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REVIEW ARTICLE

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Improving exclusive breastfeeding in low and middle-income countries: A systematic review

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Abstract

Exclusive breastfeeding (EBF) rates until 6 months in most low and middle income countries (LMICs) are well below the 90% World Health Organization benchmark. This systematic review sought to provide evidence on effectiveness of various interventions on EBF until 6 months in LMICs, compared with standard care. Experimental and observational studies with concurrent comparator promoting EBF, conducted in LMICs with high country rates of breastfeeding initiation, were included. Studies were identified from a systematic review and PUBMED, Cochrane, and CABI databases. Study selection, data abstraction, and quality assessment were carried out independently and in duplicate. Relative risks (RRs) with 95% confidence intervals (CIs) were calculated for individual studies and pooled. High heterogeneity was explored through prespecified subgroup analyses for the primary outcome (EBF until 6 months) by context and by intervention for the randomized controlled trials. Prediction intervals were calculated for each effect estimate. Sixty-seven studies with 79 comparisons from 30 LMICs were included. At 6 months, intervention group infants were more likely to be exclusively breastfed than controls (RR = 2.19, 95% CI [1.73, 2.77]; I^2 78.4%; 25 randomized controlled trials). Larger effects were obtained from interventions delivered by a combination of professional and laypersons (RR 3.90, 95% CI [1.25, 12.21]; I^2 46.7%), in interventions spanning antenatal and post-natal periods (RR 2.40, 95% CI [1.70, 3.38]; I^2 83.6%), and when intensity was between four to eight contacts/sessions (RR 3.20, 95% CI [2.30, 4.45]; I^2 53.8%). Almost every intervention conducted in LMICs increased EBF rates; choice of intervention should therefore be driven by feasibility of delivery in the local context to reduce infant mortality.

KEYWORDS

breastfeeding, developing countries, exclusive breastfeeding, intervention effectiveness, meta-analysis, systematic review

1 | INTRODUCTION

Infant nutrition plays a major role in child health and impacts significantly on survival. In low and middle income countries (LMICs), infants not breastfed are six to 10 times more likely to die in the early months than those breastfed (World Health Organization [WHO], 2009). The World Health Organization (WHO) and United Nations Children's Emergency Fund recommend that infants should be exclusively breastfed until 6 months of age, with breastfeeding continuing to be an important part of nutrition until at least 2 years

(WHO, 2001; WHO, 2009). The benefits of exclusive breastfeeding (EBF) until 6 months are well documented, improving growth, health, and survival (Rollins et al., 2016; Sankar et al., 2015; Victora et al., 2016). A Lancet review of systematic reviews to describe breastfeeding rates internationally and benefits of breastfeeding concluded that protection, promotion, and support of breastfeeding is crucial to achieving several Sustainable Development Goals (Victora et al., 2016). If EBF rates were to attain near universal coverage 13.8% of all child deaths below 2 years in LMICs, corresponding to over 800,000 child deaths annually, could be averted (Victora et al., 2016).

Despite this, EBF rates are far below optimal; 37% of infants under 6 months in LMICs were exclusively breastfed in recent country surveys (Victora et al., 2016), well below the WHO 90% benchmark (United Nations Children's Fund [UNICEF] 2013). Despite evidence that early initiation of breastfeeding significantly reduces neonatal mortality, even in countries with high initiation rates, there is often a delay in initiating breastfeeding, with less than half (42%) of newborns globally breastfed within 1 hr (UNICEF, 2013).

Breastfeeding patterns differ markedly between LMICs and high income countries (HICs). Late breastfeeding initiation and low EBF rates characterize the patterns in most LMICs; in HICs, there is the added problem of short duration of any breastfeeding (McFadden et al., 2017; Victora et al., 2016). Previous systematic reviews of breastfeeding interventions have included HICs and LMICs studies combined (Haroon, Das, Salam, Imdad, & Bhutta, 2013; Jolly et al., 2012; McFadden et al., 2017; Renfrew, McCormick, Wade, Quinn, & Dowswell, 2012; Sinha et al., 2015); however, because culture, maternal education, maternity services, and feeding patterns differ considerably between HICs and LMICs, and much more than between LMICs, it is important that systematic reviews focused solely on LMICs are conducted to provide adequate evidence of what works there. A recent review by Sinha et al. investigated effectiveness of types of interventions in LMICs for EBF aged 1–5 months combined (Sinha et al., 2017) but did not ascertain interventions that would be effective in improving EBF up until the recommended 6 months of age for all. A review to determine which interventions work most effectively to improve EBF until 6 months is therefore critical to provide robust evidence for scaling-up breastfeeding intervention programmes in LMICs, thereby reducing mortality and accelerating progress towards the Sustainable Development Goals by 2030 (UNICEF and WHO, 2015). The main aim of this study therefore was to determine the effect of various interventions on breastfeeding exclusivity until 6 months in LMICs with high breastfeeding initiation rates.

Key messages

- In LMICs, delivery of any intervention to support breastfeeding (insufficient evidence for telephone support) will improve EBF rates, by approximately two-fold.
- Policy makers in LMICs should identify and implement interventions that best suit their resources, cultural context, and health service delivery system.
- More research is needed to determine how EBF rates are affected by telephone-based interventions, interventions targeting significant others (father, mother-in-law), and interventions conducted solely in the community, work place or policy contexts.

2 | METHODS

2.1 | Protocol and registration

The protocol for this systematic review is registered in PROSPERO International prospective register of systematic reviews, University of York: CRD42016037029.

2.2 | Eligibility criteria

This review included experimental and observational studies with concurrent comparator promoting EBF, conducted in LMICs (defined by World Bank's classification of countries by income [Fantom, 2016] at the time of primary study) with high country breastfeeding initiation rates (≥80% initiation; McFadden et al., 2017); almost all LMICs have high initiation rates. The interventions were delivered to mothers in the antenatal and/or post-natal period, in one or more contexts identified in previous conceptual frameworks as follows: health systems and services, home and family, community, workplace/employment, and policy environment (Rollins et al., 2016; Sinha et al., 2015). The comparator group comprised usual care.

2.2.1 | Exclusion criteria

Studies with interventions targeted primarily at sick mothers or babies or with special/medical needs, such as prematurity, low birth weight, or tuberculosis, were excluded.

2.3 | Outcomes

The primary outcome was the rate of EBF up until 6 months as defined by study authors. Secondary outcomes were EBF feeding rates at 0 to 1, 2 to 3, and 4 to 5 months of age; EBF rates of infants 0–5 months; early initiation of breastfeeding (proportion of infants put to breast within 1 hr of birth), and continued breastfeeding at 1 year (WHO, 2008). EBF rates were measured using 24-hr, 7-day, previous month, or since birth recalls; in some studies, assessment mode was not specified. The outcome measuring EBF of infants 0–5 months was derived from WHO Core Indicators for assessing infant and young child feeding practices (WHO, 2008) and included any study that assessed EBF among a group of infants between 0 and 5 months

of age; however, two estimates that measured EBF among infants 0–6 months were also included because they measured a cross section of children in the specified age range. Studies that reported EBF at several time points contributed data to each relevant meta-analysis.

