

The Influence of the Baby-Friendly Hospital Initiative and Maternity Care Practices on Breastfeeding Outcomes

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Abstract

Background: The Baby-Friendly Hospital Initiative (BFHI) was launched in 1991 to promote breastfeeding through hospital policy. Researchers have reported breastfeeding improvements after hospitals became “Baby-Friendly.” In Hong Kong, the first public hospital was designated as a Baby-Friendly Hospital in 2016.

Research Aim: To examine the influence of the BFHI on breastfeeding by comparing breastfeeding outcomes in a study cohort recruited before the implementation of the BFHI and a cohort recruited after its implementation.

Methods: This was a quasi-experimental interrupted time-series design. Two cohorts of mother-infant pairs ($N = 2369$) were recruited immediately postpartum from four public hospitals in Hong Kong and followed up prospectively. Comparisons were made in five of the BFHI steps experienced in both cohorts and the duration of any and exclusive breastfeeding.

Results: A higher proportion of participants from the post-implementation cohort breastfed and breastfed exclusively at all follow-up periods. Participants in the pre-BFHI cohort, on average experienced 3.10 ($SD = 1.42$) of the BFHI steps, whereas the participants in the post-BFHI cohort experienced 3.59 (1.09) of the BFHI steps. Half of the participants discontinued any breastfeeding by 13 weeks in the pre-BFHI cohort; more than half in the post-BFHI cohort were still breastfeeding at 6 months postpartum ($p < .001$). Giving only human milk in the first 48 hr of delivery and not providing pacifiers or bottles were associated with lower risk of not exclusive breastfeeding in both cohorts.

Conclusion: Implementation of the BFHI was associated with improvements in breastfeeding practices and outcomes.

Keywords

Baby-Friendly Hospital Initiative, breastfeeding, China, Hong Kong, maternal care practices, quasi-experimental design, time-series design

Background

Human milk offers unique nutrition to support the optimal growth of infants. The World Health Organization (WHO, 2018) recommends infants to be breastfed exclusively for the first 6 months of life and with complementary feeding up to 2 years of age. Globally, 43% of infants 0–5 months old were estimated to be exclusively breastfed (Victora et al., 2016). Early cessation of breastfeeding is a public health concern, especially in high-income countries, where only 25% of children were breastfeeding at 12 months of age, far below the global average of 74% (Victora et al., 2016). Women often cited difficulties, including low milk supply, painful nipples, and latching problems, as reasons for breastfeeding cessation. In addition, other factors, including lack of support or feeding advice (Gianni et al., 2019), formula use (Hemmingway et al., 2020), and returning to work, also contributed to breastfeeding cessation (Chang et al., 2019).

The Baby-Friendly Hospital Initiative (BFHI) was introduced by the WHO and the United Nations Children’s Fund (UNICEF) in 1991, when the global breastfeeding rate was very low (WHO, 1991). Healthcare facilities assessed to be in compliance with the 10 steps of the BFHI are designated as “Baby-Friendly.” Hospitals must also comply with the International Code of Marketing of Breast-Milk Substitutes

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(WHO, 1981), which forbids the promotion of infant formula or other products within the hospital. The 10 steps of the BFHI intend to create a supportive and educational environment to encourage breastfeeding initiation and to assist women in overcoming breastfeeding barriers and maintaining breastfeeding after discharge.

To date, there are three designated “Baby-Friendly” public hospitals in Hong Kong. Authors from previous international studies have found the BFHI practices associated with improved breastfeeding outcomes in initiation and continuation at 6 months (Kim et al., 2018). Others have also reported hospitals that have become “Baby-Friendly” are also associated with higher rates and longer durations of any and exclusive breastfeeding (Jung et al., 2019; Patterson et al., 2018; Spaeth et al., 2018). However, accredited hospitals were typically compared to non-accredited hospitals in these studies. In addition, previous breastfeeding studies describing breastfeeding rates from Hong Kong were conducted in hospitals before implementing the BFHI (Tarrant et al., 2016). We aimed to compare a cohort from four public hospitals in Hong Kong prior to implementation of the BFHI and/or accreditation of Baby-Friendly Hospital (BFH) status, and a cohort from the same four hospitals after the implementation of BFHI steps and accreditation of the BFHI. We are the first to report on a designated BFH and add to the literature the results after implementing the BFHI. We aimed to examine the influence of the BFHI on breastfeeding by comparing breastfeeding outcomes in a study cohort recruited before the implementation of the BFHI and a cohort recruited after the implementation.

Methods

Research Design

We used a quasi-experimental interrupted time-series design to examine the influence of the BFHI on breastfeeding outcomes. The rationale for the design is to compare before and after the implementation of the BFHI and the influence of the policy on breastfeeding outcomes. Study methods of the pre-BFHI cohort have been published elsewhere (Tarrant et al., 2016). Ethical approval for the study was obtained from all the participating sites: the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW 16-2044), the Hong Kong East Cluster Research Ethics Committee (HKEC-2016-106), and the Research Ethics Committee of the Kowloon Central/Kowloon East Cluster (KC/KE-16-0248). Ethical approval for the baseline cohort was obtained from the same hospital sites.

