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Impact of baby-friendly hospital initiatives on breastfeeding outcomes: Systematic review and meta-analysis

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ABSTRACT

Background: The Baby-Friendly Hospital Initiative (BFHI) is a global effort promoting the Ten Steps to support breastfeeding in maternity-care facilities.
Aim: This study examined the effect of BFHI on breastfeeding outcomes, focusing on initiation rates, exclusive breastfeeding durations, and factors influencing its effectiveness.
Methods: A systematic review and meta-analysis were conducted by searching nine databases (1991 to February 2024). Included studies were experimental, quasi-experimental, or observational studies, with sites implementing the full BFHI or at least three steps. Two reviewers independently screened studies, assessed risk of bias, and extracted data. Random-effects models were used for pooled results, with subgroup analyses based on BFHI status and country income level.
Discussion: Eighty-six studies were included. Infants in BFHI hospitals were more likely to be exclusively breastfed at ≤ 3 months (OR= 1.77; 95 % CI: 1.37–2.29) and 3–6 months (OR= 1.82; 95 % CI: 1.26–2.61). Higher rates of any breastfeeding were observed at ≤ 3 months (OR= 1.48; 95 % CI: 1.17–1.87), 3–6 months (OR= 1.75; 95 % CI: 1.18–2.61) and at > 6 months (OR= 2.34; 95 % CI: 1.04–5.27).
Conclusions: BFHI implementation positively impacts breastfeeding outcomes, with both short- and long-term effects. Partial implementation also correlates with higher exclusive breastfeeding rates. Insignificant differences across income levels may reflect the limited number of studies in low-and middle- income countries. Further research with longer-term follow up is needed to confirm long-term effects.

Problem of Issue

- A lack of comprehensive and updated analysis on the impact of Baby-Friendly Hospital Initiative on breastfeeding outcome.

What is already known

- The Baby-Friendly Hospital Initiative is a global effort to promote, support, and protect breastfeeding by creating an optimal environment in healthcare facilities for mothers and newborns.
- Substantial evidence indicates that the Baby-Friendly Hospital Initiative has the potential to significantly influence breastfeeding success.

What this paper adds

- We found a positive association between the Baby-Friendly Hospital Initiative and breastfeeding outcomes across timespan.

Subgroup analyses showed that even a partial implementation of the Baby-Friendly Hospital Initiative steps, among a smaller sample size was associated with a higher exclusive breastfeeding rate.

1. Introduction

Extensive evidence supports the positive impact of breastfeeding on the health of infants and women. Breastfeeding provides optimal nutrition for infants, promoting healthy growth and development [1].

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For mothers, the benefits of breastfeeding include a reduction of the risk of breast and ovarian cancer, promoting postpartum weight loss, and emotional bonding with the infant [1]. The World Health Organization (WHO) recommends initiating breastfeeding within the first hour of birth, aligning with Step 4 of the Ten Steps to Successful Breastfeeding, which emphasizes skin-to-skin contact and early initiation [2]. The WHO also recommends exclusive breastfeeding for the first six months and continued breastfeeding alongside complementary foods for up to two years or beyond [3]. Additionally, the WHO emphasizes the importance of supporting breastfeeding practices and creating an enabling environment for breastfeeding mothers.

The Baby-Friendly Hospital Initiative (BFHI) is a global program launched by the WHO and the United Nations Children's Fund (UNICEF) to promote breastfeeding initiation, duration, and exclusivity [4]. This program certifies hospitals or maternity facilities if they meet the Ten Steps to Successful Breastfeeding. In 2018, WHO revised the Ten Steps (Supplementary material 1, Table 1), focusing on integrating the program more fully into the health-care system and facilitating universal coverage [2]. It is estimated that more than 20,000 hospitals or maternity institutions across 160 countries have been certified as Baby-Friendly [5]. The Baby-Friendly Hospital Initiative has been a global effort to improve breastfeeding outcomes [6].

Many studies have been conducted to review the literature about the Baby-Friendly Hospital Initiative. Most of these reviews have focused on the implementation of this program [7–9]. Fewer studies have evaluated the impacts of the Baby-Friendly Hospital Initiative on improving breastfeeding initiation, duration, or exclusivity. One article reviewed [10] the studies that had evaluated the effectiveness of the Baby-Friendly Hospital Initiative as an intervention to improve breastfeeding outcomes in the United States but failed to conclude the effectiveness due to weak design, settings outside the United States, and methodological limitations. Another review [11] also intended to evaluate the Baby-Friendly Hospital Initiative critically, and they suggested the evidence was non-conclusive regarding the Baby-Friendly Hospital Initiative as a successful program to increase initiation and long-term breastfeeding rates. Only one systematic review [12] analyzed the impact of the Baby-Friendly Hospital Initiative on breastfeeding outcomes. They found positive and dose-related effects on breastfeeding outcomes.

The BFHI is influenced by various factors known as influencing factors. These include the stage of BFHI implementation, the quality of training and education provided to healthcare staff, cultural and social factors, hospital policies and support systems, maternal characteristics, healthcare provider attitudes and practices, community support and resources, and health system factors [8,9]. These elements can impact the successful implementation and effectiveness of the BFHI in promoting and supporting breastfeeding. Understanding these influencing factors is important for tailoring interventions and strategies to improve breastfeeding outcomes [8,9].