2.4 | Information sources

Studies were identified from an earlier systematic review of breastfeeding interventions by Sinha et al. (2015). A systematic literature search was then carried out in PUBMED, Cochrane, and CABI databases for January 2014–November 2016, to identify studies published after the Sinha (2015) review was conducted. We searched references of included studies and contacted authors to obtain additional published and unpublished articles and if full text, translations, and/or additional data were needed. Grey literature was sought from Conference Proceedings Citation Index and Science Citation Index. No language restrictions were applied to the updated searches.

2.5 | Search strategy

The search was conducted using index terms and text words in various combinations relating to interventions to improve breastfeeding exclusivity in LMICs (electronic search strategy details in Appendix A). The search did not include individual LMIC country names as countries move between income groups, and we categorized the country according to its status when the study was undertaken.

2.6 | Study selection

Each paper from the Sinha review was screened for country; those in LMICs went on to full text review. After removal of duplicates, titles and abstracts identified from database searches were screened for eligibility; full texts of potentially eligible articles were then assessed for inclusion. Eligibility and inclusion were undertaken independently by two review authors (T. F. O. and A. A. R.), with a third reviewer resolving any disagreements (K. J. or C. M.).

2.7 | Data extraction

Data extraction was conducted using a proforma modified from Cochrane data abstraction form and entered into a database. Extracted information included study details, population characteristics, context, setting, methods, and results. Details of interventions are presented in relation to their context, setting and nature, duration and intensity, and timing in relation to the birth.

2.8 | Risk of bias in individual studies

Two authors independently assessed risk of bias using Cochrane tools for randomized controlled trials (RCTs), and nonrandomized studies of interventions (ACROBAT-NRSI; Higgins, Altman, & Sterne, 2011). Studies were judged as having a high risk of bias among RCTs if one or more domains were of high risk.

2.9 | Summary measures

Relative risks (RRs) for EBF with 95% confidence intervals (CIs) were used as summary measures; in studies that did not report RR, it was calculated from raw data where available. We explored clinical heterogeneity (by qualitatively comparing characteristics among included studies) and statistical heterogeneity (using χ^2 tests and I^2 statistic). We combined results from included studies for each outcome to give an overall estimate of treatment effect using random effects models throughout, on the assumption that included studies covered a range of populations, interventions, and contexts (Riley, Higgins, & Deeks, 2011). Where two or more interventions from the same study contributed to the same meta-analysis, the sample size in the control group was divided by the number of comparisons it contributed to within the meta-analysis. For meta-analyses containing 10 or more studies, potential publication bias was investigated by examining asymmetry on a funnel plot.

For cluster trials, we computed the design effect from data presented in the reports (intra-class correlation coefficients [ICC] and cluster adjusted estimates) and adapted the standard errors of the RR to make appropriate allowance for clustering (Higgins, Deeks, & Altman, 2011). Authors of some cluster trials were contacted to request to obtain their ICC; an average ICC (of included cluster trials that provided the ICC in their article) was computed and used for those cluster trials for which the adjusted RR or ICCs were not available (Higgins et al., 2011).

Prediction intervals (PIs) were calculated for effect estimates where there were at least three studies, to describe the range in which 95% of the distribution of the effects lie. These predict how the effectiveness of the intervention could vary from the average in different circumstances; for example, different contexts and populations (IntHout, Ioannidis, Rovers, & Goeman, 2016; Riley et al., 2011).

2.10 | Evidence synthesis

Included articles have been synthesized and reported narratively and in tables following PRISMA guidelines. Meta-analysis using Stata version 14.2 was conducted for randomized studies only for the a priori main analyses and then for all study types as secondary analysis. High heterogeneity was explored through prespecified subgroup analyses for the primary outcome by intervention characteristics—context, mode of delivery, type of intervention, timing, intensity, provider of the intervention, and target of intervention; this was done for RCTs as this review focuses on high quality studies that are likely to give more precise results. We have also undertaken subgroup analyses for all study types combined to enable comparison with other published systematic reviews. Meta-regression was conducted to calculate *P* values for differences observed in subgroup analysis. Sensitivity analysis was also conducted for the primary outcome by study size and bias judgement.

2.11 | Ethical approval

Ethical approval was not required for this systematic review.

3 | RESULTS

3.1 | Study selection

The search identified 7,698 titles; after removal of duplicates, 6,947 underwent title/abstract screening, 183 full text articles were assessed for eligibility, and 67 studies were eligible for inclusion, comprising 79 comparisons between intervention and control (Figure 1). The meta-analysis includes 64 studies with 76 comparisons. No study was excluded for having a breastfeeding initiation rate below 80%. References of included studies are in Appendix B.

3.2 | Study characteristics

3.2.1 | Study design

This review includes 44 RCTs (of which 23 were cluster-RCTs), seven quasi-experimental studies, 12 nonrandomized intervention studies, and four observational studies (Appendix C). Table 1 summarizes characteristics of included randomized trials; characteristics of non-RCTs are contained in Appendix D.

3.2.2 | Location, setting, and participants

Studies were undertaken in 30 LMICs (Table 1). Of studies reporting setting, 10 were in rural settings, 27 in urban areas, four in peri-urban/suburban settings, and one in a combination of settings.

Interventions were directed primarily at mothers and/or pregnant women in 61 intervention arms, mother plus a significant family member in four arms, and health workers in 10 arms. Four study arms provided their intervention to married women in the community.

3.2.3 | Characteristics of usual care

Usual care varies both within and between countries and geographical regions. For example, usual care consisted of in-hospital care and follow up by a community nurse after discharge in Wuhan, China (Study 69); breastfeeding health talk at immunization clinic, health education leaflets during antenatal or post-natal visits, and advice from health care workers under the framework of BFHI in Malaysia

