation results and the mother's informed plan.

Abbreviations

ANOVA
Analysis of Variance
BF
Breastfeeding
BSES
Breastfeeding Self-Efficacy Scale
BSES-SF
Breastfeeding Self-Efficacy Scale-Short Form
CI
Confidence interval
HR
Hazard Ratio
I-CVI
Item Content Validity Index
OR
Odds Ratio
S-CVI
Average Content Validity Index
SD
Standard Deviation
SE
Standard Error
WHO
World Health Organization

Declarations

Acknowledgments

The authors are grateful to the Center for Quantitative Sciences, Clinical Medicine Research Center, National Cheng Kung University Hospital, for providing statistical consulting services. This manuscript was edited by Wallace Academic Editing.

Authors' contributions

YUW and YJC have contributed to the conception and design of the study. YUW conducted the analysis and made the first draft. YJC critically revised and supervised the study. All authors read and approved the final manuscript. Contributions to the final version of the manuscript were made by all authors.

Funding

No funding was available for this study. Open Access funding provided by National Cheng Kung University.

Availability of data and materials

Data cannot be made publicly available in order to protect the privacy of mothers and infants.

Ethics approval and consent to participate

The ethical approval for the study was taken from the institutional review boards of the National Cheng Kung University Hospital (No. A-ER-108-171) on Jun. 2019 and the institutional review boards of Kuo General Hospital (No. B-19-K016) on Sep. 2019. Written informed consent for participation in the study was obtained after a verbal explanation of the study procedure and objectives was provided.

Consent for publication

Not applicable.

Competing interests

The authors declare no conflict of interest.

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Figures

Figure 1

Nomogram for the probability of breastfeeding termination within 6 months