Setting and Relevant Context

There are eight public and 11 private hospitals with maternity units in Hong Kong, with the public sector covering

62.8% of the births in 2019 (Census and Statistics Department, 2020a; Hospital Authority, 2020). Since 2013, public hospitals could register their intent to become “Baby-Friendly,” and the first BFH in Hong Kong was accredited in 2016 (Baby Friendly Hospital Initiative Hong Kong Association, 2020a). To date, three out of eight public hospitals were designated BFHs, and two of those are included in this study. The remaining five were in the process of becoming fully designated BFHs.

The breastfeeding initiation rate was high in Hong Kong, with 88% of women breastfeeding upon discharge from the hospital (Department of Health, 2019). This initiation rate was higher than some countries, for example, the United States (84%; Centers for Disease Control and Prevention, 2020) and India (42%; Senanayake et al., 2019), but lower than others like Norway (98%; Theurich et al., 2019). However, the breastfeeding rate in Hong Kong fell to 66% by 2 months, with the exclusive breastfeeding rate at 2 months at 32% (Department of Health, 2019).

Sample

The target population of the study was women who give birth in the postnatal wards of participating hospitals. The inclusion criteria in both cohorts were: (1) intention to breastfeed, (2) singleton pregnancies, (3) Cantonese speaking, (4) Hong Kong residency for more than 1 year, and (5) no serious medical or obstetrical complications. Participants were excluded from the study if the newborns were: (1) born < 37 weeks gestation, (2) assigned an Apgar score < 8 at 5 min after birth, (3) birth weight < 2500 g, (4) born with any severe medical conditions or congenital malformations, (5) placed in the special care nursery for more than 48 hr after delivery, and (6) placed in the intensive care nursery after birth. Mothers with no intention to breastfeed were ineligible to participate in this study because, in our analyses, we were interested in the protective influence of the BFHI on weaning from breastfeeding rather than initiation.

For all cases, a trained research assistant conducted telephone follow-ups at 1, 3, and 6 months. The duration of the study was 6 months for the post-BFHI cohort, or until weaned, whichever came first. The flow of participants' recruitment and follow-up is presented in Figure 1. In the pre-BFHI cohort, $N = 1287$ mother-infant pairs were recruited prior to the implementation of the BFHI policies. Ten participants who subsequently did not meet the study criteria were excluded, and 37 participants were lost to follow-up after hospital discharge. Of the remaining 1240 participants, 39 completed partial follow-up, and $N = 1201$ completed all follow-ups. In the post-BFHI cohort, $N = 1249$ mother-infant pairs were recruited. Thirteen participants were excluded due to the lack of demographic data, 44 subsequently did not meet the inclusion criteria, one withdrew from the study, and 62 were lost to follow-up. Among the remaining 1129 participants, 68 had partial follow-up,