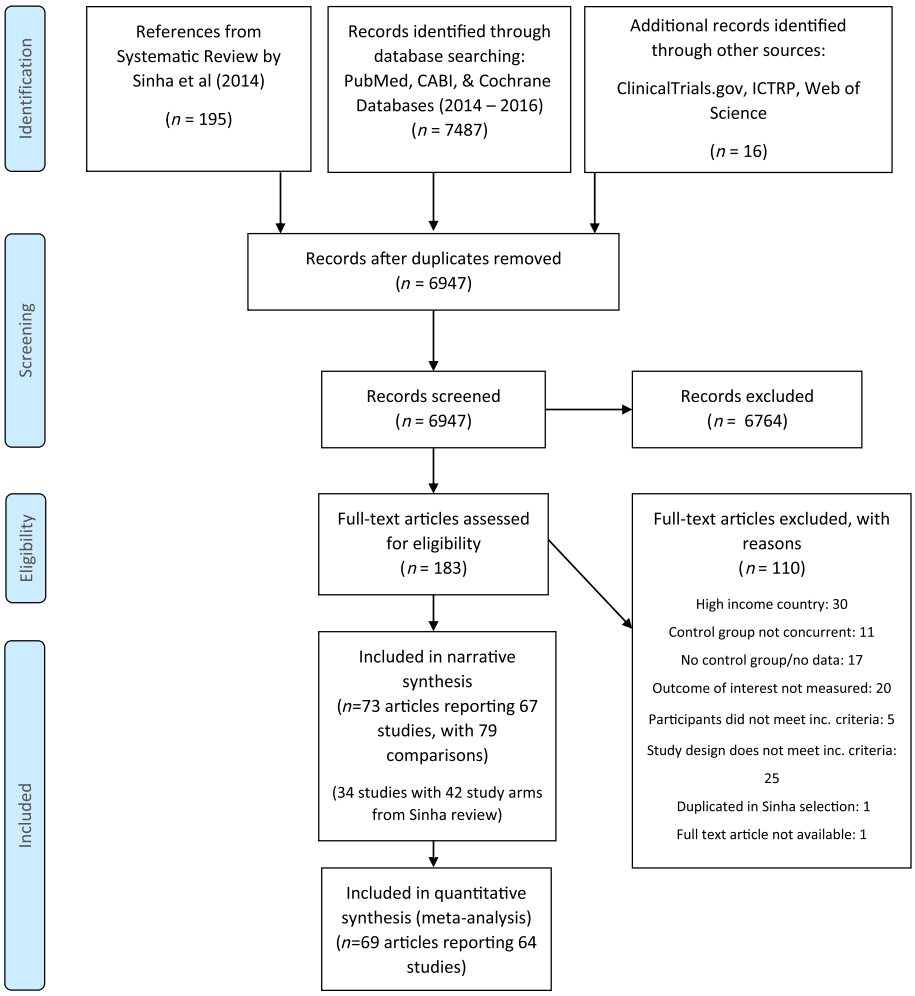

FIGURE 1 PRISMA flow diagram. CABI: Centre for Agriculture and Biosciences International; ICTRP: International Clinical Trials Registry Platform; inc.: inclusion

TABLE 1 Summary table of study characteristics

Characteristic	Number of studies	Number of articles	Reference numbers
Study design			
RCT	21	23	3, 4, 5, 6, 7, 10, 13–15, 19, 22, 25, 28, 33, 37, 38, 39, 43, 47, 51, 56, 66, 69
Cluster RCT	23	26	8, 9, 11, 12, 18, 23, 26, 29 & 58, 30, 34, 35, 36, 40, 44, 46, 48 & 73, 50, 52, 57, 60 & 61, 67, 68, 70
Quasi-experimental	7	7	24, 31, 32, 42, 45, 53, 71
Nonrandomized study of intervention	12	13	1, 16 & 17, 20, 21, 27, 41, 54, 55, 59, 62, 65, 72
Observational	4	4	2, 49, 63, 64
WHO region			
African region	16	19	3, 20, 23, 29 & 58, 30, 34, 35, 40, 46, 48 & 73, 49, 50, 60 & 61, 65, 68, 70
Americas	16	18	7, 13–15, 19, 21, 22, 38, 39, 43, 44, 47, 55, 62, 63, 64, 66, 67
South East Asia	13	13	1, 6, 8, 9, 11, 26, 27, 31, 37, 51, 54, 57, 71
Eastern Mediterranean (including Egypt)	10	10	2, 4, 10, 12, 18, 24, 28, 33, 52, 72
Western Pacific region & China	8	9	16, 17, 25, 32, 41, 42, 53, 56, 69
European region	4	4	5, 36, 45, 59
Intervention context (code)	Number of studies	Number of study arms	
health systems/services	N/A	23	1, 2, 6, 27, 30, 31, 36, 38, 46a, 49, 51a, 51b, 53, 55a, 55b, 62, 63, 64, 65, 67, 70a, 70b, 72
home/family context		27	5, 10a, 10b, 19, 22, 26, 29 & 58, 32, 34, 39, 40b, 43, 44a, 44b, 46b, 48, 50, 52, 56, 57a, 57b, 60–61BF, 60–61U, 60–61SA, 66, 68, 73
community interventions		6	9, 20, 23, 40a, 59, 71
Context combinations			
Context 1 + 2		15	3, 4, 7, 13–15a, 13–15b, 24, 25, 28, 33, 37, 41, 42, 45, 47, 69
Context 2 + 3		5	12, 18, 21, 35, 54
Context 1 + 3		Nil	
Context 1 + 2 + 3		3	8, 11, 16–17
Setting		N/A	
Rural	10		12, 16 & 17, 20, 23, 35, 40, 48 & 73, 52, 54, 68
Urban	27		3, 6, 7, 13–15, 19, 22, 24, 25, 26, 27, 28, 29 & 58, 31, 33, 34, 38, 42, 43, 45, 46, 50, 55, 59, 62, 63, 67, 70
Peri-urban/suburban	4		21, 30, 44, 60 & 61
Rural & urban/suburban	1		36
Not specified	25		1, 2, 4, 5, 8, 9, 10, 11, 18, 32, 37, 39, 41, 47, 49, 51, 53, 56, 57, 64, 65, 66, 69, 71, 72
Intervention directed at	N/A		
Mothers/pregnant women		61	1, 2, 3a, 3b, 4, 5, 6, 7, 10a, 10b, 11, 12, 16–17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 37, 38, 39, 40b, 41, 42, 43, 44, 45, 46a, 46b, 47, 48 & 73, 50, 51a, 51b, 52, 55a, 56, 57a, 57b, 58, 59, ode of delivery60–61BF, 60–61U, 60–61SA, 62, 66, 68, 69, 71, 72
Mother + father/other family member		4	13–15a, 13–15b, 53, 55b
Health workers		10	20, 21, 36, 49, 63, 64, 65, 67, 70a, 70b
Combined/other groups		4	8, 9, 40a, 54
Type of intervention	N/A		
Education		16	2, 6, 9, 22, 23, 27, 30, 32, 40a, 51b, 55a, 55b, 59, 64, 66, 67
Support		1	31

(Continues)

TABLE 1 (Continued)

