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Association between breastfeeding-friendly environmental factors and breastfeeding practices at 6 months in mothers in Taiwan

Tzu-Ling Chen[1], Li-Li Chen[1] and Meei-Ling Gau[1*]

Abstract

Background The World Health Organization (WHO) aims to achieve a 50% rate of exclusive breastfeeding (EBF) during the first six months of life by 2025. Continuing breastfeeding up to six months is determined by an individual woman's choice and the availability of breastfeeding-friendly environments.

Methods In this multicenter prospective longitudinal study, we identified breastfeeding-friendly environmental factors that were associated with breastfeeding practices from days 1–5 to six months postpartum. Breastfeeding-friendly environmental factors were assessed using structured questionnaires for mothers who gave birth under a Baby-Friendly Hospital Initiative (BFHI). We evaluated uptake of breastfeeding by asking mothers if they used the indicated practices, as well as their perceived level of acceptance of breastfeeding among their live-in family members and their perceived availability of lactation rooms in public settings. From 2012 to 2016, we recruited 1,870 women at 1–5 days postpartum from obstetrics medical facilities in Taiwan and followed their breastfeeding status at one, two, four, and six months postpartum. The definition of EBF was that the infant had received only breast milk since birth, with no supplemental infant formula. We categorized breastfeeding practices into two groups: continuing EBF and non-continuing EBF at six months. We used logistic regression models to identify factors associated with continuing EBF at six months postpartum.

Results The prevalence of EBF and non-EBF at six months postpartum was 30.9% and 69.1%, respectively. The logistic regression analysis revealed that above university-level education, multiparity, and vaginal delivery were positively associated with continuing EBF. The Ten Step Baby-Friendly Hospital Initiative practices, perceived acceptance of breastfeeding in live-in families, and perceived availability of lactation rooms in public settings, were associated with a higher likelihood of continuing EBF. Postpartum women who returned to work at or after two months postpartum were more likely to report non-continuing EBF than women who did not return to work.

Conclusion Those who promote public health should advocate for breastfeeding-friendly practices, including the adoption of breastfeeding-friendly measures in public and workplace settings and providing increased support for breastfeeding mothers during and after hospitalization.

Keywords Breastfeeding duration, Exclusive breastfeeding, Breastfeeding-friendly environment, Prospective study

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Background

The importance of breastfeeding has gained global recognition. The World Health Organization (WHO) aims to achieve a 50% rate of exclusive breastfeeding (EBF) during the first six months of life by 2025 [1]. However, breastfeeding duration is typically shorter in countries with higher levels of economic development [2]. For instance, the breastfeeding rate during hospitalization in the United States was 83.2% in 2019 but only 24.9% after six months [3]. Research on breastfeeding rates in comparable economies in 2000–2018 yielded similar patterns. For example, Germany, Sweden, and South Korea had EBF rates at one week after delivery of 51%, 75%, and 16%, respectively, which decreased to 0.8%, 13%, and 2% by six months [2].

The Ministry of Health in Taiwan implemented the Ten Step Baby-Friendly Hospital Initiative (BFHI) guidelines in 1992. Currently, 99.8% of births in Taiwan occur in medical facilities, with 187 of the 335 nationwide maternity departments being BFHI certified [4], significantly increasing the breastfeeding rate among Taiwanese women [5]. Exclusive breastfeeding within six months in Taiwan exhibited a sharp decrease from 44.5% at 3–5 days during hospitalization to 14.8% at 6 months [6, 7]. Taiwanese women have achieved advanced educational qualifications and embraced professional vocations [8], and such alterations in environmental and maternal factors may influence the practice of breastfeeding and impede the maintenance of EBF for the first six months [7, 9–11].

In 2008, the Taiwanese government introduced breastfeeding-friendly initiatives such as two months of fully paid maternity leave followed by an additional six months of maternity leave paid at 60% of the regular salary. To further increase breastfeeding duration, "lactation rooms" – designated private areas for breastfeeding and breast pumping – were established in public spaces, such as shopping malls, airports, and parks, as well as in workplaces [5]. Further, breastfeeding consultation services were offered online and via telephone. To improve the EBF rates and duration in Taiwan, further investigation into the impact of breastfeeding-friendly environmental factors on the duration of EBF is warranted. In this study, we aimed to assess the impact of breastfeeding-friendly environmental factors on breastfeeding practices at six months postpartum in mothers in Taiwan.