Given the limited evidence and necessary update on the role of the Baby-Friendly Hospital Initiative on breastfeeding outcomes, this systematic review and meta-analysis review aimed to (1) examine the effect of the Baby-Friendly Hospital Initiative on breastfeeding outcomes, specifically focusing on initiation rates and exclusive breastfeeding durations. (2) identify influencing factors related to the Baby-Friendly Hospital Initiative that may moderate its effectiveness in promoting breastfeeding practices.

Table 1
Terms used for literature search.

Search terms:
1. baby friendly.mp.
2. ten step$.mp.
3. 1 AND 2
4. exp Breast Feeding/
5. baby friendly initiative.mp.
6. baby friendly hospital initiative.mp.
7. BFI.mp.
8. BFHI.mp.
9. 10 step$.mp.
10. breastfeeding policy.mp.
11. breastfeeding policies.mp.
12. breastfeeding support.mp.
13. breastfeeding outcome$.mp.
14. health system$.mp.
15. hospital$.mp. or Hospitals/
16. health program$.mp.
17. health service.mp. or Health Services/
18. 1 or 2 or 3 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 14 or 15 or 16 or 17
19. 4 or 13
20. 18 and 19

2. Method

This study was registered on PROSPERO (ID: CRD: 42021223825). The results were reported based on the principles of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [13].

2.1. Search strategy

We searched MEDLINE, MEDLINE In-Process, Cumulative Index to Nursing & Allied Health (CINAHL Plus), Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Database of Systematic Reviews (CDSR), Database of Abstracts of Reviews of Effects (DARE), EMBASE, Health Technology Assessment (HTA) database and PsycINFO The language was restricted to English and the date was limited from 1991 to February 2024. The search terms, including appropriate subject headings and wildcards of "Baby Friendly Hospital Initiative", "breastfeeding", "10 steps", "breastfeeding policies", "breastfeeding support", "breastfeeding outcomes", health programs" and "health services" were combined and can be found in Table 1. Information on studies in progress, unpublished research or research reported in the gray literature was sought by searching a range of resources: ClinicalTrials.gov, Conference Proceedings Citation Index: Science, Conference Proceedings Citation Index: Social Science, Health Services Research Projects in Progress (HSRProj), OAIster and the Trip database.

2.2. Eligibility criteria

The inclusion of this study was as follows: (1) Studies that report breastfeeding initiation rates for women giving birth in Baby-Friendly hospitals compared to those in non-Baby-Friendly hospitals. (2) Studies that report exclusive breastfeeding rates at or below 3 months and between 3 and 6 months for women in Baby-Friendly hospitals versus those in non-Baby-Friendly hospitals. (3) Studies that assess the impact of specific BFHI steps or community initiatives associated with breastfeeding outcomes. To clarify, the ten steps of the Baby-Friendly Hospital Initiative contained facility policies, staff competency, antenatal information, immediate postnatal care, supporting with breastfeeding, supplementation, rooming-in, responsive feeding, feeding bottles, teats and pacifiers, and care at discharge, which were updated and revised in 2018 [2]. The definitions of any and exclusive breastfeeding were based on the infant feeding categories proposed by the WHO. Any breastfeeding was defined as infants receiving breastmilk (direct from the breast or expressed) [14]. Exclusive breastfeeding means infants only received breastmilk or expressed breastmilk and no other liquids or solids except vitamins, mineral supplements and medicines [14].

The excluded criteria for this study encompassed studies with an ecological design, studies involving preterm/sick infants, studies including HIV-positive women, studies including women who delivered at home, and studies involving women and infants with breastfeeding contraindications.

2.3. Studies selection, data collection, and risk of bias assessment

Two researchers (** and **) independently identified and imported records into EndNote X8. After the removal of duplicates, titles and abstracts were screened by these two researchers. A full text review was conducted on the remaining articles. Dissents were resolved by a third researcher (**). A study form was designed to collect information including study design, sample, setting, outcomes, and results. Risk of bias of the included studies were assessed using a quality assessment tool for observational cohort and cross-sectional studies in terms of 14 items [15]. Each of the 14 items can be responded with yes, no, cannot determine, not applicable or not reported. Studies were considered as low risk of bias if they were rated yes to items 7–11 and item 14 or they provided sufficient answers to more than 10 of the 14 items [16]. The quality of the included studies was assessed using the NIH Study Quality Assessment Tool, which evaluates multiple criteria such as study design, risk of bias, and reporting. Each criterion was assessed individually, and investigators assigned an overall quality rating based on cumulative evaluation of these criteria. Studies were classified as follows: good (studies that met most criteria with minimal risk of bias), fair (studies that met some criteria but had moderate risk of bias or limitations), poor (studies that met few criteria or had significant risk of bias and limitations). This overall rating approach aligns with the NIH guidelines, which emphasize a holistic evaluation rather than a rigid scoring system [15].