Characteristic	Number of studies	Number of articles	Reference numbers
Combination		60	1, 3a, 3b, 4, 5, 7, 10a, 10b, 11, 12, 13–15a, 13–15b, 16–17, 18, 19, 20, 21, 24, 25, 26, 28, 29 & 58, 33, 34, 35, 36, 37, 38, 39, 40b, 41, 42, 43, 44a, 44b, 45, 46a, 46b, 47, 48 & 73, 49, 50, 51a, 52, 53, 54, 56, 57a, 57b, 60–61BF, 60–61U, 60–61SA, 62, 63, 68, 69, 70a, 70b, 71, 72
Not specified/not applicable		2	8, 65
Mode of delivery of intervention	**Number of studies**	**Number of study arms**	
Face to face	54	66	1, 2, 3a, 3b, 5, 6, 7,9, 10a, 10b, 11, 12, 13–15a, 13–15b, 16–17, 18, 19, 20, 21, 22, 24, 26, 27, 29 & 58, 30, 31, 34, 35, 36, 38, 39, 40a, 40b, 41, 44a, 44b, 45, 46a, 46b, 47, 48 & 73, 49, 50, 51a, 51b, 52, 53, 54, 55a, 55b, 57a, 57b, 59, 60–61BF, 60–61U, 60–61SA, 63, 64, 65, 66, 67, 68, 70a, 70b, 71, 72
Telephone (voice/SMS)	3	3	32, 43, 56
Combination	9	9	4, 23, 25, 28, 33, 37, 42, 62, 69
Not specified/not applicable	1	1	8
Timing of intervention	N/A		
Antenatal		6	2, 4, 6, 46a, 53, 59
Post-natal		27	1, 5, 7, 10a, 10b, 11, 13–15a, 13–15b, 19, 22, 24, 25, 27, 31, 33, 39, 43, 45, 47, 51a, 51b, 55a, 55b, 56, 62, 66, 69
Both		34	3a, 3b, 12, 16–17, 18, 21, 26, 28, 29 & 58, 30, 32, 34, 35, 37, 38, 40b, 41, 42, 44a, 44b, 46b, 48 & 73, 49, 50, 52, 54, 57a, 57b, 60 & 61BF, 60 & 61U, 60 & 61SA, 68, 70a, 70b
Not specified/not applicable		12	8, 9, 20, 23, 36, 40a, 63, 64, 65, 67, 71, 72
Intensity (number of sessions)	N/A		
≤3		21	1, 2, 4, 5, 10b, 28, 31, 33, 38, 43, 44b, 45, 46a, 47, 51a, 51b, 53, 55a, 55b, 67, 72
4–8		26	6, 7, 10a, 11, 12, 13–15a, 13–15b, 16–17, 24, 29 & 58, 30, 35, 39, 40b, 44a, 46b, 48 & 73, 52, 54, 59, 60 & 61BF, 60 & 61U, 60 & 61SA, 62, 68, 69
≥9		19	3a, 3b, 9, 18, 19, 22, 23, 25, 26, 27, 32, 34, 37, 40a, 50, 56, 57a, 57b, 66
Not specified/not applicable		13	8, 20, 21, 36, 41, 42, 49, 63, 64, 65, 70a, 70b, 71
Intervention delivered by			
Professional	40	47	1, 3a, 3b, 6, 7, 10a, 10b, 13–15a, 13–15b, 16–17, 18, 19, 20, 21, 22, 24, 25, 27, 28, 29 & 58, 31, 34, 36, 37, 38, 41, 42, 43, 45, 46a, 47, 49, 50, 51a, 51b, 53, 55a, 55b, 56, 62, 63, 66, 67, 69, 70a, 70b, 72
Para-professional	5	5	8, 12, 30, 35, 52
Lay	10	14	9, 26, 39, 40a, 40b, 44a, 44b, 46b, 48, 60 & 61BF, 60 & 61U, 60 & 61SA, 68, 71
Lay + professional/para-professional	6	7	4, 11, 54, 57a, 57b, 59, 65
Not specified/not applicable	5	5	2, 5, 32, 33, 64

Multiple entries were allowed for studies with more than one study arm.

(Study 56); session on breastfeeding promotion as part of standard nutrition education in a slum in Kenya (Study 46), and a facility-based 6-week post-natal visit for support and follow up in Jordan (Study 33). However, for each included study, the intervention(s) provided services above/beyond the usual care for the study context, in quality, coverage, and/or intensity.

3.2.4 | Context and type (nature) of intervention

More than 70% of interventions were delivered within a single context —health systems and services, home and family, or the community (56 study arms), with the rest (23 study arms) delivered in multiple contexts (any combination). Three-quarters (75.9%) of interventions employed both education and breastfeeding supports (60 study arms).

3.2.5 | Personnel delivering interventions and mode of delivery

Interventions were delivered face to face (55 studies), by phone/SMS (three studies), and by a combination of face to face and telephone (nine studies).

Interventions were delivered by a range of personnel, including doctors, nurses, midwives, nutritionists, lactation counsellors, community health workers, traditional birth attendants, peer

educators/counsellors, religious leaders, and other laypersons (details in Table 1).

3.2.6 | Timing and intensity of interventions

Interventions ranged from a single session to over 20 sessions, spanning pregnancy up to the end of the first year. Of the interventions that specified planned contacts, 21 offered three or less, 26 had four to eight contacts, and 19 at least nine contacts.

More details on included studies and characteristics of interventions are in Table 2.

3.2.7 | Risk of bias

Among randomized trials, nine (36%) were assessed to be low risk for bias. (Summary of risk of bias assessment in Appendices E and F).

3.3 | Primary outcome: EBF until 6 months

a. RCTs only

This outcome includes 25 comparisons from 18 RCTs involving 29,483 participants and compared all forms of interventions with standard care. Pooled results showed that infants receiving an intervention had more than a twofold increase in EBF rates (RR = 2.19, 95% CI [1.73, 2.77]; I^2 = 78.4%, 95% PI [0.81, 5.94]) compared with controls (Figure 2).

b. All study types

This outcome includes 35 comparisons from 29 studies involving 33,684 participants, comparing all forms of interventions with usual care. The results followed a similar pattern as that for RCTs only, as infants receiving an intervention also had more than a twofold increase in EBF rates (RR = 2.27, 95% CI [1.88, 2.76]; I^2 = 83.1%, 95% PI [0.89 to 5.79]) compared with controls (Figure 3).

3.4 | Subgroup analyses of EBF until 6 months

a. RCTs only

Table 3 summarizes effect estimates for EBF until 6 months from subgroup analyses. Interventions delivered in a single context more than doubled EBF rates compared with controls, whether conducted in the health facility (RR = 2.25, 95% CI [1.01, 4.99]) or home/family context (RR = 2.20, 95% CI [1.43, 3.37]). No RCTs were conducted solely in the community context.

Interventions delivered in a combination of health services and home/family contexts more than doubled EBF rates (RR = 2.38, 95% CI [1.68, 3.39]), whereas interventions in a combination of home/family and community contexts increased EBF rates by nearly 50% (RR = 1.49, 95% CI [1.19, 1.87]) compared with controls (Table 3, Figure S1). There was no evidence of a difference between the effect of interventions in single versus multiple contexts (P = 0.95).

Table 3 and Figures S1–S4 report subgroup analyses by personnel delivering the intervention, timing and intensity of contacts, mode of delivery, and study type. Meta-regression analyses found no significant differences between different delivery characteristics. The largest effect sizes were for interventions delivered by a combination of professional/para-professional and laypersons (RR = 3.90, 95% CI [1.25, 12.21]); those delivered by a combination of face to face and telephone methods (RR = 2.33, 95% CI [1.42, 3.84]); interventions combining education and support (RR = 2.29, 95% CI [1.77, 2.98]); and those delivered across antenatal and post-natal periods (RR = 2.40, 95% CI [1.70, 3.38]).

PIs were calculated for each effect estimate; the PI reports the range in which 95% of the distribution of the effects lies. The majority of the intervals are greater than zero and thus mainly in favour of the breastfeeding interventions; however, they mainly overlap zero indicating that the interventions may not always be effective. The strongest PIs were found for interventions delivered by laypersons (95% PI [1.00, 7.80]) and for interventions with four to eight contacts (95% PI [1.35, 7.59]). This implies that there is a high level of certainty that future interventions deploying these characteristics will yield positive results.

b. All study types

The results by context and delivery characteristics for all study designs are similar to those for RCTs only and are reported in Table 3.

3.5 | Sensitivity analysis

A sensitivity analysis by study size (>500 participants) gave a similar effect estimate to that for all RCTs with wider confidence interval (RR = 2.43, 95% CI [1.64, 3.61]); a similar effect size was also obtained from a sensitivity analysis by bias judgement (low risk) with RR = 2.23 (95% CI [1.54, 3.22]; Table 3; Figure S5).