Methods

Study design

This study was a multicenter prospective longitudinal study conducted from 2012 to 2016. It forms part of a larger study, entitled Breastfeeding Practice in Taiwan, which aims to evaluate breastfeeding-friendly initiative practices in the first six months of breastfeeding at obstetrics medical facilities with delivery rates greater than 250 delivery births per year in Taiwan, which formed the basis for the targeted sample size. We recruited participants via convenience sampling from 31 obstetrics medical facilities in Taiwan (Fig. 1). The inclusion criteria for the study were as follows: participants were aged ≥ 18 years; delivery of a healthy term infant (> 37 weeks); and planning to return to the workforce within two years. We excluded mothers who did not intend to breastfeed their infants from birth ("refusal to breastfeed"). Breastfeeding status was classified into three categories: EBF, partial breastfeeding, and infant formula feeding. In this study, the definition of EBF was that the infant had received only breast milk since birth, with no supplemental infant formula. Partial breastfeeding refers to infants having been fed with breast milk and any supplemental formula. Infant formula feeding refers to infants having been fed with infant formula only.

Sample size estimation

We recruited a sample of 1,870 women in Taiwan. Waits et al. (2018) found that the correlation among breastfeeding-friendly environmental factors and 6-month breastfeeding rates was 1.13–1.80 [7]. Assuming a bivariate correlation of 1.2 between these factors and breastfeeding practices in the first six months after delivery, a statistical power of 80%, and an alpha of 0.05, we estimated that a sample size of 800 was required (G*power 3.1). Assuming a follow-up rate of 0.80 [12], the number of recruited women was deemed acceptable for this analysis.

This study was approved by the Medical Research Ethical Foundation's Joint Institutional Review Board (09-S-008) in September 2012. All participants provided signed informed consent to participate, and we ensured that all personal information was treated confidentially. We also ensured secure data handling and storage to protect the participants' information. Participants were informed at the in-person interview that they would receive the follow-up questionnaire by phone. After completing the questionnaire, each participant received a US $3 convenience store voucher for each questionnaire completed in the study.

Measurement and data collection

We conducted in-person interviews with recruited participants in the obstetric ward at 1–5 days postpartum using a structured questionnaire that took ~ 20 min to complete. Demographic variables were collected during this interview. Trained interviewers followed up participants via phone interviews at one, two, four, and six months postpartum. All individual case data were encoded by numbers to ensure confidentiality. The variables measured at each time point are presented in Table 1. Data on the demographic characteristics of the