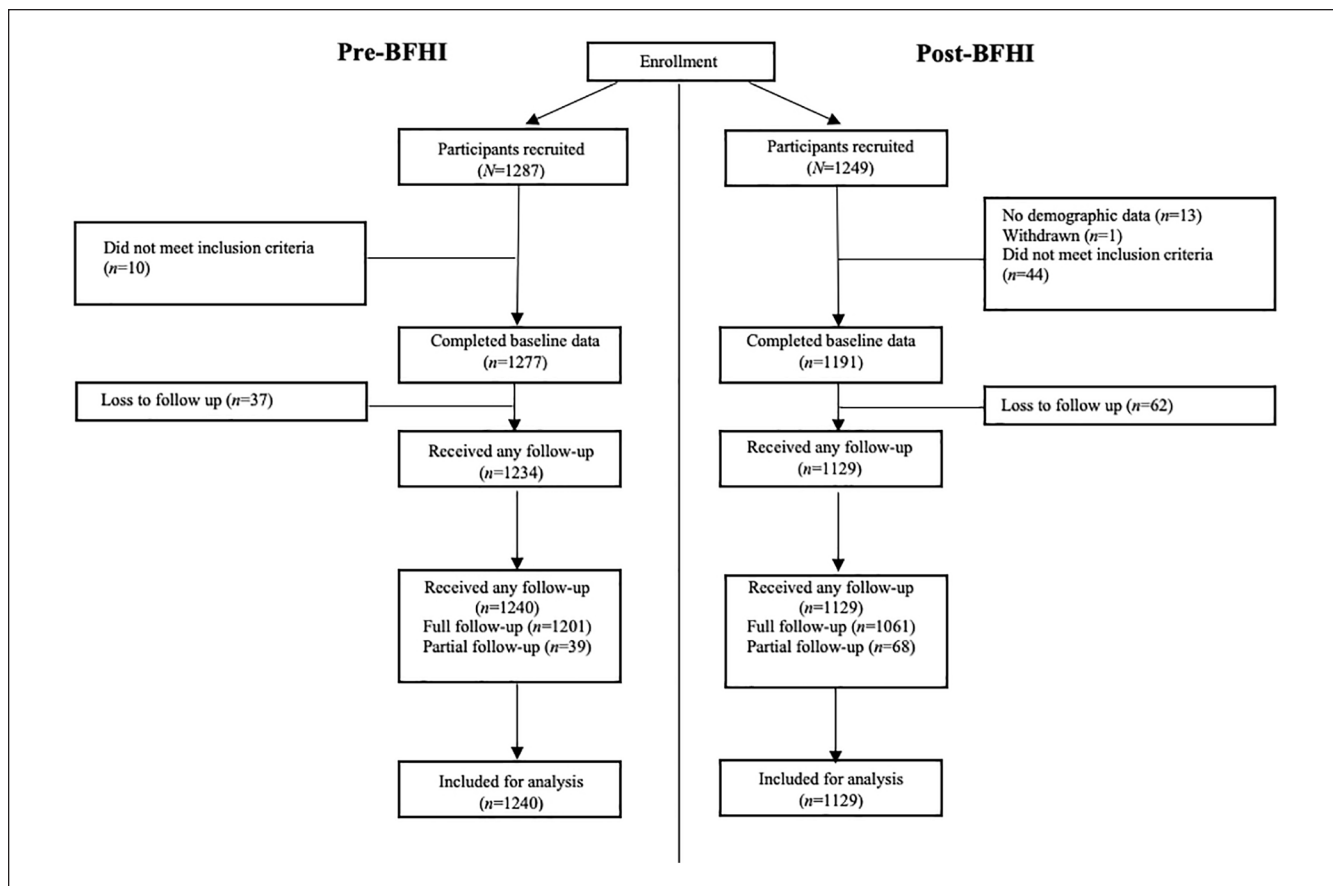


Figure 1. Flow Diagram of Participant Recruitment and Follow-up.

and $N = 1061$ completed all follow-ups. A total of $N = 2369$ mother-infant pairs from both cohorts ($N = 1240$ in pre-BFHI and $N = 1129$ in the post-BFHI cohort) were included in the analysis.

The sample size was based on comparing the 3-month breastfeeding rate in the two hospitals before and after the BFH designation. Based on the evidence concerning the effectiveness of the accreditation of BFHs, we estimated that the processes involved in receiving the designation would improve breastfeeding rates at 3 months by approximately 10% in the participants from the BFH. In addition, based on data collected by Tarrant et al. (2016) in 2011–2012, any breastfeeding rate at 3 months in this population was reported to be 50%. Therefore, in the BFH, we expect the breastfeeding rate at 3 months to increase to 60%. Alpha of 2.5% was used to control the overall Type 1 error rate to within 5%. Based on a power of 80%, a sample size of 479 participants would be needed in both the intervention and control groups to detect a 20% difference in the rates of breastfeeding. In addition, assuming a 25% rate of loss to follow up, a total of 627 participants would be needed in each group. By the end of the recruitment period, we recruited 1191 participants. With 1240 participants in the pre-BFHI cohort, there was adequate power to compare both groups.

Measurement

The outcomes of this study were any and exclusive breastfeeding durations. “Any breastfeeding” refers to the infant having received human milk (WHO, 1991). Duration of breastfeeding was estimated based on information obtained from telephone follow-ups. “Exclusive breastfeeding” was defined as feeding no other solids or liquids except human milk, with vitamins, minerals, and/or medicine via drops or syrups allowed (WHO, 1991). At follow-up interviews, participants were asked (1) to recall the infant feeding patterns in the 25 hr preceding the call and (2) the exact age of stopping any and exclusive breastfeeding.

The exposure of this study was the BFH practices (i.e., BFHI steps). The cohort recruited when there was no hospital designated as BFHs was the “pre-BFHI” cohort; whereas the “post-BFHI” cohort was the cohort recruited after the designation of two of the study sites as BFHs and after the remaining two sites were in the process of accreditation. Five of the 10 steps of Baby-Friendly practices measured in the study were extracted from the patient charts and verified with the participants (Supplementary Table 1). They included (1) Step 4: help mothers initiate breastfeeding within the 1st hr after birth; (2) Step 6: give newborn infants no food or drink other than breastmilk, unless medically indicated;

(3) Step 7: practice rooming-in; (4) Step 8: encourage breastfeeding on demand; and (5) Step 9: give breastfeeding babies no artificial teats or pacifiers. These steps were chosen as they affect individual mothers.

The other 5 steps were excluded for the following reasons: Steps 1 and 2 apply to the hospital and are related to policy management. Step 3 would normally occur during the antenatal period to give mothers time to decide about the benefits and management of breastfeeding. Step 5 (show mothers how to breastfeed and maintain lactation) was excluded because, similar to other studies (Tarrant et al., 2015), the data suggested that exposure to this step was an indicator of women experiencing breastfeeding difficulties rather than the demonstration of breastfeeding to all new mothers. Therefore, this variable was dropped from additional analysis. Step 10 (provide mothers with information about breastfeeding support upon discharge) was excluded due to missing data from one site. In Hong Kong, discharge information is typically provided to mothers, so this would have been typically fulfilled in most hospitals.

Sociodemographic variables and breastfeeding history were the potential confounders in this study. They included maternal education, family income, length of residence in Hong Kong, past breastfeeding experience, partner's preferred feeding method, breastfed as a child, intention to return to work, childbirth and breastfeeding class attendance, and plan to exclusively breastfeed. These data were collected directly from participants (Supplementary Table 2). Maternal information, which included age and method of delivery, were collected from patient charts (Supplementary Table 3). While age was collected as a continuous variable, it was divided into three categories during analysis: 18–29, 30–34 and ≥ 35 . All potential confounders that have been associated with breastfeeding duration were adjusted accordingly found in previous studies in this population group (Bai et al., 2016; Cohen et al., 2018; Lok et al., 2018)

Data Collection

The pre-BFHI cohort was recruited prospectively between October 2011 and July 2012, whereas the post-BFHI cohort was recruited prospectively between May 2017 and June 2018. Trained research nurses obtained written informed consent from all participants when they agreed to participate. They collected baseline demographic information during participants' postpartum stay. Maternal and infant feeding questionnaires were completed on-site by the research nurses using patient charts. During the follow-up, if the mother had stopped breastfeeding, weaning data was also collected. In sum, we recruited two cohorts of mother-infant pairs from four geographically and socioeconomically distributed public hospitals in Hong Kong (two hospitals from Hong Kong Island and two from the Kowloon Peninsula). We followed them prospectively for up to 6 months or until weaned, whichever came first. All data were kept confidential and

secured according to the University's Code of Practice on the Personal Data (Privacy) Ordinance.