There was no evidence of a small study effect such as publication bias (Figure S6).

3.6 | Secondary outcomes

Secondary outcomes are in Table 4 and Figures S7–S12. Breastfeeding rates at all secondary endpoints for the interventions were significantly higher than usual care for all study designs combined for all outcomes, compared with the findings for RCTs only. The largest effect sizes for EBF (RCTs only) were at 2 to 3 months (RR = 1.91, 95% CI [1.33, 2.73] with PI [0.40, 9.17]) and 4 to 5 months (RR = 1.76, 95% CI [1.41, 2.19] with PI [0.81, 3.81]). For the pooled RCTs, the effects of interventions on early initiation of breastfeeding and EBF in populations below 6 months were not significantly higher than controls.

4 | DISCUSSION

This systematic review has clearly established that a wide range of different interventions, in different settings, and by different types of providers significantly improves EBF in LMICs with high breastfeeding

TABLE 2 Characteristics of studies and intervention: randomized controlled trials

Study ID	Study & location	Study design	Participants	Intervention characteristics	Primary outcome (EBF until 6 months) assessed?	Method of outcome assessment
03	Aidam (2005) Ghana	RCT	Pregnant women in third trimester, with FT singleton delivery; *n* = 137	*Health systems/services & home/family setting* BF education given prenatally (IG1) or perinatally (IG2) with home visits post-partum by trained staff CG: education on other health-related topics	Yes	24-hr recall
04	Ansari (2014) Iran	RCT	Primips >36 weeks GA attending public health centres, with intention to BF; *n* = 120	*Health systems/services & home/family setting* Group training sessions prenatally on benefits of BF + peer education + phone counselling + standard care CG: standard care	Yes	Not specified
05	Aksu (2011) Turkey	RCT	Primips with FT vaginal delivery at study hospital; *n* = 60	*Home/family setting* Single post-partum education session during home visit + standard care CG: standard care	Yes	Not specified
06	Akter (2012) Bangladesh	RCT	Pregnant women in seventh month of pregnancy attending government facility; *n* = 115	*Health systems & services* Group antenatal nutrition education between 7 & 9 months of pregnancy CG: standard care	No	24-hr recall
07	Albernaz (2003) Brazil	RCT	Women at 37–42 weeks GA with singleton birth, resident in area, & intending to BF; *n* = 167	*Health systems/services & home/family setting* Post-natal lactation counselling video session in hospital + home visits & 24-hr telephone hotline CG: standard care	No	Not stated
08	Arifeen (2009) Bangladesh	c- RCT	All women ever married 15–49 years & children <5 years; *n* = 3,115	*Health systems/services, home/family & community setting* Implementation of facility & community components of IMCI, involving VHW & community leaders CG: standard care	No	Not stated
09	Azad (2010) Bangladesh	c-RCT with factorial design	Married WRA + other female members; *n* = 30,952			*Community setting* Women's group participatory learning & action meetings (20 cycles) with peer educators
No	Not stated					
10	Bashour (2008) Syria	RCT	Women with FT healthy infant, resident in study area; *n* = 877	*Home/family setting* Four (IG1) or one (IG2) home visits post-partum providing information, education and support CG: standard care	No	Not stated
11	Bhandari (2003) India	c-RCT	All infants born & residing in study communities during recruitment period; *n* = 895	*Health systems/services, home/family & community setting* Repeated EBF counselling at multiple opportunities through existing PHC services, home visits & community meetings	Yes	24-hr recall Since birth recall
12	Bhutta (2011) Pakistan	c-RCT	All pregnant women in study areas; *n* = 4,474	*Home/family & community environment* Home visits by lady health workers; ante + post-natal + community health committee group education	No	Not stated

(Continues)

TABLE 2 (Continued)

Study ID	Study & location	Study design	Participants	Intervention characteristics	Primary outcome (EBF until 6 months) assessed?	Method of outcome assessment
				sessions; training of TBAs (*Dais*)		
13, 14, 15	de Oliveira[a] (2014) Brazil (with Bica, 2014 and da Silva, 2016)	RCT	Adolescent mothers living with or without maternal grandmothers; *n* = 320	*Health systems/services & home/family setting* Single post-natal counselling session at maternity + home visits CG: standard care at BFI facility	Yes	Previous month recall
18	Brasington (2016) Egypt	c-RCT	Pregnant women & women with child (ren) < 2 years; *n* = 3,445	*Home/family & community setting* Monthly antenatal & post-natal home visits with individual & family counselling sessions + further sessions for children at risk	No	24-hr recall
19	Coutinho (2005) Brazil	RCT	Mothers of FT normal delivery with birth weight >2,500 g; *n* = 350	*Health systems & services/home & family setting* Post-natal home visits up to 6 months + BFHI training of maternity staff CG: BFHI training of maternity staff	No	24-hr recall
22	Feldens (2006) Brazil	RCT	Mothers with healthy FT in public health facility; *n* = 372	*Home/family setting* Home visits post-natally for nutrition counselling by trained fieldworkers until 12 months	No	Since birth recall
23	Flax (2014) Nigeria	c-RCT	Microcredit clients, pregnant, & aged 15–45 years; *n* = 390	*Community setting* BF learning sessions during microcredit meetings + cellphone SMS & voice messages + participant-generated songs & drama	Yes	Since birth recall
25	Gu (2016)[b] China	RCT	Healthy primipara, with husband or grandmother able to attend intervention activities; *n* = 285	*Health systems/services & home/family setting* Individual, group, & telephone counselling sessions held post-partum in hospital & home until 6 months CG: standard care	Yes	Not specified
26	Haider (2000) Bangladesh	c-RCT	Pregnant women 16–35 years resident in study area; *n* = 653	*Home/family setting* Home-based peer counselling (10–15 visits) in antenatal & post-natal period up to fifth month CG: standard care	No	24-hr recall Previous month recall
28	Heidari (2016) Iran	RCT	Primipara >18 years with singleton pregnancy; *n* = 70	*Health systems/services & home/family setting* Two prenatal & one post-natal group BF counselling session with key family members + regular SMS messages CG: standard care	No	Not stated
29 & 58	Ijumba (2015) S. Africa (with Tomlinson, 2014)	c-RCT	Pregnant women ≥17 years, resident in study area; *n* = 3,656	*Home/family setting* Ante- & post-natal home visits by CHWs providing education using motivational interviewing techniques CG: three home visits from CHW, focusing on social welfare	No	24-hr recall
30	Jakobsen (1999) Guinea Bissau	c-RCT	Mothers of FTND registered during pregnancy; *n* = 963	*Health systems and services* Ante- & post-natal health education sessions during routine clinic visits, until 9-month post-partum	No	Not stated

(Continues)

TABLE 2 (Continued)