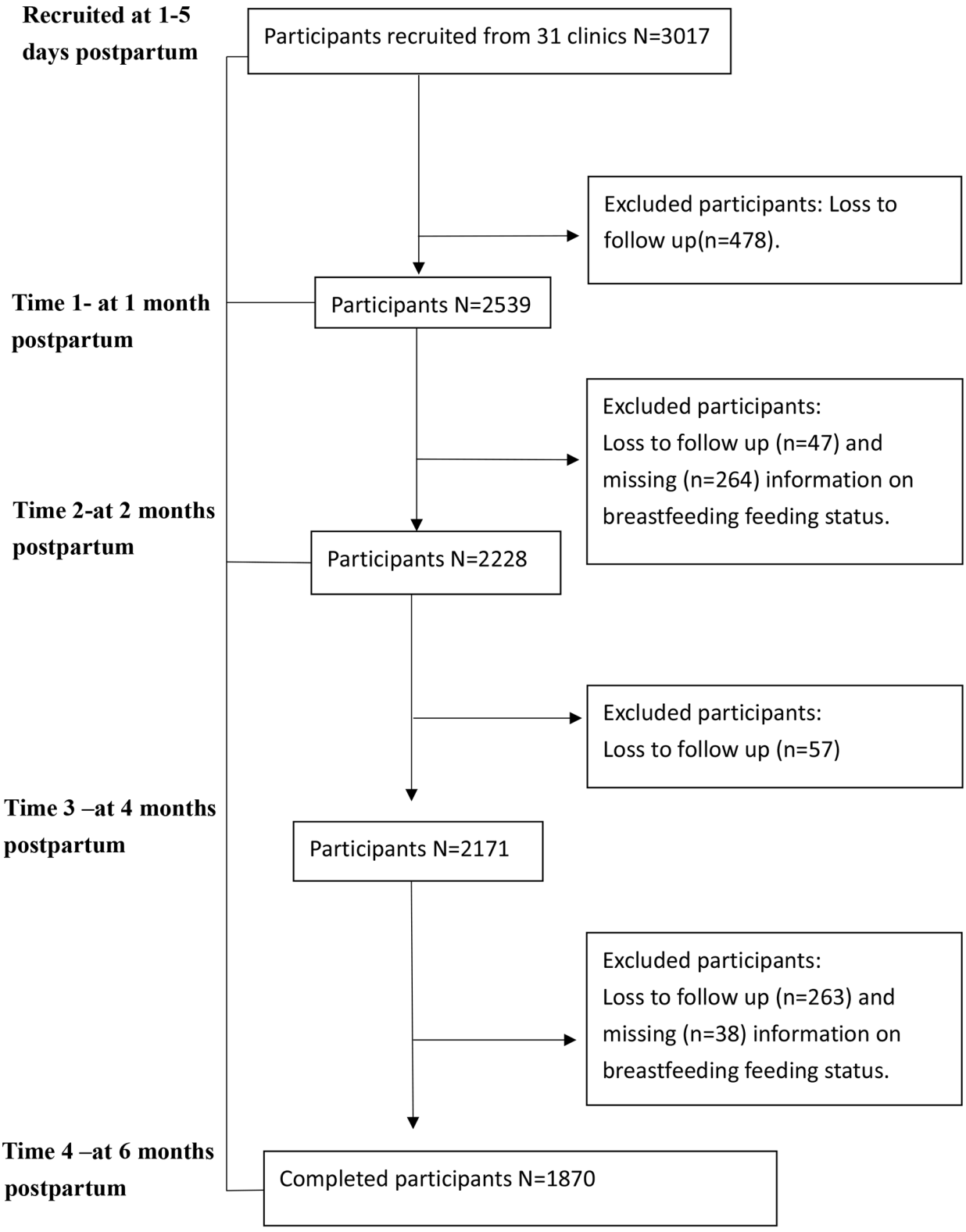

Fig. 1 Insert dot and raise query

Table 1 Study variables and data collection time points

Measurement Time Points	Variables
1–5 days postpartum	maternal age, educational level, parity, delivery mode, return-to-work status, BFHI, and breastfeeding status
1 month postpartum	breastfeeding status
2 months postpartum	breastfeeding status
4 months postpartum	breastfeeding status
6 months postpartum	breastfeeding status, and use of breastfeeding-friendly environments

Note: The BFHI measures adherence to the "Ten Steps to Successful Breastfeeding" through a 19-item (yes/no) questionnaire assessing mothers' experiences 1–5 days postpartum. Breastfeeding status measure: EBF (EBF), partial breastfeeding, and infant formula feeding. Use of breastfeeding-friendly environmental practices, including perceived level of acceptance of breastfeeding among live-in family members

participants and breastfeeding-friendly environmental variables were collected using self-completed questionnaires. Maternal demographic characteristics included maternal age, educational level, parity, delivery mode and return-to-work status (before two months postpartum / at or after two months postpartum / not returned). This definition was used due to the Taiwanese government's introduction of two months of fully paid maternity leave and none of the study participants reported returning to work before two months. Breastfeeding-friendly environmental factors were assessed using structured questionnaires for mothers in the BFHI, along with breastfeeding-friendly services in the community and the level of acceptance of breastfeeding among the live-in family members. For example: The BFHI measures adherence to the "Ten Steps to Successful Breastfeeding" through a 19-item (yes / no) questionnaire assessing mothers' experiences 1–5 days postpartum. Breastfeeding status measure: EBF, partial breastfeeding, and infant formula feeding.

Details of the questionnaire design are presented in Chen et al. (2021) [13]. We developed the survey in two phases. In Phase 1, we conducted a literature review. We interviewed obstetrics and pediatric department managers working in Taiwan about implementing the "Ten Steps to Successful Breastfeeding" policies to clarify the concept and contents of the scale. These specialists rated the questionnaires for correctness, appropriateness, and clarity using a four-point Likert scale ranging from one (very poor) to four (very good). The content validity index (CVI) of the breastfeeding-friendly initiative practices was determined by dividing the number of specialists giving an item a rating of three or four by the total number of specialists and then averaging the item-level results, which yielded a mean of 0.95. The results (item CVI=0.99, scale-CVI=0.94) indicated that the 19-item scale had acceptable validity [12]. In Phase Two, the questionnaires were pilot-tested with 30 postpartum mothers to ensure semantic clarity and readability. The BFHIs were measured on a 19-item (yes / no) experience questionnaire at 1–5 days postpartum. Mothers' use of breastfeeding-friendly environmental practices was evaluated by asking them if they used the indicated practices, including their perceived level of acceptance of breastfeeding among live-in family members (1=very poor, 5=very good), and their perceived availability of lactation rooms in public settings (0=not present; 1=very few present, < 20%; 2=few present, 20–50%; 3=many present, 50–80%; and 4=almost all present, > 80%). Additionally, their use of lactation rooms at their workplace and whether they had time to express milk at work were assessed via a dichotomized yes / no answer.