2.4. Data synthesis

We performed statistical analyses using Stata 17.0. The breastfeeding rates, including rate of breastfeeding initiation, any breastfeeding and exclusive breastfeeding, were reported as odds ratios (ORs) with confidence interval (CI). The risks of weaning, including the discontinuation of any and exclusive breastfeeding, were presented as hazards ratios (HRs) with confidence intervals (CIs). Additionally, data related to any and exclusive breastfeeding rates were analyzed for three postpartum timeframes: ≤ 3 months (short term), 3–6 months (medium term), and > 6 months (long term). The heterogeneity among the included studies was assessed using I^2 statistics, with I^2 value categorized as low (0–30 %), moderate (30–60 %) or substantial (60–100 %). A significant Q value ($p < 0.10$) indicated heterogeneity [17]. We employed the random-effects model to account for potential variations in intervention effects across studies [17]. Subgroup analyses were conducted based on the status of the Baby-Friendly Hospital Initiative (full implementation, in the process of implementation, and received the Baby-Friendly Hospital Initiative training), country income evaluation (low- and middle-income countries (LMICs) and high-income countries (HICs), and sample size (≤ 1000 and > 1000) when the pooled results of the outcomes were statistically significant.

3. Results

A total of 20,268 records were initially identified through a databases search. After removing duplicates, the titles and abstracts of 17,578 records were screened to ensure a thorough examination of relevant studies. Following this, 153 articles were assessed in full text for eligibility. Finally, 86 [18–103] papers were included in the systematic review and meta-analysis, as shown in Fig. 1. This extensive screening process was designed to capture a wide range of studies related to the Baby-Friendly Hospital Initiative, minimizing the risk of overlooking important research.

3.1. Characteristics of included studies

The 86 eligible studies were conducted in 43 countries and were published between 1993 and 2022, involving 1,544,240 participants. Various study designs were included, encompassing 37 cross-sectional surveys, 27 prospective cohort studies, 8 retrospective cohort studies, 1 ambispective cohort study, 3 randomized controlled trial, 8 quasi-experiments, and 2 case-control studies. Further details are available in supplementary material 1, Table 2.

3.2. Risk of bias assessment

The results of the quality assessment are provided in Supplementary Material 2. As described in Section 2.2, each study was evaluated using the NIH Study Quality Assessment Tool, and an overall rating of good, fair, or poor was assigned based on cumulative evaluation of the criteria. Of the total studies, seven (8 %) were classified as poor, 50 (58 %) as fair, and 29 (34 %) as good.

3.3. Overall effects of baby-friendly hospital initiative on breastfeeding outcomes

3.3.1. Breastfeeding initiation rates

A total of seven studies [20,23,36,60,80,94,99] reported on breastfeeding initiation rates, focusing on women who gave birth at Baby-Friendly hospitals. The findings indicate these women had higher rates of breastfeeding initiation compared to those in non-certified hospitals (OR= 1.27; 95 % CI: 1.12–1.44) (Fig. 2). This supports the effectiveness of the BFHI in promoting early breastfeeding practices.

3.3.2. Exclusive breastfeeding rates

No studies reported the association between exclusive breastfeeding rates beyond 6 months and BFHI status. The pooled results of seventeen studies [21,30,32,34,37,38,47,52,56,60,68,70,74,76,87] indicated a higher exclusive breastfeeding rate at or below 3 months among women who delivered after the implementation of the BFHI (OR= 1.77; 95 % CI: 1.37–2.29) (Fig. 3a). Similarly, infants born in Baby-Friendly hospitals were more likely to be exclusively breastfed for 3–6 months (OR= 1.82; 95 % CI: 1.26–2.61), based on pooled data from eighteen studies [21,27,32,37,38,47,52,56,60,65,70,72,74–76,103] (Fig. 3b).

Additionally, the pooled hazard ratios of six studies [19,27,34,62,75,98] showed that women exposed to the Baby-Friendly Hospital Initiative were significantly less likely to discontinue exclusive breastfeeding (HR=0.78, 95 % CI: 0.68–0.90).

3.3.3. Any breastfeeding rates

Any breastfeeding rate was assessed in eighteen studies [21,24,29,30,32–34,36,38,50,52,60,68,70,74,76,87] at ≤ 3 months postpartum, sixteen studies [21,24,27,29,32,37,38,50,52,60,70,74–76,103] at 3–6 months, and seven studies [24,29,38,50,52,72,76] at > 6 months. The analysis revealed significant higher rates of any breastfeeding at ≤ 3 months postpartum (OR=1.48; 95 % CI: 1.17–1.87) (Fig. 4a), between 3 and 6 months (OR= 1.75; 95 % CI: 1.18–2.61) (Fig. 4b) and at > 6 months postpartum (OR= 2.34; 95 % CI: 1.04–5.27) (Fig. 4c) among participants who delivered at BFHI hospitals compared to non-Baby-Friendly hospitals.

Additionally, the risk of cessation of any breastfeeding was significantly lower in women exposed to the Baby-Friendly Hospital Initiative (HR= 0.69, 95 %, CI: 0.60–0.80), as reported in three studies [27,34,75].