Data Analysis

Frequencies and proportions were used to describe the characteristics of the study population. Chi-square tests were used to compare the sociodemographic characteristics, breastfeeding outcomes, and exposure to the five measured BFHI steps between the two study cohorts. The Kaplan-Meier life table method was used to determine whether the cumulative probabilities of any and exclusive breastfeeding at a given week after delivery differed by BFHI status. The duration of any and exclusive breastfeeding in participants who were lost to follow-up was censored at the time of the last contact for all analyses. The analysis was repeated by entering all potential confounding variables collected in this study. Tests to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern as Variance Inflation factor values were values below the recommended cut-off value of 10. All data were analyzed using Stata (Version 15.1) statistical software. Two-tailed $p < .05$ was used as the criterion for statistical significance.

Results

Characteristics of the Sample

The demographic characteristics of the participants are shown in Table 1. Almost half of the participants were aged 30–34 years old, had completed secondary education, and had an income of HK\$15,000–\$34,999. Participants in the post-BFHI were older, more educated, and had higher monthly family incomes (all $p < .001$). Furthermore, a higher proportion of the post-BFHI participants had previous breastfeeding experience ($p = .011$), planned to exclusively breastfeed ($p < .001$), had partners who favored infant formula or mixed feeding ($p < .001$), and gave birth by cesarean section ($p < .001$).

Baby-Friendly Hospital Practices

Comparing the BFH practices experienced by participants in the two cohorts (Table 2), participants in the post-BFHI cohort were more likely to breastfeed in the postnatal wards for the infants' first feeding, room with the infants during the first 24 hr, provide no pacifiers or artificial teats, and provide only human milk during the hospital stay. However, they were less likely to breastfeed within the 1st hr than the participants in the pre-BFHI cohort.

For the pre-BFHI cohort, a similar proportion of participants experienced one to five BFHI steps (Figure 2). In contrast, the post-BFHI cohort showed a left-skewed distribution with a peak at four steps, with nearly half of the post-BFHI cohort experiencing four BFHI steps (Figure 2).

Table 1. Characteristics of Participants of the Two Study Cohorts Pre- and Post-BFHI (N = 2369).

Characteristic	Total n (%)	Pre-BFHI n = 1240 n (%)	Post-BFHI n = 1129 n (%)	χ^2	p
Maternal age (years)					
18–29	678 (28.6)	381 (30.7)	297 (26.3)	6.11	.047
30–34	1028 (43.4)	529 (42.7)	499 (44.2)		
≥35	663 (28.0)	330 (26.6)	333 (29.5)		
Highest level of maternal education				68.49	<.001
Secondary	1115 (47.1)	684 (55.2)	431 (38.2)		
Post-Secondary	383 (16.2)	168 (13.6)	215 (19.0)		
University degree or above	871 (36.8)	388 (31.3)	483 (42.8)		
Monthly family income (HKD) ^a				124.54	<.001
<\$15,000	270 (11.4)	212 (17.1)	58 (5.1)		
\$15,000–\$34,999	1082 (45.7)	603 (48.6)	479 (42.4)		
≥\$35,000	1017 (42.9)	425 (34.3)	592 (52.4)		
Length of residence in Hong Kong				1.12	.570
<5 years	167 (7.1)	92 (7.4)	75 (6.6)		
≥ 5 years	772 (32.6)	411 (33.2)	361 (32.0)		
Since birth	1430 (60.4)	737 (59.4)	693 (61.4)		
Attended antenatal childbirth class				8.35	.004
No	1234 (52.1)	681 (54.9)	553 (49.0)		
Yes	1135 (47.9)	559 (45.1)	576 (51.0)		
Attended antenatal breastfeeding class				19.78	<.001
No	1478 (62.4)	826 (66.6)	652 (57.8)		
Yes	891 (37.6)	414 (33.4)	477 (42.3)		
Previous breastfeeding experience				6.47	.011
No	1363 (57.5)	744 (60.0)	619 (54.8)		
Yes	1006 (42.5)	496 (40.0)	510 (45.2)		
Planning to exclusively breastfeed				113.77	<.001
No	748 (31.6)	271 (21.9)	477 (42.3)		
Yes	1621 (68.4)	969 (78.2)	652 (57.8)		
Partner's infant feeding preference				19.14	<.001
Breastfeeding only	994 (42.0)	528 (42.6)	466 (41.3)		
No preference	1154 (48.7)	627 (50.6)	527 (46.7)		
Infant formula and mixed feeding	221 (9.3)	85 (6.9)	136 (12.1)		
Delivery type				33.44	<.001
Spontaneous vaginal	1751 (73.9)	976 (78.7)	775 (68.6)		
Assisted vaginal	126 (5.3)	60 (4.8)	66 (5.9)		
Planned caesarean	236 (10.0)	103 (8.3)	133 (11.8)		
Emergency caesarean	256 (10.8)	101 (8.2)	155 (13.7)		
Return to work ≤ 6 months postpartum				0.32	.572
No	830 (35.0)	441 (35.6)	389 (34.5)		
Yes	1539 (65.0)	799 (64.4)	740 (65.5)		
Breastfed as a child				0.11	.742
No	1385 (58.5)	721 (58.2)	664 (58.8)		
Yes	984 (41.5)	519 (41.9)	465 (41.2)		

Note. ^aUSD = 7.78 HKD; HKD = Hong Kong dollar.