Data analysis

Data analysis was performed using SPSS for Windows version 22.0 (SPSS Inc, Chicago, IL, USA). The descriptive statistics used in the study included mean, standard deviation (SD), frequency, and percentage, depending on the type of variables. Bivariate analysis was performed using Chi-square χ^2) tests or ANOVA. Chi-squared tests or Fisher's exact tests were used to examine differences in the characteristics. Were it not for data limitations, we could have used more than three categories of breastfeeding practices at six months postpartum. However, only three categories could be populated after accounting for missing data and loss to follow-up. Therefore, we categorized these breastfeeding practices into the following two groups: continuing EBF at six months and non-continuing EBF at six months (i.e., "the baby was fed via a combination of breastfeeding and formula before its first six months" or "the baby was fed formula only before its first six months"). We assessed the normality of the residuals using a normal predicted probability (Q–Q) plot. To address the issue of multiple comparisons and account for the exploratory nature of identifying factors associated with breastfeeding practices at six months postpartum, the significance level was set at $p<0.01$ [14, 15]. In our logistic regression analyses, we used the breastfeeding status from 1 to 5 days to six months postpartum as the dependent variable. The demographic characteristics of the participants and breastfeeding-friendly environmental variables were the independent variables. In addition to primary data analysis, we performed multiple imputations to deal with missing data [15]. Multiple imputations of the final multiple regression analysis yielded values similar to those of the results from primary data analysis [16, 17]. Only the analyses of the complete data sets are presented in this study.

Results

Sample flow

Of the 3,017 women recruited at 1–5 days postpartum, 2,539 completed the questionnaire at one month

Table 2 Prevalence of breastfeeding from 1–5 days to 6 months postpartum ($n=1,870$)

	Exclusive breastfeeding	Partial breastfeeding	Infant formula
1–5 days postpartum	845 (45.2%)	524 (28.0%)	501 (26.8%)
1 month postpartum	797 (42.6%)	490 (26.2%)	583 (31.2%)
2 months postpartum	681 (36.4%)	510 (27.3%)	679 (36.3%)
4 months postpartum	649 (34.7%)	325 (17.4%)	896 (47.9%)
6 months postpartum	578 (30.9%)	310 (16.6%)	982 (52.5%)