3.4. Subgroup analysis

Subgroup analyses were conducted based on the status of the BFHI, country income level, and sample size. No significant subgroup differences were observed for any breastfeeding rate at 3–6 months postpartum. However, certain subgroup differences emerged concerning exclusive breastfeeding based on specific pre-defined factors.

The subgroup analyses indicated that both any and exclusive breastfeeding rates at ≤ 3 months varied by BFHI status. Compared to hospitals with incomplete BFHI implementation (Any breastfeeding rate: OR= 1.01, 95 % CI: 0.96–1.07; Exclusive breastfeeding rate:

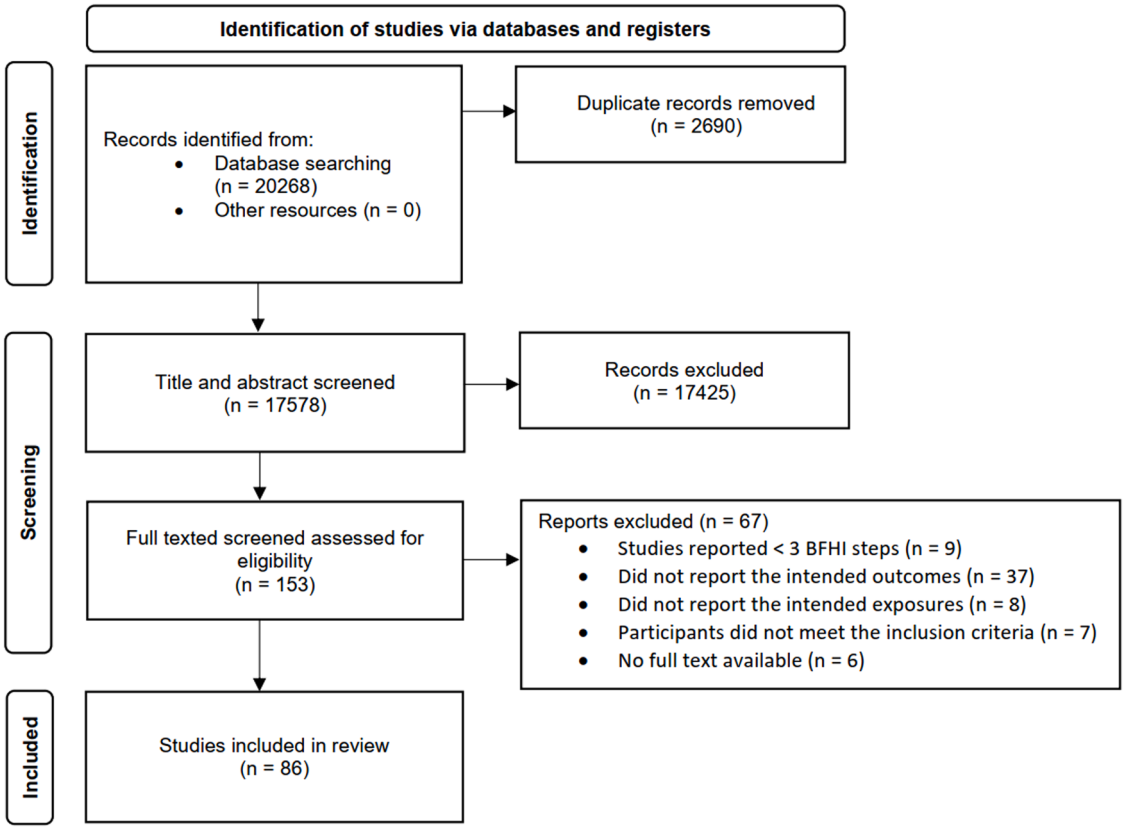

Fig. 1. PRISMA flowchart.

Table 2
Subgroup analysis of BFHI on exclusive breastfeeding rates and any breastfeeding rates.

Variables	Exclusive breastfeeding rates						Any breastfeeding rates					
	At < 3 months postpartum			At 3–6 months postpartum			At < 3 months postpartum			At 3–6 months postpartum		
	K	OR (95 %CI)	*P*	K	OR (95 %CI)	*P*	K	OR (95 %CI)	*P*	K	OR (95 %CI)	*P*
Status of BFHI			**0.0103**			0.060			**< 0.001**			0.086
BFHI	12	1.59(1.17, 2.18)*		13	1.49(1.00, 2.21)		14	1.53 (1.15, 2.03)*		12	1.79(1.10, 2.92)	
In the process of BFHI	4	1.44(1.19, 1.73)*		3	1.36(0.40, 4.64)		5	1.01(0.96, 1.07)		2	1.13(0.90, 1.41)	
Received BFHI training	5	2.27(1.56, 3.32)*		5	3.21(1.91, 5.39)*		4	1.35(1.15, 1.59)*		4	1.67(1.15, 2.41)*	
Income level			0.225			0.863			0.363			0.590
HICs	10	1.51(1.25, 1.82)*		10	2.01(1.13, 3.59)*		14	1.46(1.11, 1.94)*		11	1.89(1.10, 3.24)*	
LMICs	7	2.25(1.17, 4.34)*		8	1.16(1.02, 1.32)*		4	1.54 (1.14, 2.09)		5	1.52 (1.33, 1.74)	
Sample size			0.355			**0.022**			0.148			0.834
≤ 1000	8	1.96(1.43, 2.67)*		10	2.40(1.44, 4.02)*		6	1.72(1.16, 2.56)*		8	1.69(1.17, 2.44)*	
> 1000	9	1.66(1.17, 2.37)*		8	1.39(0.85, 2.29)		12	1.38 (1.03, 1.85)		8	1.84(0.99, 3.42)	