Breastfeeding Outcomes

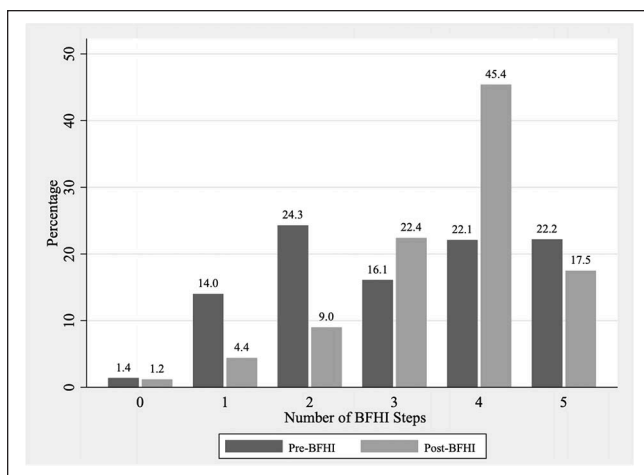
The median times for first breastfeeding were 1.5 and 2 hr for the pre-BFHI and post-BFHI cohorts, respectively (Figure 3). However, among participants who had cesarean sections, the median times for initiation of first breastfeeding were 4.0

and 2.7 hr for the pre-BFHI and post-BFHI cohorts, respectively (Figure 3).

From the Kaplan-Meier survival curves for any and exclusive breastfeeding for the two cohorts (Figure 4), it can be seen that half of the participants discontinued any breastfeeding by 13 weeks in the pre-BFHI cohort, whereas more than

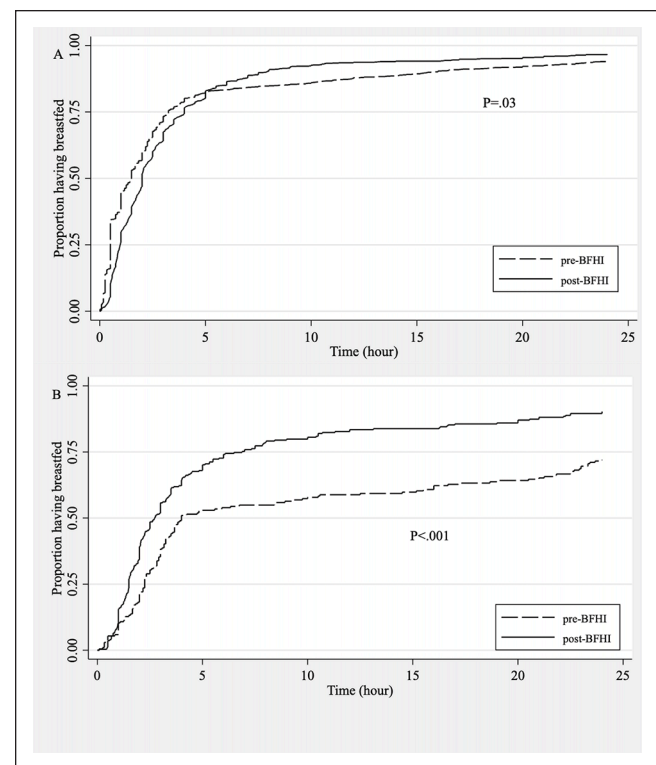
Table 2. Comparison of Baby-Friendly Hospital Practices Experienced by Participants of the Two Cohorts (N = 2369).

BFI Practices	Total n (%)	Pre-BFHI n=1240 n (%)	Post-BFHI n=1129 n (%)	χ^2	p
Step 4: Breastfeeding initiation within 1 hour					
Yes	893 (37.7)	560 (45.2)	333 (29.5)	61.75	<.001
No	1476 (62.3)	680 (54.8)	796 (70.5)		
Step 6: Only human milk given					
Yes	1236 (52.2)	507 (40.9)	729 (64.6)	132.84	<.001
No	1133 (47.8)	733 (59.1)	400 (35.4)		
Step 7: Rooming-in					
Yes	1914 (80.8)	851 (68.6)	1063 (94.2)	248.12	<.001
No	455 (19.2)	389 (31.4)	66 (5.9)		
Step 8: Breastfeeding on demand					
Yes	1887 (79.7)	973 (78.5)	914 (81.0)	2.26	.133
No	482 (20.4)	267 (21.5)	215 (19.0)		
Step 9: No artificial teats and pacifiers given					
Yes	1969 (83.1)	955 (77.0)	1014 (89.8)	68.97	<.001
No	400 (16.9)	285 (23.0)	115 (10.2)		

**Figure 2.** Cumulative Baby-Friendly Hospital Initiative (BFHI) Steps Participants Experienced by Cohorts.

half of the participants in the post-BFHI cohort were still breastfeeding by the end of the study at 6 months ($p < .001$). On the other hand, half of the participants stopped breastfeeding exclusively at 1 week in the pre-BFHI cohort, while half of the participants stopped breastfeeding exclusively around 8 weeks in the post-BFHI cohort ($p < .001$).