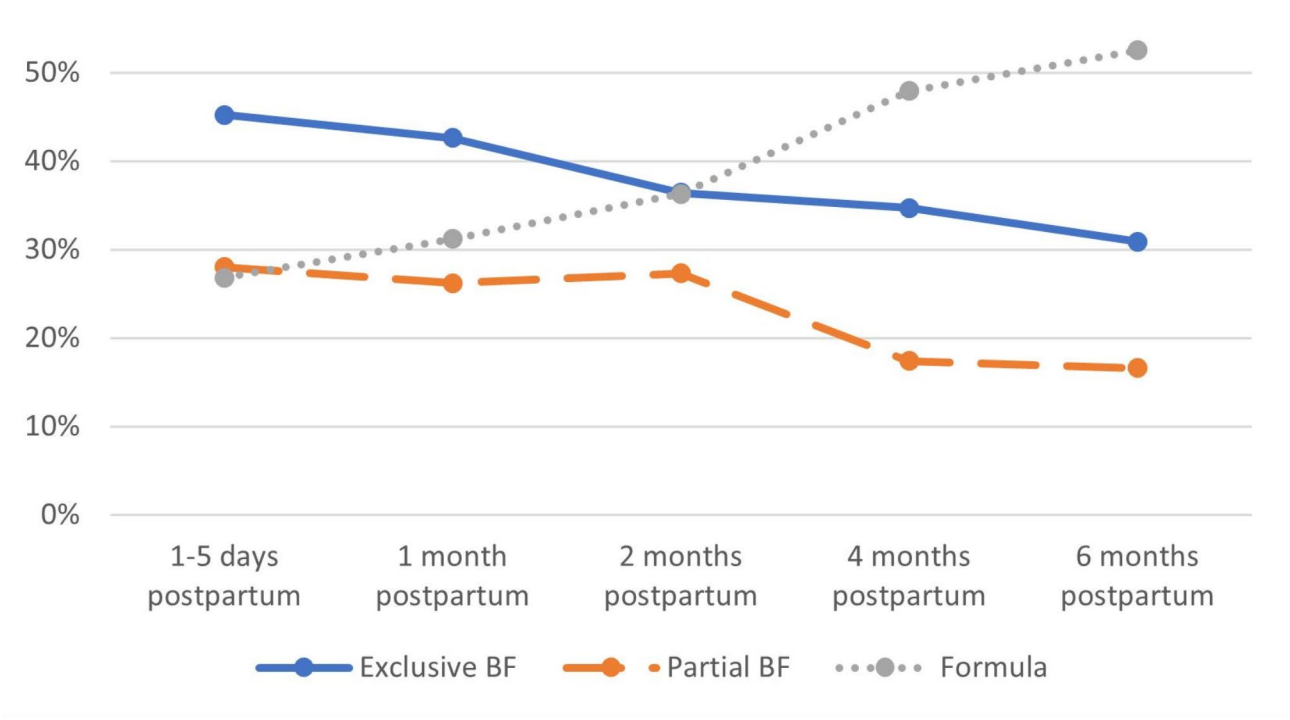

Fig. 2 Trends in breastfeeding practices from 1–5 days to six months postpartum

postpartum. A total of 2,228 (87.8%), 2,171 (85.5%), and 1,870 (73.7%) women completed the questionnaire at two, four, and six months postpartum, respectively. Our analysis included the 1,870 women who completed all four follow-up questionnaires (Fig. 1). There were no significant differences in age, parity, or maternal work status between this group ($n=1,870$) and those who only completed the questionnaire at one month postpartum ($n=2,539$).

Participant characteristics and EBF at six months postpartum

The prevalence of EBF, partial breastfeeding, and infant formula feeding was 45.2%, 28.0%, and 26.8% at 1–5 days postpartum, respectively (see Table 2; Fig. 2). As described above, we categorized breastfeeding practices into two groups: continuing EBF at six months (30.9%) and non-continuing EBF at six months (69.1%).

Participant characteristics are presented in Table 3. The mean age of the participants was 30.6±4.3 (range=18–45) years, and 64.7% of participants reported university-level or higher education. Approximately 64% of women had a vaginal birth. Half of the participants were primipara, and 69.4% were women who returned to work at or after two months postpartum. We compared breastfeeding-friendly environmental practices at six months postpartum between the two groups using dichotomized "yes / no" answers (Table 4). Women who reported non-continuing EBF at six months tended to report a lower experience rating to the BFHI than those who reported continuing EBF at six months. For example, "yes" response rates to the statements "I was aware that the hospital does not accept free breastmilk substitutes, bottles, pacifiers, or soothers from formula manufacturers or their agents" and "My baby was exclusively breastfed during the hospital stay and did not receive any other liquids or solids" were 82.7% and 70.4% for mothers reporting continuing EBF at six months and 74.2% and 43.3% for those reporting non-continuing EBF at six months, respectively.

Additionally, mothers reporting continuing EBF at six months tended to have a significantly higher mean score

Table 3 Continuing exclusive breastfeeding at 6 months postpartum and participant demographics ($n=1,870$)

		Yes $n=577$ (30.9%)	No $n=1293$ (69.1%)	χ^2 test	*p*- value
Variables	All	*n* (%)	*n* (%)		
Maternal age (years)				7.19	0.10
18–24	176	40 (22.7%)	136 (77.3%)		
25–29	637	192 (30.1%)	445 (69.9%)		
30–34	795	260 (32.7%)	535 (67.3%)		
≥ 35	262	85 (32.4%)	177 (67.6%)		
Education level				28.48	< 0.001**
High school or below	661	153 (23.1%)	508 (76.9%)		
Above university	1,209	424 (35.1%)	785 (64.9%)		
Parity				13.87	0.001*
Primipara	934	251 (26.9%)	683 (73.1%)		
Multipara	936	326 (34.8%)	610 (65.2%)		
Delivery type				14.30	< 0.001**
Vaginal delivery	1,195	405 (33.9%)	790 (66.1%)		
Cesarean delivery	675	172 (25.5%)	503 (74.5%)		
Women who returned to work at or after two months postpartum				42.74	< 0.001**
Yes	1,297	340 (26.2%)	957 (73.8%)		
No	573	237 (41.1%)	336 (58.6%)		

Note: * $p<0.01$, ** $p<0.001$

for perceived level of acceptance of breastfeeding among live-in family members (4.81±0.72) and perceived availability of lactation rooms in public settings (2.74±1.27) than those reporting non-continuing EBF at six months (4.56±1.10 and 1.73±1.17, respectively) (Table 5).

We used a parsimonious model to identify maternal and breastfeeding-friendly policies associated with continuing EBF at six months [18]. A *P*-value of less than 0.05 was considered statistically significant. Logistic regression revealed that above university-level education (adjusted odds ratio [AOR] 1.33: 95% CI 1.03, 1.72); multiparity (AOR 1.75; 95% CI 1.39, 2.19); vaginal delivery (AOR 1.29; 95% CI 1.01, 1.65); "perceived level of acceptance of breastfeeding in live-in family" (AOR 1.18; 95% CI 1.03, 1.36); "perceptions of the availability of lactation rooms in public settings" (AOR 1.74; 95% CI 1.59, 1.90); and women who returned to work at or after two months postpartum were more likely to report non-continuing EBF than women who did not return to work (Table 6). These findings suggest that implementing the BFHI [13] and using breastfeeding-friendly environmental practices were more likely to be associated with continuing EBF at six months (Cox and Snell $R^2=0.20$; Nagelkerke $R^2=0.29$).