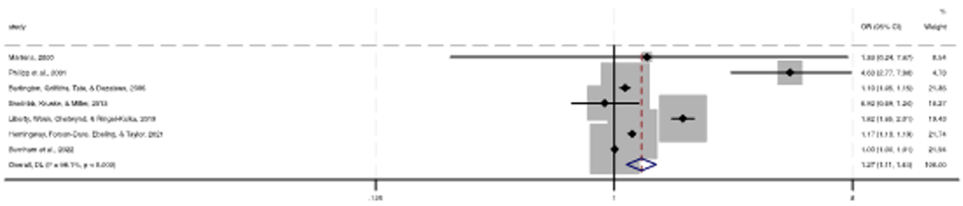

Fig. 2. Overall effects of the baby-friendly hospital initiative on breastfeeding initiation.

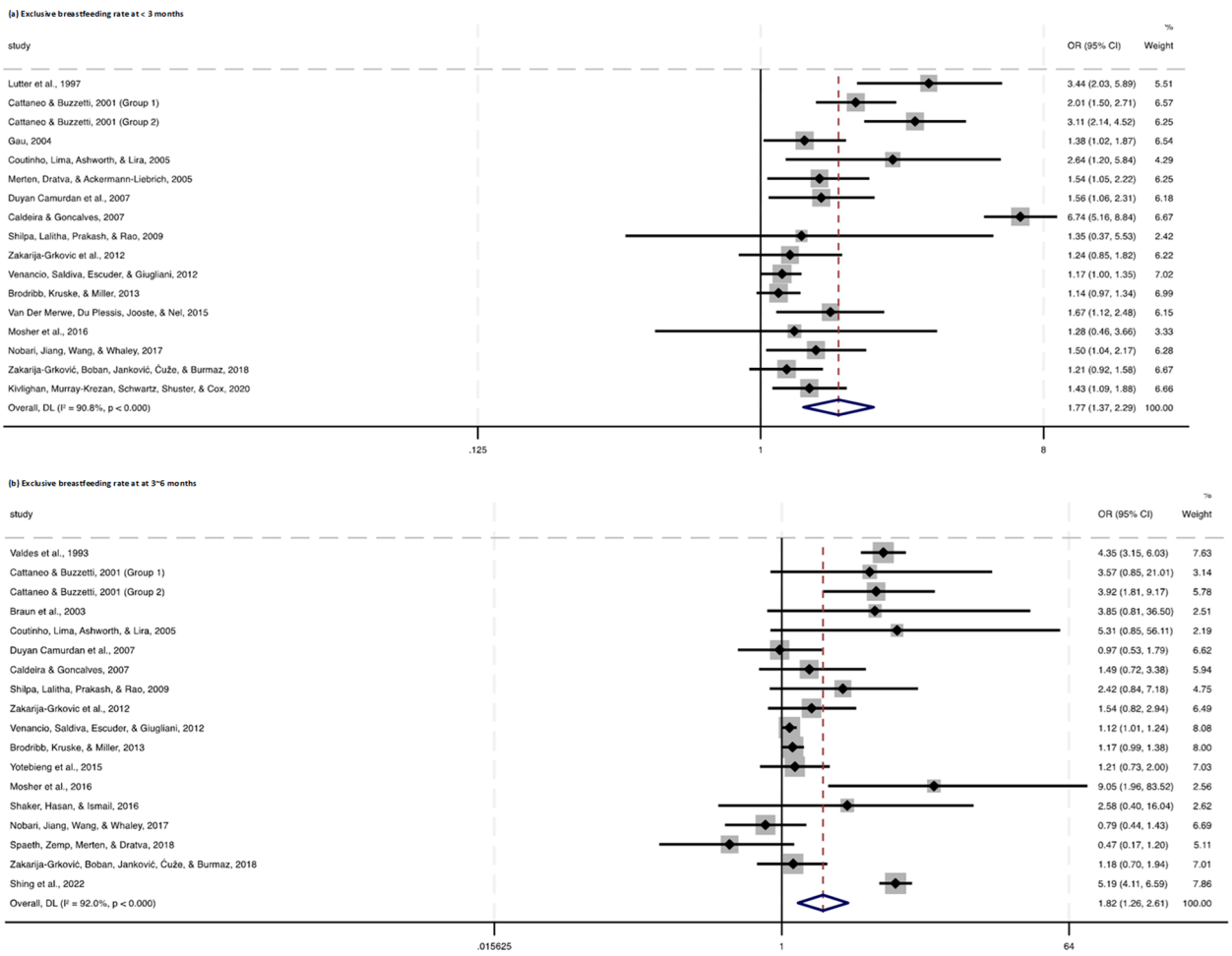

Fig. 3. Overall effects of the Baby-Friendly Hospital Initiative on (A) exclusive breastfeeding rate at < 3 months (B) exclusive breastfeeding at 3–6 months.