In the unadjusted hazard ratios of the steps for the risk of not breastfeeding in both cohorts, giving only human milk, and not giving artificial teats were significant in protection from breastfeeding discontinuation (Table 3). In the unadjusted analysis of both cohorts, giving only human milk and not giving artificial teats were significant in protection from breastfeeding discontinuation. After adjusting for potential confounders, giving only human milk in the first 48 hr of

**Figure 3.** Time to First Breastfeeding for Pre- and Post-Baby-Friendly Hospital Initiative (BFHI) Study Cohorts Among (A) the Whole Sample, and (B) a Subgroup of Participants Who Delivered Via Caesarean Section.

delivery was associated with a 22% (aHR = 0.78; 95% CI [0.66, 0.92]) lower risk of weaning in the pre-BFHI cohort. In the post-BFHI cohort, breastfeeding on demand

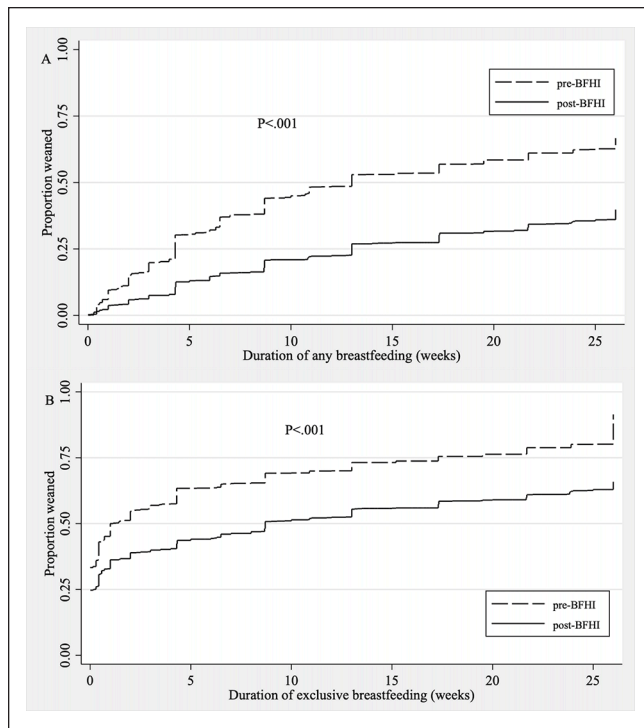


Figure 4. Kaplan-Meier Curves of (A) Any and (B) Exclusive Breastfeeding for Pre- and Post-Baby-Friendly Hospital Initiative (BFHI) Study Cohorts.

and not providing pacifiers or bottles were associated with 22% (aHR = 0.78; 95% CI [0.62, 0.98]) and 37% (aHR = 0.63; 95% CI [0.46–0.85]) lower likelihood of weaning, respectively.

In the adjusted hazard ratios for BFHI steps in not exclusive breastfeeding (Table 4), giving only human milk in the first 48 hr after delivery and not providing pacifiers or bottles were associated with 17% (aHR = 0.83; 95% CI [0.72, 0.97]) and 19% (aHR = 0.75; 95% CI [0.60, 0.92]) lower risk of not exclusive breastfeeding in the pre-BFHI cohort, respectively. Similarly, giving only human milk in the first 48 hr of delivery and not providing pacifiers or bottles were associated with a respective 28% (aHR = 0.72; 95% CI [0.60, 0.86]) and 23% (aHR = 0.77; 95% CI [0.60, 0.99]) lower risk of not exclusive breastfeeding in the post-BFHI cohort (Table 4).

Discussion

We are the first to compare breastfeeding outcomes of women who delivered in hospitals having received BFH designation or implemented BFHI steps and in the process of accreditation with the outcome of those who delivered in the same hospitals prior to receiving the BFHI accreditation or before implementing BFHI steps for accreditation. In the pre-BFHI cohort, none of the hospitals in Hong Kong were designated as BFHs. In contrast, in the post-BFHI cohort,

two of the study sites were designated BFHs, and the remaining two had implemented BFHI steps and were in the process of accreditation. We conducted regular follow-ups to track the breastfeeding status of mothers and collected data on hospital practices from patient charts to increase reliability and reduce recall bias. We found that participants delivering at a hospital that had implemented BFHI steps for BFH accreditation had improved breastfeeding outcomes.

In addition, we found that participants who were able to exclusively breastfeed in the hospital (Step 6) and not give a pacifier or bottle (Step 9) were shown to be protected against not exclusively breastfeeding in both cohorts. As time progressed with the implementation of the BFHI policy, breastfeeding on demand (Step 8) and not giving artificial teats or bottles (Step 9) appeared to be protective against weaning. This is consistent with the literature. Perez-Escamilla et al. (2016) conducted a systematic review in which they suggested that Step 6 was likely a reflection of the successful implementation of the other steps. Participants who were unable to breastfeed exclusively in the hospital and thereby required in-hospital supplementation may have difficulties with breastfeeding. In previous research, in-hospital supplementation was associated with early cessation of breastfeeding (McCoy & Heggie, 2020). As supplementation reduces the amount of breastfeeding, it leads to reduced stimulation of the breast from suckling, which would ultimately lead to reduced prolactin secretion (Zhang et al., 2016). Human milk synthesis is also negatively affected with lower clearance of the breast (Sriraman, 2017), which the mother may perceive herself as having inadequate milk and hence cease breastfeeding. This finding highlights that mothers in the post-BFHI cohort may receive more help and that a supportive and breastfeeding-friendly environment may help mothers achieve Step 6 and continue breastfeeding post-discharge.