Study ID	Study & location	Study design	Participants	Intervention characteristics	Primary outcome (EBF until 6 months) assessed?	Method of outcome assessment
33	Khresheh (2011) Jordan	RCT	Primiparous women with vaginal delivery at study hospitals; *n* = 90	*Health systems/services & home/family setting* Individual BF education session post-natally + follow-up phone calls CG: standard care	Yes	Not specified
34	Kimani-Murage (2016) Kenya	c-RCT	Pregnant women 12–49 years old, resident in study communities; *n* = 1,110	*Home/family setting* Regular, comprehensive, home-based nutritional counselling by trained CHWs, from pregnancy until first birthday CG: standard care, including counselling by CHWs not specially trained	Yes	3-day recall Since birth recall
35	Kirkwood (2013) Ghana	c-RCT	All pregnant women and newborns resident in intervention zones; *n* = 15,594	*Home/family and community setting* Ante- & post-natal home visits by community-based surveillance volunteers CG: standard care	No	24-hr recall
36	Kramer (2001) Republic of Belarus	c-RCT	Mothers of healthy FT infants, intending to BF; *n* = 17,046	*Health systems and services* BFHI training, emphasizing health worker support for BF initiation and maintenance CG: standard care	Yes	Since birth recall
37	Kupratakul (2010) Thailand	RCT	Pregnant women <32 weeks GA attending ANC, & having a telephone; *n* = 80	*Health systems/services & home/family setting* Single KSPES session antenatally + telephone follow up ± home visits where necessary CG: standard education programme	Yes	Not specified
38	Langer (1998) Mexico	RCT	Women with single pregnancy in labour (<6 cm dilated), no previous vaginal delivery or indication for elective C/S; *n* = 724	*Health systems and services* Support from a *Doula* during delivery and immediate post-partum period CG: standard care	No	Not stated
39	Leite (2005) Brazil	RCT	Mothers of healthy singletons weighing <3,000 g; *n* = 1,003	*Home/family setting* Home visits post-partum by lay counsellors until 4 months after delivery CG: standard care	No	Not stated
40	Lewycka (2013) Malawi	c-RCT with factorial design	Women 10–49 years in study community (IG1) and all pregnant women (IG2); *n* = 2,286	*Home/family & community setting* IG1: women's group intervention: community mobilization action cycle of 20 meetings IG2: volunteer peer counselling ante- & post-natally (five visits). CG: standard care	Yes	Not stated
43	Malowsky (2016) Ecuador	RCT	Mothers ≥15 years, Spanish-speaking, recruited after delivery from study facilities; *n* = 135	*Home/family setting* 48 hr post-discharge counselling session via telephone + telephone support in neonatal period CG: standard care	No	Not specified
44	Morrow (1999) Mexico	c-RCT	All pregnant women residing in study area; *n* = 130	*Home/family setting* Six (IG1) or three (IG2) home visits by peer counsellors ante- & post-natally	No	7-day recall

(Continues)

TABLE 2 (Continued)

Study ID	Study & location	Study design	Participants	Intervention characteristics	Primary outcome (EBF until 6 months) assessed?	Method of outcome assessment
				CG: standard care		
46	Ochola (2012) Kenya	c- RCT	Pregnant HIV-negative women accessing antenatal services; *n* = 360	*Health systems/services & home/family setting* IG1: single, one-on-one BF counselling session prenatally at health facility IG2: intensive, home-based counselling sessions prenatally & post-natally by peer counsellors until 5 months post-partum CG: standard care	Yes	24-hr recall Since birth recall
47	de Oliveira (2006) Brazil	RCT	Mothers of healthy singletons weighing >2,500 g in the study hospital; *n* = 211	*Health systems/services & home/family setting* Post-natal BF counselling session prior to discharge + 2 home visits in first month CG: standard care	No	Since birth recall
48, 73	Penfold (2014) Tanzania (with Hanson, 2015)	c-RCT	All pregnant women in study communities; *n* = 512 (*n* = 14, 295 for Hanson, 2015)	*Home/family setting* Home visits during pregnancy & early neonatal period by lay community volunteers CG: standard care	No	Not stated
50	Rotheram-Borus (2014) South Africa	c-RCT	Pregnant women ≥18 years, living in study clusters; *n* = 1,152	*Home/family setting* Home visits by trained CHWs, ante- & post-natally, to deliver health messages including EBF CG: standard care	Yes	Not stated
51	Sharma (2013) India	RCT	Pregnant women who delivered at term in study facility; *n* = 1,412	*Health systems and services* IG1: post-natal counselling session IG2: video demonstration on BF CG: standard care	No	Not stated
52	Sikander (2015) Pakistan	RCT	Married women 17–40 years in third trimester, resident in study area; *n* = 358	*Home/family setting* Psycho-educational sessions integrated into routine LHW home visits, ante- & post-natally CG: home visits from routinely trained LHW	Yes	24-hr recall
56	Tahir (2013) Malaysia	RCT	Pregnant women who received at least one prenatal BF education session, with telephone access; *n* = 357	*Home/family setting* Post-natal lactation counselling by phone twice monthly until 6 months CG: standard care	Yes	24-hr recall Since birth recall
57	Talukder, (2016) Bangladesh	c-RCT	Pregnant women in second & third trimester & mothers of children 0–6 months; *n* = 1,147	*Home/family setting* Home visits (ante- & post-natal) by trained TBAs & community volunteers (IG1) + support from field supervisors (IG2), until 6 months	No	24-hr recall
60, 61	Tylleskar (2011) Burkina Faso, Uganda, & South Africa (with Engebretsen, 2014)	c-RCT	Visibly pregnant women intending to BF, with singleton live birth & resident in study area; *n* = 2,579 (nBF = 794, nUG = 765, nSA = 1,020)	*Home/family setting* Ante- & post-natal home visits by trained peer counsellors CG: received standard care in Burkina Faso & Uganda; in S. Africa peer supporters helped with vital registration and benefits	Yes	24-hr recall 7-day recall
66	Vitolo (2005) Brazil	RCT	Mothers of healthy FT infants with birth weight >2,500 g; *n* = 500	*Home/family setting* Post-natal home visits (10 sessions) until 12 months	Yes	Not stated

(Continues)

TABLE 2 (Continued)

Study ID	Study & location	Study design	Participants	Intervention characteristics	Primary outcome (EBF until 6 months) assessed?	Method of outcome assessment
67	Vitolo (2014) Brazil	c-RCT	Pregnant women in third trimester attending health facilities; *n* = 693	*Health systems and services* Single session update for health professionals focused on improving infant feeding practices	Yes	Since birth recall
68	Waiswa (2015) Uganda	c-RCT	All pregnant women and their newborns identified in study communities; *n* = 1,787	*Home/family setting* Home visits (five sessions) in antenatal and early post-natal period by volunteer CHWs + health facility strengthening CG: standard care + health facility strengthening	No	Not stated
69	Wu (2014)[a] China	RCT	Primipara ≥18 years, healthy FT infant & intention to BF; *n* = 74	*Health systems/services & home/family setting* Three individualized self-efficacy enhancing sessions early post-partum; third session by telephone CG: standard care	No	Not stated
70	Yotebieng (2015) Democratic Republic of Congo	c-RCT	Mothers delivering healthy singleton at study facilities & intending to attend well-baby clinics; *n* = 975	*Health systems and services* Training of health staff in Steps 1–9 (IG1) & Steps 1–10 (IG2) of successful BF CG: standard care	Yes	24-hr recall 7-day recall

Note. c-RCT: cluster randomized controlled trial; RCT: randomized controlled trial; IG: intervention group; CG: control group; BF: breastfeeding; EBF: exclusive breastfeeding; FT: full term; FTND: normal delivery; GA: gestational age; IMCI: integrated management of childhood illnesses; KSPES: knowledge sharing practices with empowerment strategic programme; VHW/CHW: village/community health worker; WRA: women of reproductive age; PHC: primary health care; TBA: traditional birth attendant; BFI/BFHI: baby friendly (hospital) initiative; SMS: short message service.