OR= 1.44, 85 % CI: 1.19–1.73), those with complete implementation (Any breastfeeding rate: OR= 1.53, 95 % CI: 1.15–2.03; Exclusive breastfeeding rate: OR= 1.59, 95 % CI: 1.17–2.18) and those that received BFHI training (Any breastfeeding rate: OR= 1.35, 95 % CI: 1.15–1.59; Exclusive breastfeeding rate: OR= 2.27, 95 % CI:1.56–3.32) demonstrated higher breastfeeding rates at ≤ 3 months.

Additionally, studies with a sample size of fewer than 1000 participants reported a higher exclusive breastfeeding rate at 3–6 months postpartum (OR= 2.40; 95 % CI: 1.44–4.02) compared to those with a sample size larger than 1000 (OR= 1.39; 95 % CI: 0.85–2.29) (Table 2). No significant subgroup differences were found between studies conducted in low- and middle-income countries (LMICs) and high-income countries (HICs) in terms of settings (Table 2).

4. Discussion

To our best of knowledge, this systematic review and meta-analysis offers new insights into the impact of the Baby-Friendly Hospital Initiative on breastfeeding outcomes by exploring specific aspects of BFHI implementation and its effects on breastfeeding outcomes that have not been extensively covered in previous meta-analyses, such as variations in regional implementation, community support factors, and long-term breastfeeding outcomes [104–106].

Overall, we found a positive association between the implementation of the BFHI and breastfeeding outcomes, both short-term and long-term. Subgroup analyses showed that even partial implementation of BFHI steps among smaller sample sizes was associated with higher exclusive breastfeeding rates.

4.1. Effects of baby-friendly hospital initiative on breastfeeding outcomes

Women delivering in baby-friendly hospitals exhibited higher breastfeeding initiation rates compared to those in non-certified hospitals. While we cannot provide a direct effect size for this comparison, previous reviews have demonstrated a positive association between the Baby-Friendly Hospital Initiative and breastfeeding initiation [10,12]. We recognize the essential role of early breastfeeding Initiation in supporting breastfeeding duration and exclusivity. However, it is important to consider the perspective highlighted by Howe-Heyman [10], who raises the possibility of confounding factors when measuring increases in breastfeeding initiation rates as an outcome of the Baby-Friendly Hospital Initiative. Improved initial rates are one of the criteria for achieving baby-friendly hospitals accreditation [107]. Additionally, since breastfeeding initiation is an integral component of the Baby-Friendly Hospital Initiative itself, it may not be suitable to be a standalone outcome measure [10]. We anticipate further discussion regarding the appropriateness of this indicator and its relevance to the overall effectiveness of the Baby-Friendly Hospital Initiative program.

Furthermore, our study identified positive effects of the Baby-Friendly Hospital Initiative on exclusive breastfeeding rates for time periods up to 6 months. While previous reviews have reported improvements in breastfeeding exclusivity, the duration of these effects remains inconclusive, primarily due to the low methodological quality and limited confidence in previous literatures [108]. Our study addresses this research gap by providing valuable evidence regarding the observed improvements in exclusive breastfeeding practices.