According to population statistics, the age of mothers giving birth in Hong Kong has slowly been rising. For example, the age group 30–34 has seen a 45% increase in age-specific fertility rates between 2003–2019 (Census and Statistics Department, 2020a, 2020b). Similarly, the proportion of individuals with post-secondary education has increased from 17.5% in 2009 to 25.3% in 2019 (Census and Statistics Department, 2020c). In this same period, the median monthly income of the general Hong Kong population has increased from HKD18,000 to HKD28,700 (Census and Statistics Department, 2020c). In previous studies researchers have also linked maternal education and socioeconomic status with breastfeeding (Ajami et al., 2018; Sarki et al., 2019). This may have accounted for the unexpected significant differences between the two cohorts. Therefore, these were adjusted and controlled for in the analysis.

Interestingly, fewer participants of the post-BFHI cohort breastfed within 1 hr (Step 4). This may be due to changes in the BFHI. The original “Ten steps to successful breastfeeding” was to initiate breastfeeding within the first 30 min of birth (WHO, 1989), which was later changed to begin

Table 3. The Unadjusted and Adjusted Hazard Ratios of the Five BFHI Steps on Any Breastfeeding for the Two Cohorts.

BFH Practice	Pre-BFHI		Post-BFHI	
	HR (95% CI)	aHR ^a (95% CI)	HR (95% CI)	aHR (95% CI)
Step 4: Breastfeeding initiation within 1 hour				
Yes	0.83 (0.73-0.94)	0.94 (0.82-1.09)	0.85 (0.69-1.05)	0.93 (0.74-1.15)
No				
Step 6: Only human milk given				
Yes	0.69 (0.61-.79)	0.78 (0.66-0.92)	0.57 (0.47-0.69)	0.80 (0.64-1.01)
No				
Step 7: Rooming-in				
Yes	1.00 (0.87-1.14)	1.17 (0.92-1.50)	0.66 (0.46-0.94)	0.92 (0.62-1.36)
No				
Step 8: Breastfeeding on demand				
Yes	0.93 (0.80-1.08)	0.92 (0.71-1.18)	0.66 (0.53-0.82)	0.78 (0.62-0.98)
No				
Step 9: No artificial teats and pacifiers given				
Yes	0.71 (0.62-0.82)	0.86 (0.71-1.04)	0.44 (0.34-0.56)	0.63 (0.46-0.85)
No				

Note. ^aadjusted for maternal age, maternal education, household income, length of residence, returning to work in the postpartum period, mother was breastfed as a child, mother's previous breastfeeding experience, partner's feeding preference, attended childbirth class, attended breastfeeding class, planning to exclusive breastfeed, mode of birth and all the other BFHI steps. CI = confidence interval; HR = hazard ratio.

Table 4. The Unadjusted and Adjusted Hazard Ratios (HRs) of the Five BFHI Steps on Exclusive Breastfeeding for the Two Participants Cohorts (N = 2369).

BFH Practices	Pre-BFHI		Post-BFHI	
	HR (95% CI)	aHR ^a (95% CI)	HR (95% CI)	aHR (95% CI)
Step 4: Breastfeeding initiation within 1 hour				
Yes	0.90 (0.81-1.01)	1.03 (0.91-1.18)	0.89 (0.76-1.05)	1.02 (0.86-1.21)
No				
Step 6: Only human milk given				
Yes	0.77 (0.69-0.86)	0.83 (0.72-0.97)	0.58 (0.50-0.68)	0.72 (0.60-0.86)
No				
Step 7: Rooming-in				
Yes	1.01 (0.90-1.14)	1.08 (0.86-1.35)	0.78 (0.58-1.04)	1.10 (0.79-1.52)
No				
Step 8: Breastfeeding on demand				
Yes	1.01 (0.88-1.16)	0.98 (0.78-1.24)	0.77 (0.65-0.93)	0.94 (0.78-1.13)
No				
Step 9: No artificial teats and pacifiers given				
Yes	0.75 (0.65-0.85)	0.81 (0.68-0.96)	0.56 (0.45-0.70)	0.77 (0.60-0.99)
No				

Note. ^aadjusted for maternal age, maternal education, household income, length of residence, returning to work in the postpartum period, mother was breastfed as a child, mother's previous breastfeeding experience, partner's feeding preference, attended childbirth class, attended breastfeeding class, planning to exclusive breastfeed, mode of birth and all the other BFHI steps. CI = confidence interval; HR = hazard ratio.

skin-to-skin contact and to breastfeed as soon as possible (WHO, 2018). It is possible that the hospitals in the pre-BFHI group followed a protocol that focused on breastfeeding initiation while the post-BFHI group focused on getting skin-to-skin initiation. Cesarean section has been found to be associated with delayed breastfeeding initiation (Chen et al., 2018; Wu et al., 2018). Another possibility for lower

breastfeeding initiation within the 1st hr could be that a quarter of the participants underwent Cesarean section in the post-BFHI cohort compared to one-sixth of the participants in the pre-BFHI cohort. In Hong Kong, public hospitals provide Vitamin K administration and Hepatitis B vaccination, along with incubator care immediately after childbirth (Chu, 2019). This separates the infant from the mother and

prevents immediate skin-to-skin care, thereby delaying breastfeeding initiation. Therefore, when examining the time to first breastfeeding initiation stratified by delivery method, there was a significant improvement in the time to first breastfeeding in the post-BFHI cohort among participants who had a cesarean delivery, suggesting hospital improvements for mothers delivering by Cesarean section.