Discussion

Our findings suggest that mothers who continued breastfeeding exclusively were more likely to have breastfeeding-friendly environmental factors. Women continuing breastfeeding at six months differed from the feeding status measured in previous studies [18, 19], making direct comparisons challenging. Unlike previous studies [7], we analyzed the impact of each breastfeeding-friendly environmental practice on breastfeeding practices at six months postpartum (Tables 3 and 4). Accordingly, our results support the implementation of the BFHI to promote continuing EBF at six months. Early and uninterrupted skin-to-skin contact immediately after delivery, continued for at least the first hour, and encouraging rooming-in positively affected EBF [10]. Additionally, to increase EBF rates and duration, efforts should be made to minimize the use of breast milk supplements and pacifiers [11]. The BFHI promotes successful breastfeeding by encouraging rooming-in and other practices that have been shown to increase breastfeeding success. However, in Taiwan, the traditional Chinese postpartum practice known as "doing the month" advises new mothers to rest extensively to minimize the risk of adverse health outcomes [20]. This cultural practice may pose challenges for mothers in our study in implementing specific practices, such as "the medical staff encouraged me to start breastfeeding as soon as possible after delivery for at least one hour" and "my baby was with me at all times during my hospital stay, except for baths and physical examinations". Consequently, when emphasizing the BFHI, it is also essential to incorporate an understanding of the postpartum cultural needs of women and provide flexible feeding strategies to increase breastfeeding [21]. Despite an increase in breastfeeding-friendly policy services in Taiwan between 2008 and 2011, as reported in previous studies [18], the present study reveals that women who returned to work at or after two months postpartum

Table 4 The impact of the WHO/UNICEF ten-step baby-friendly Hospital Initiative on continuing exclusive breastfeeding at 6 months postpartum *(n* = 1,870)

Variables	Yes *n* = 577 (30.9%)	No *n* = 1293 (69.1.%)	χ^2 test	*p*-value
WHO/UNICEF Ten-step Baby-friendly Hospital Initiative				
Step 1. Have a written breastfeeding policy that is routinely communicated to all healthcare staff.				
(1) The hospital posted written materials about breastfeeding that I could understand.	563 (97.6%)	1233 (95.4%)	5.15	0.03* [b]
(2) I was aware that the hospital does not accept free breastmilk substitutes, bottles, pacifiers, or soothers from formula manufacturers or their agents.	477 (82.7%)	960 (74.2%)	15.90	< 0.001** [b]
Step 2. Provide healthcare staff with the necessary skills to implement this policy.				
(3) I felt that the medical staff knew about and supported breastfeeding.	551 (95.5%)	1204 (93.1%)	3.91	0.04* [b]
(4) I felt that the medical staff consistently had adequate knowledge and skills to support breastfeeding.	545 (94.5%)	1198 (92.7%)	2.05	0.16 [b]
Step 3. Inform all pregnant women about the benefits and management of breastfeeding.				
(5) The medical staff informed me about the advantages and importance of breastfeeding.	513 (88.9%)	1088 (84.1%)	7.35	0.01* [b]
(6) The medical staff explained the negative impacts of formula feeding on my baby's health to me.	409 (70.9%)	920 (71.2%)	0.01	0.91 [b]
(7) The medical staff provided instructions on breastfeeding my baby.	455 (78.9%)	968 (74.9%)	3.49	0.07 [b]
Step 4. Help mothers initiate breastfeeding within half an hour of birth.				
(8) The medical staff guided me and facilitated skin-to-skin contact with my baby on the labor and delivery bed.	512 (88.7%)	1041 (80.5%)	19.17	< 0.001** [b]
(9) The medical staff encouraged me to start breastfeeding as soon as possible after delivery for at least one hour.	203 (35.2%)	299 (23.1%)	29.54	< 0.001** [b]
(10) The medical staff taught me how to maintain my milk supply while away from my baby.	513 (88.9%)	1087(84.1%)	7.57	0.01* [b]
(11) The medical staff taught me how to hand-express milk when I am away from my baby.	525 (91.0%)	1154 (89.2%)	1.31	0.28 [b]
(12) The medical staff taught me how to breastfeed my baby within the first 6 h after delivery[a].	515 (89.3%)	1084(83.8%)	9.45	0.002* [b]
Step 6. Give newborn infants no food or drink other than breast milk unless medically indicated.				
(13) The medical staff educated me on the importance of exclusive breastfeeding and advised me against giving water, beverages, or food to my baby.	495 (85.8%)	981 (75.9%)	23.60	< 0.001** [b]
(14) My baby was exclusively breastfed during the hospital stay and did not receive any other liquids or solids.	406 (70.4%)	560 (43.3%)	16.93	< 0.001** [b]
Step 7. Practice rooming-in (allow mothers and infants to remain together) 24 h a day.				
(15) My baby was with me at all times during my hospital stay, except for baths and physical examinations.	305 (52.9%)	454 (35.1%)	52.11	< 0.001** [b]
Step 8. Encourage breastfeeding on demand.				
(16) The medical staff encouraged me to breastfeed my baby whenever my baby showed signs of hunger, such as smacking their lips.	519 (89.9%)	1112 (86.0%)	5.57	0.02* [b]
Step 9. Give breastfeeding infants no artificial teats or pacifiers (dummies and soothers).				
(17) My baby did not use a pacifier or soother during our hospital stay.	491 (85.1%)	890 (68.8%)	54.64	< 0.001**
(18) I have not received any free formula, pacifiers, or breastmilk substitutes since giving birth.	478 (82.8%)	918 (71.0%)	29.58	< 0.001**
Step 10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.				
(19) The medical staff provided information on how to seek assistance if I experienced breastfeeding difficulties, including the unit to contact and the available communication methods.	432 (74.9%)	900 (69.6%)	5.40	0.02* [b]