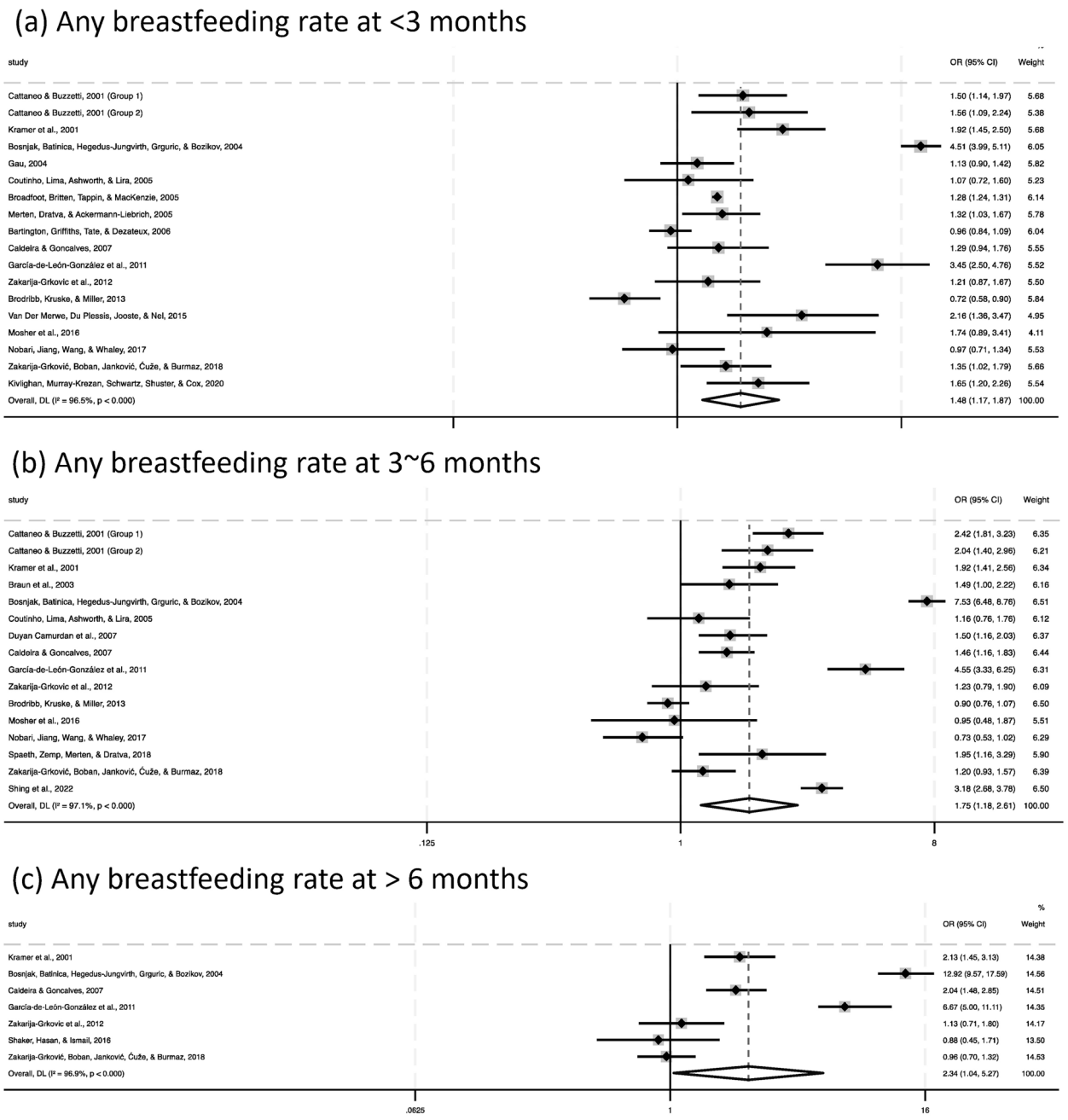

Fig. 4. Overall effects of the baby-friendly hospital initiative on (A) any breastfeeding rate at 3 months (B) any breastfeeding rate at 3–6 months and (C) any breastfeeding rate at > 6 months.

The duration of improvements in any breastfeeding rates was also not clearly defined. This study confirms that the BFHI led to improvement in any breastfeeding rates at ≤ 6 months. Furthermore, the BFHI demonstrated a longer-term effect on any breastfeeding rates in this study. This finding supplemented previous systematic reviews that reported inconclusive results regarding the sustained effects of the Baby-Friendly Hospital Initiative [12,107]. The results of this study emphasize the importance of rigorously implementing Step 10 for the long-term maintenance of breastfeeding improvements [12]. Step 10 focuses on providing ongoing breastfeeding support and care at the community level. Without consistent follow-up and reinforcement beyond the hospital setting, the short-term gains of the BFHI may diminish over time. Notably, the 10th step of the Baby-Friendly Hospital Initiative has emerged as one of the most challenging steps to implement [109]. Current implementation of Step 10 varies across settings; while some hospitals have well-established systems in place, others may encounter difficulties in ensuring timely access to ongoing support for parents after discharge. Numerous challenges have been documented, including insufficient staff available to work outside their own facilities [2] and disagreements or lack of collaboration among healthcare professionals [8]. Despite these barriers, significant efforts have been made to establish connections between healthcare service providers at the facility level and the community, aiming to leverage the considerable potential to promote the long-term sustainability of optimal breastfeeding practices [110].

4.2. *Influencing factors of baby-friendly hospital initiative*

Several studies have examined the effect of years of accredited BFHI status on compliance with the initiative's steps. Some studies suggest

that hospitals with longer durations of BFHI accreditation tend to have higher compliance with the initiative. These hospitals are more likely to integrate the recommended practices into their routines and establish systems to support breastfeeding women [12,88,103]. However, other studies have found that compliance with specific steps may decline over time, indicating a need for on-going support, monitoring and reinforcement to ensure sustained adherence to BFHI practices [12,103]. Therefore, even the process of obtaining accreditation can effectively improve breastfeeding outcomes.

According to the subgroup analyses, the effects of the Baby-Friendly Hospital Initiative on exclusive and any breastfeeding rates at ≤ 3 months differed among various implementation statuses. Although we did not find a clear direct trend among the effect sizes of different stages, the findings confirmed that breastfeeding outcomes can improve even when the Baby-Friendly Hospital Initiative is implemented partially. It was surprising that facilities not certified but trained showed even higher exclusive breastfeeding rates at ≤ 3 months than those in hospitals with full or partial BFHI implementation. We acknowledge the positive effects of BFHI training, as it led to greater adherence to some steps. However, the results of this subgroup comparison should be interpreted with caution due to the uneven distribution of the number of trials contributing to each subgroup [111].