Although less than half of the post-BFHI cohort would experience four of the five steps, it has doubled compared to the pre-BFHI cohort, showing an improvement upon implementation of the BFHI policy. However, further awareness is needed for greater adherence to the BFHI practices, particularly Step 4. The low compliance of one step and changes made to Step 4 by the WHO may have influenced the overall analysis. In the Baby-Friendly Hospital Initiative Hong Kong Association's (BFHIHKA) annual report (2020b) it is reported that only 51% of the patients in public hospitals have experienced Step 4 (Chen et al., 2018). It should be noted that this statistic incorporates all eight public hospitals in Hong Kong (three BFHs and five in the process of designation). They reported those that have successfully achieved skin-to-skin for 1 hr within 5 min of birth, as opposed to achieving breastfeeding initiation within 1 hr in our study. Skin-to-skin information was not collected in the pre-BFHI cohort, therefore limiting our data to compare the revised Step 4 across the hospitals due to differences in time and practice. Therefore, further follow up to measure the amended Step 4, "skin to skin contact and breastfeeding initiation within 30 minutes" and efforts to enhance awareness and adherence of this step are needed.

In this study, participants who delivered in a hospital that has implemented BFHI steps for BFH accreditation were more likely to have a longer duration of any and exclusive breastfeeding compared with delivering in a non-accredited hospital, which is consistent with previous findings. In the pre-BFHI cohort, 78.8% of participants were still breastfeeding at 1 month, but by 6 months, only 32% were still breastfeeding. In comparison, in the post-BFHI cohort, breastfeeding rates improved to 92.0% at 1 month and 55.5% at 6 months. Similarly, the prevalence of exclusive breastfeeding in the post-BFHI cohort was consistently higher compared with that in the pre-BFHI cohort. Our results were consistent with that in the overall breastfeeding data in Hong Kong (Department of Health, 2019).

Despite the improvements in breastfeeding rates after the implementation of BFHI steps, the exclusive breastfeeding rate was still very low in both cohorts. Low prevalence of exclusive breastfeeding has previously been reported in other developed and developing countries (Duan et al., 2018; Theurich et al., 2019). Similarly, exclusive breastfeeding in developed countries remains low even after the accreditation of BFHs (Spaeth et al., 2018). A previous study conducted in New Zealand investigated the reason for low exclusive breastfeeding rate between 3 and 6 months. Participants reported they had to balance between work and

mother roles, loss of autonomy from long breastfeeding duration and cultural practices (Alianmoghaddam et al., 2018). Other researchers have found milk storage issues and fear of inadequate nutrition (Buttham et al., 2017; Shepherd et al., 2017). While the BFHI could facilitate early breastfeeding complications, there may be a role for government and future studies to address long-term breastfeeding support in communities and workplaces to sustain exclusive breastfeeding durations.

Limitations

In terms of limitations, both cohorts were not population-based, despite the large sample size. The study recruited mothers with an intention to breastfeed, which could introduce bias in the results as new mothers with more breastfeeding confidence might have been more likely to agree to participate. This may limit the generalizability of the findings. However, the data of the post-BFHI cohort were comparable with the population-based breastfeeding survey (Department of Health, 2019), which suggested that our results were representative. Second, we did not measure the breastfeeding attitudes of participants. The two cohorts in this study differed by a period of 5 years. As such, social attitudes toward breastfeeding may have changed over time. These attitudes' influence on breastfeeding duration compared with the influence of the BFHI is unknown and further investigation is needed. Level of compliance with Baby-Friendly practices also needed to be assessed as this was the most limiting aspect of the study. Also, as the focus of the study was on the breastfeeding duration and excluded women with no intention to breastfeed, we did not examine the full impact of the BFHI on the possible changes in the intention to breastfeed in women after giving birth due to supportive maternity practices. This warrants further investigation. Measuring only five steps when compliance was particularly low in one step would have influenced the analysis compared to measuring ten steps. While we still found a significantly longer duration of both any and exclusive breastfeeding in the post-BFHI cohort, the duration may have been longer based on a dose-response in the number of steps.

Further research into the effect of training or retraining hospital staff from the BFHI institutions on compliance with the BFHI and breastfeeding outcomes is needed. Further investigation into the barriers and factors affecting exclusive breastfeeding duration in developed countries is also necessary to increase the proportion of mothers achieving 6 months of exclusive breastfeeding.

Conclusion

Women who delivered in BFHs had higher any and exclusive breastfeeding rates and duration, as they, on average, had increased exposure to Baby-Friendly practices. After the implementation of BFHI steps, a huge improvement in time

to first breastfeeding was noted in participants who had cesarean deliveries, resulting in a higher rate of breastfeeding in this at-risk group. Furthermore, Step 6 (only human milk), Step 8 (breastfeeding on demand), and Step 9 (no artificial teats and pacifiers) were strong predictors of any and exclusive breastfeeding duration. Further investigation into the influence of all ten steps on breastfeeding outcomes will be needed when hospitals are fully designated as BFHs.

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Supplemental Material

Supplementary Material may be found in the “Supplemental material” tab in the online version of this article.

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