Note: * $p < 0.05$ **, $p < 0.001$. % indicates the proportion of a dichotomized "yes" answer

[a] WHO (2018) Protecting, promoting and supporting breastfeeding in facilities providing maternity and newborn services: the revised baby-friendly hospital initiative. Global standards: at least 80% of breastfeeding mothers of term infants report that someone on the staff offered assistance with breastfeeding within 6 h after birth

[b] Fisher's test: the expected frequencies are less than five in the table

Table 5 Perceived acceptance of breastfeeding and availability of lactation rooms in public settings among live-in families impacting the continuation of exclusive breastfeeding at 6 months postpartum (*n* = 1,870)

Variables	Yes *n* = 577 (30.9%)	No *n* = 1293 (69.1.%)	χ^2 test or independent samples t tests	*p*-value
Use of lactation rooms in workplaces	140 (24.3%)	139 (10.8%)	57.39	< 0.001** [a]
Having time to express milk at work	235 (40.7%)	280 (21.7%)	72.73	< 0.001**
Perceived level of acceptance of breastfeeding in live-in family	4.81 ± 0.72	4.56 ± 1.10	5.04	< 0.001**
Perceived availability of lactation rooms in public settings	2.74 ± 1.27	1.73± 1.17	16.97	< 0.001**

Note: * $p < 0.01$ **, $p < 0.001$. [a] Fisher's test: the expected frequencies are less than five in the table

Table 6 Logistic regression model on factors associated with continuing of exclusive breastfeeding at 6 months postpartum (*n* = 1,870)

Variables	AOR	95%CI
Education level		
High school or below	1	
Above university	1.33	1.03, 1.72*
Parity		
Primipara	1	
Multipara	1.75	1.39, 2.19**
Delivery type		
Vaginal delivery	1.29	1.01, 1.65*
Cesarean delivery	1	
Women who returned to work at or after two months postpartum	0.55	0.35, 0.87*
WHO/UNICEF Ten-Step Baby-Friendly Hospital Initiative		
The medical staff encouraged me to start breastfeeding as soon as possible after delivery for at least one hour	1.41	1.10, 1.80*
My baby was exclusively breastfed during our hospital stay and did not receive any other liquids or solids	2.18	1.67, 2.85**
My baby did not use a pacifier or soother during our hospital stay	1.50	1.10, 2.04*
Perceived level of acceptance of breastfeeding in live-in family	1.18	1.03, 1.36*
Perceived availability of lactation rooms in public settings	1.74	1.59, 1.90**
Having time to express milk at work	2.60	1.64, 4.13**

Note 1: The model was adjusted for maternal age, education level, parity, and delivery type

Note 2: * $p < 0.01$, ** $p < 0.001$

Note 3: AOR = adjusted odds ratio, CI = confidence interval, OR = odds ratio

Note 4: The model with Cox and Snell R2 = 0.20; Nagelkerke R2 = 0.29

were 74.0% more likely to report non-continuing EBF at six months. This finding correlates with a substantial decline in EBF rates, which decreased from 45.2% at 1–5 days to 36.4% at two months postpartum. This decline could be attributed to Taiwan's domestic maternity leave policy, which provides only two months of fully paid maternity leave. Additionally, the lack of supportive breastfeeding policies at work and concerns about job security and income when seeking time for breastfeeding have led many women to stop EBF [19, 22], resulting in an increase in the number of mothers reporting non-continuing EBF at 6 months. Despite the Taiwanese domestic policy [23] mandating an hour of breastfeeding time for every eight hours of work, only 14.9% of surveyed women reported access to breastfeeding facilities at their workplaces. Future research should scrutinize the implementation and utilization of breastfeeding accommodations in the workplace for employed women. Health policies should advocate for flexible working hours to enhance the efficacy and duration of EBF and support postpartum women returning to work [22] while addressing obstacles to breastfeeding in professional settings [19]. The findings of this study suggest that the utilization of lactation rooms in public spaces can significantly boost the prevalence of EBF, aligning with prior research results [10, 18]. However, our findings reveal a perceived shortage of breastfeeding facilities in public areas.