Regarding country income level, our study found that the effects of the Baby-Friendly Hospital Initiative on breastfeeding outcomes did not differ significantly between low- and middle-income countries and high-income countries. In an overview of systematic reviews, a subgroup analysis based on income level was originally intended; however, definitive conclusions regarding comparison between low- and middle-income countries and high-income countries [108] could not be established due to the limited availability of studies specifically reporting the impact of the Baby-Friendly Hospital Initiative accreditation in low- and middle-income countries or including studies solely conducted within these countries.

The primary objective of the BFHI is to promote breastfeeding and improve health outcomes for both mothers and infants. However, the magnitude of health benefits derived from breastfeeding may vary depending on a country's income level [112]. In this context, it becomes crucial to gather evidence to assess whether the initiative's aims are being achieved globally. Our study provides valuable evidence in evaluating the effectiveness of the BFHI on a global scale.

4.3. Strengths and limitations

To the best of our knowledge, this systematic review and meta-analysis comprehensively examined the effects of the Baby-Friendly Hospital Initiative on breastfeeding outcomes. Eighty-six studies from 43 countries were included, and the evidence from a wider range of sources has strengthened external validity compared to previous analyses. However, we acknowledge concerns about threats to internal validity due to the inclusion of studies without parallel groups, such as cross-sectional surveys and cohort studies, which did not control for other confounding factors. Furthermore, there was substantial heterogeneity in the pooled results of breastfeeding outcomes. Although the implementation stage was identified as one source of heterogeneity through subgroup analyses, other significant variables, such as marital status, which may be crucial for breastfeeding behavior but are difficult to cluster, were overlooked. Lastly, some findings from the subgroup analysis were unexpected. It is important to recognize that comparison results from subgroups with unevenly distributed numbers of trials and participants may not accurately reflect the actual situation of the BFHI implementation.

4.4. Implications for clinical practice and research

In general, the BFHI has demonstrated significant impacts on breastfeeding initiation rates, exclusive breastfeeding rates, and overall breastfeeding rates. To ensure the long-term positive effects of the BFHI, it is crucial for maternity and newborn service providers to establish strong connections between healthcare facilities and communities. This can be achieved through the implementation of a well-coordinated discharge plan, guaranteeing ongoing support and appropriate care for parents and their infants. Various community resources can be utilized for this purpose, including primary health care centers, community health workers, home visitors, breastfeeding clinics, nurses and midwives, lactation consultants, peer counselors, peer support groups, and telephone helplines. Furthermore, our review suggests a need for future studies to explore the appropriateness of breastfeeding initiation rates as an outcome measure for assessing the effectiveness of the BFHI. Lastly, to ascertain the BFHI's effectiveness as an intervention aimed at enhancing breastfeeding rates, future research should incorporate experimental studies with extended follow-up periods.

Importantly, the BFHI not only promotes immediate breastfeeding outcomes, such as initiation and exclusivity in the early months, but also has the potential for long term benefits, including sustained breastfeeding practices and improved maternal and infant health outcomes [113]. However, there is currently a lack of comprehensive evidence validating the potential broader long-term impacts of BFHI (implemented either in hospitals and community) on maternal and infant health outcomes [104,107]. Further research is needed to establish the sustained effectiveness of BFHI in improving these outcomes [107].

5. Conclusions

The data from this systematic review and meta-analysis suggest a positive association between the BFHI and breastfeeding outcomes with short-term to long-term improvements. Notably, community support is crucial to ensure parents and infants receive continued assistance for breastfeeding, thereby promoting the long-term sustainability of improvements achieved through the BFHI. Given the current evidence regarding the long-term health effects of the BFHI on mothers and infants, experimental studies with extended follow-up periods would be beneficial in further establishing the effectiveness of the BFHI as an intervention for improving breastfeeding rates. Moreover, subgroup analysis revealed that even partial implementation of BFHI steps is associated with higher breastfeeding rates. However, the insignificant differences in breastfeeding outcomes across countries with different income levels were likely due to the limited number of studies conducted in low- and middle- income countries, highlighting the need for more BFHI research in these settings.

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None declare.

Author agreement

We confirm that this work is original and has not been published previously or submitted elsewhere. All authors have contributed, seen and approved to the submitted work. All authors declare to abide by the copyright terms and conditions of Elsevier and the Australian College of Midwives

Ethical statement

This study was registered on PROSPERO (ID: CRD 42021223825).

CRediT authorship contribution statement

Yingwei Fan: writing- original draft, review & editing. **Heidi Sze Lok Fan:** Conceptualization, design, search strategy development, database searching, study selection, quality assessment, data extraction, data analysis. **Jeffery Sheung Yu Shing:** Database searching, study

selection, quality assessment, data extraction. **Hoi Lam Ip:** Writing-review & editing, supervision. **Daniel Yee Tak Fong:** Writing-review & editing. **Kris Yuet Wan Lok:** Conceptualization, design, search strategy development, quality assessment, data analysis, writing-review & editing, supervision.

Declaration of Competing Interest

The listed authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

None declare.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.wombi.2025.101881.

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