[a]Not included in meta-analysis.

[b]A very similar article with the same study results. Wan (2016) was not included in the review, because it did not contribute any additional results. It is cited as an additional reference.

initiation. The estimate of the average effect of the interventions ranged from a twofold to threefold increase in the proportion of women breastfeeding exclusively until 6 months: This was robust to study type and exclusive of studies with a high risk of bias.

4.1 | Principal findings

Pooled results for all types of interventions showed more than a doubling in EBF rates at 6 months for RCTs and all study types (RR 2.19 and 2.27, respectively). This effect is of a greater magnitude than estimates found in reviews that included studies from LMICs and HICs combined, which ranged from 44% increase in EBF rates (RR 1.44; 95% CI [1.38, 1.51]; Sinha et al., 2015) to 22% reduction in likelihood of stopping EBF before 6 months (McFadden et al., 2017). This difference could be due in part to the effect of large differences in control arm breastfeeding rates between LMICs and HICs on treatment effects calculated on the RR scale. Sinha et al. (2015) obtained a pooled estimate for interventions in LMICs (57 studies) with RR of 1.69 (95% CI [1.54, 1.86]); however, their analysis pooled outcomes from studies capturing EBF rates from any age between 0 and 5 months, so studies may have had the final outcome measure at any time prior to 6 months. Therefore, this is not comparable with our primary outcome, which captured EBF rates at 24 to 26 weeks (6 months) only. Sinha's more recent review (Sinha et al., 2017) reported an odds ratio for EBF rates between 1 and 5 months in LMICs of 3.08 (95% CI [2.57, 3.68]) for all study designs, in 61 studies reported in English. Haroon et al. also reviewed breastfeeding interventions, reporting that in combination, these had a large and significant effect on EBF rates in infants across ages 1–5 months old in developing countries (RR = 2.88, 95% CI [2.11, 3.93]), whereas effects were nonsignificant in developed countries (Haroon et al., 2013). McFadden et al. also combined EBF at all ages up to 6 months and showed significant effects across low/middle and high income settings (McFadden et al., 2017).

Most of the high-burden countries for neonatal and maternal mortality are LMICs, particularly sub-Saharan Africa and south Asia, which generally have weak health care systems and low levels of community participation; these have been identified as important determinants of breastfeeding practices, as described in a conceptual model on breastfeeding (Rollins et al., 2016). What is provided as standard maternity care in most HICs may only be delivered as part of a funded intervention in an LMIC and not usually available routinely from the health service due to lack of capacity. For example, many interventions in this review would be usual care within the U.K. context (Studies 5, 6, 10, 36). Breastfeeding patterns

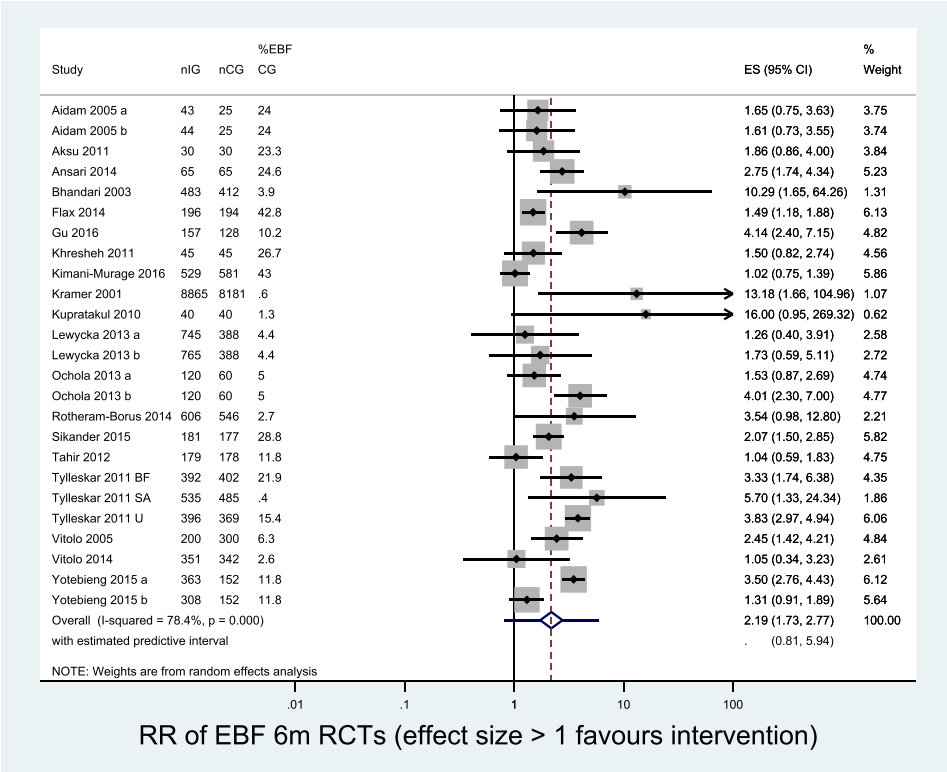

FIGURE 2 Exclusive breastfeeding at 6 months (RCTs): all interventions versus standard care. EBF: exclusive breast feeding; %EBF: CG percent of EBF in control group; ES: effect size; nCG: number in control group; nIG: number in intervention group; RCT: randomized controlled trial; RR: relative risk

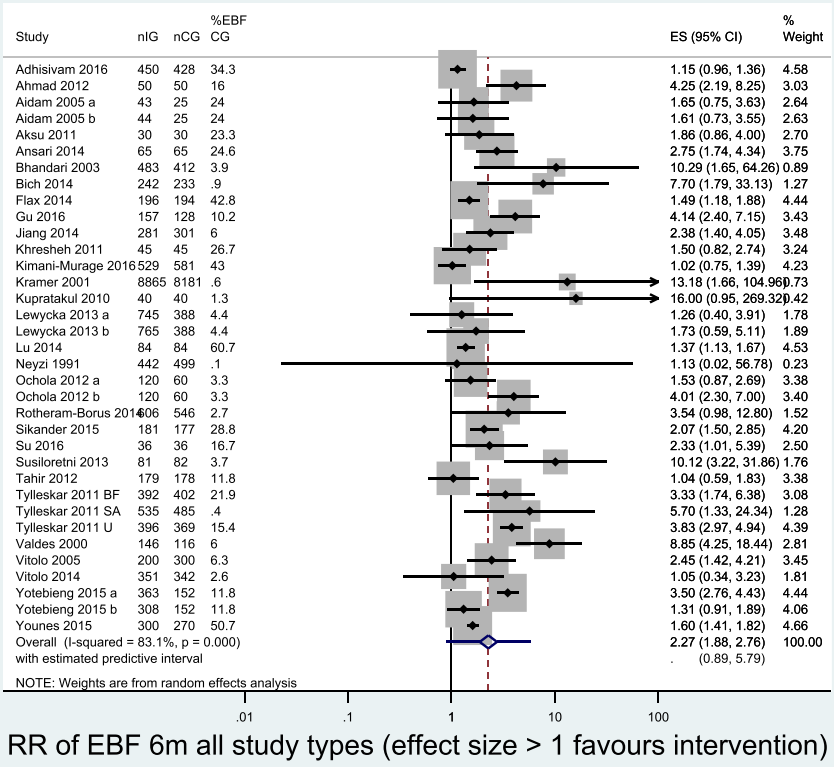

FIGURE 3 Exclusive breastfeeding at 6 months (all study types): all interventions versus standard care. EBF: exclusive breast feeding; %EBF: CG percent of EBF in control group; ES: effect size; nCG: number in control group; nIG: number in intervention group; RCT: randomized controlled trial