According to our results, 52% of women believed there was a lack of breastfeeding facilities in public places. However, in 2010, Taiwan implemented regulations regarding breastfeeding in public areas [23]. As of 2015, Taiwan had created 2,916 lactation rooms in public places, including 781 in schools, medical institutions, and workplaces, and 2,135 in public transportation stations, railways and bus terminals, department stores, and retail shops [4]. While this demonstrates that Taiwan is a society that strongly promotes breastfeeding, there is still a conflicting attitude towards breastfeeding in

Taiwanese culture. The government encourages breastfeeding and provides lactation rooms and pumping time in workplaces, but societal and cultural perspectives treat breastfeeding as a private activity. This view results in breastfeeding spaces being perceived as unsuitable for sharing, leading to discrepancies between the capacity for public lactation rooms and their actual usage. These factors may impede breastfeeding [23] and could be related to the attitudes of Taiwanese society towards public breastfeeding. Additionally, promoting lactation rooms may encourage the idea that it is not acceptable to breastfeed in public, which could negatively affect women by discouraging this practice [24]. Future research should explore these factors to gain further understanding and support for breastfeeding in public areas. Factors positively associated with continuing EBF at six months included above university-level education, multiparity, vaginal delivery, and a high perceived level of acceptance of breastfeeding among live-in family members. These findings are consistent with previous research suggesting that individuals with above university-level education are more likely to be knowledgeable about the importance of breastfeeding and how to overcome breastfeeding difficulties, which results in a longer duration of EBF [7, 10, 19]. Additionally, multiparous women, those with vaginal deliveries, and those with sufficient family support tend to have shorter postpartum adaptation periods and pay more attention to their newborns, leading to lower usage of baby formula [7, 19]. To extend the duration of EBF, future strategies should focus on developing breastfeeding support and promoting the education of co-residing family members [10].

Implications

The BFHI and breastfeeding-friendly environmental practices can lead to continuing EBF at six months. To enhance breastfeeding outcomes, future breastfeeding-friendly policies should focus on increasing the availability of breastfeeding and pumping facilities in workplaces and public spaces, which will support women in continuing their breastfeeding journey.

Limitations

This study was subject to some limitations. First, while we retained 62% of the original study participants during follow-up and observed no significant socio-demographic differences between the retained and non-retained group, a possibility of selection bias may still exist. Specifically, mothers and infants encountering health issues during the follow-up period might have been more prone to being lost to follow-up. Second, women's perceptions of familial attitudes may not fully reflect the family's opinion. Further research is needed to explore the perspectives of the families and staff of baby-friendly hospitals and explore other possible ways to improve EBF. Finally, data were based on self-reports and could not be validated.

Conclusion

Public health advocates should promote breastfeeding-friendly environmental practices, including EBF during hospital stays with no introduction of other liquids or solids and avoiding the use of pacifiers or soothers. Maternity leave policies may also improve continuing EBF at six months. Adopting breastfeeding-friendly practices in public and workplace settings and increasing support for breastfeeding mothers during and after hospitalization may mitigate early termination of EBF.

Abbreviations

AOR	Adjusted odds ratio
BFHI	Baby Friendly Hospital Initiative
CVI	Content validity index
EBF	Exclusive breastfeeding
SD	Standard deviation
WHO	World Health Organization

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13006-024-00681-6.

Supplementary Material 1

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Author contributions

Tzu-Ling Chen and Meei-Ling Gau made substantial contributions to the conception and design, data acquisition, analysis and interpretation of data, and drafting of the article. The second author (L.-L. C.) helped in recruiting study participants and critically revising the manuscript for important intellectual content. Finally, all authors have read and approved the final version of the manuscript. All authors have read and agreed to the published version of the manuscript.

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Data availability

The data and materials supporting the findings in this study are available from the corresponding author upon request.

Declarations

Ethics approval and consent to participate

The study protocol was approved by the Medical Research Ethical Foundation's Joint Institutional Review Board (09-S-008). All participants provided informed consent.

Consent for publication

Consent to publish is not required.

Conflicts of interest
All authors are without conflicts of interest, including specific financial interests, relationships, and affiliations relevant to the subject of their manuscript.

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