TABLE 3 Summary of effect estimates for EBF until 6 months

Variable	No. of estimates	No. of participants	Pooled ES	Lower limit 95% CI	Upper limit 95% CI	I^2 (%)	Lower limit PI	Upper limit PI	*P* value	Meta-reg P value
All interventions by study type										0.493
RCTs	25	29,483	2.188	1.731	2.766	78.4	0.81	5.94	0.000	
Non-RCTs	10	4,211	2.429	1.752	3.368	85.5	0.90	6.97	0.000	
All studies	35	33,694	2.274	1.877	2.755	83.1	0.89	5.79	0.000	
Subgroup analysis (RCTs only)										
By intervention context										0.981
Health systems & services	4	18,714	2.246	1.011	4.990	87.7	0.07	67.57	0.000	
Home & family	9	6,116	2.197	1.433	3.368	84.8	0.53	9.09	0.000	
Community	N/A	–	N/A				–	–		
Combined context										
Health systems & services/home & family	8	1,082	2.384	1.678	3.386	55.6	0.89	6.42	0.027	
Home & family/community settings	3	2,676	1.490	1.190	1.866	0.0	0.35	6.40	0.923	
Health systems & services/home & family/community	1	895	10.289	1.648	64.261	N/A	–	–	–	
Single versus combined context										0.949
Single context	13	24,830	2.191	1.547	3.103	84.9	0.64	7.51	0.000	
Combined context	12	4,653	2.187	1.606	2.977	61.6	0.86	5.54	0.003	
Mode of delivery of intervention										0.936
Face to face	19	28,151	2.255	1.704	2.983	78.2	0.78	6.56	0.000	
Telephone (voice/SMS)	1	357	1.042	0.595	1.825	0.0	–	–	–	
Face to face + telephone	5	975	2.333	1.419	3.837	76.7	0.44	12.30	0.002	
Type/nature of intervention										0.363
Education	3	1,583	1.670	1.148	2.427	38.4	0.04	64.03	0.197	
Education + support	22	27,900	2.292	1.765	2.976	79.2	0.79	6.63	0.000	
Intervention delivered by										
Professional/para-professional	13	22,693	2.019	1.416	2.878	81.6	0.59	6.86	0.000	0.900
Layperson	7	5,225	2.800	1.924	4.074	55.9	1.00	7.80	0.035	
Lay + professional/para-professional	2	1,025	3.900	1.246	12.208	46.7	–	–	0.171	
Other group/not specified/not applicable	3	540	1.517	1.229	1.871	0.0	0.39	5.92	0.865	
Timing of intervention										0.784
Antenatal	2	310	2.101	1.185	3.725	60.2	–	–	0.113	
Post-natal	6	2,187	2.179	1.319	3.599	69.5	0.45	10.45	0.006	
Antenatal + post-natal (combined)	13	7,724	2.395	1.697	3.380	83.6	0.72	7.94	0.000	
Not specified/not applicable	4	19,262	1.569	0.891	2.763	36.2	0.21	11.51	0.195	
Intensity of intervention (number of contacts)										0.992
≤3	5	1,153	1.852	1.362	2.518	15.7	0.95	3.62	0.314	
4–8	7	5,165	3.199	2.299	4.450	53.8	1.35	7.59	0.043	
≥9	10	5,144	1.755	1.256	2.452	68.4	0.65	4.76	0.001	
Not specified/not applicable	3	18,021	2.761	1.111	6.861	90.9	0.00	105726.73	0.000	
Intervention targeted at										0.996
Mothers/pregnant women	21	10,769	2.185	1.701	2.807	75.8	0.81	5.90	0.000	
Health care provider	4	18,714	2.246	1.011	4.990	87.7	0.07	67.57	0.000	
Mother + other family member	N/A		N/A							
Combined group/other	N/A		N/A							

(Continues)

TABLE 3 (Continued)

Variable	No. of estimates	No. of participants	Pooled ES	Lower limit 95% CI	Upper limit 95% CI	I^2 (%)	Lower limit PI	Upper limit PI	*P* value	Meta-reg P value
Sensitivity analysis										
By bias judgement										
Low risk	9	4,673	2.226	1.541	3.215	80.4	0.73	6.75	0.000	
All RCTs	25	29,483	2.188	1.731	2.766	78.4	0.81	5.94	0.000	
By study size										
≥500 participants	13	27,236	2.429	1.637	3.605	83.7	0.64	9.27	0.000	
All RCTs	25	29,483	2.188	1.731	2.766	78.4	0.81	5.94	0.000	
Subgroup analysis (all studies)										
By intervention context										0.739
Health systems & services	8	20,026	2.631	1.502	4.611	92.1	0.41	17.09	0.000	
Home & family	10	6,698	2.207	1.503	3.242	83.0	0.60	8.06	0.000	
Community	1	570	1.603	1.408	1.824	N/A	N/A	N/A	N/A	
Combined context										
Health systems & services/home & family	10	2,191	2.159	1.518	3.072	70.5	0.74	6.29	0.000	
Home & family/community settings	3	2,676	1.490	1.190	1.866	0.0	0.35	6.40	0.923	
Health systems & services/home & family/community	3	1,533	9.337	4.159	20.964	0.0	0.05	1767.51	0.953	
Single versus combined context										0.880
Single context	19	27,294	2.268	1.740	2.955	88.1	0.77	6.65	0.000	
Combined context	16	6,400	2.289	1.715	3.055	69.5	0.89	5.87	0.000	
Mode of delivery of intervention										0.875
Face to face	26	31,350	2.307	1.819	2.925	83.7	0.84	6.33	0.000	
Telephone (voice/SMS)	2	939	1.583	0.704	3.557	77.2	N/A	N/A	0.036	
Face to face + telephone	7	1,405	2.513	1.626	3.886	85.8	0.62	10.13	0.000	
Type/nature of intervention										0.771
Education	5	2,265	2.134	1.407	3.237	67.0	0.55	8.31	0.017	
Education + support	30	31,429	2.317	1.863	2.881	84.7	0.86	6.27	0.000	
Intervention delivered by										0.621
Professional/para-professional	19	25,489	2.104	1.575	2.810	85.1	0.69	6.42	0.000	
Layperson	8	5,795	2.476	1.610	3.808	85.4	0.64	9.60	0.000	
Lay + professional/para-professional	3	1,188	5.440	1.926	15.362	64.9	0.00	509515.44	0.058	
Other/not specified/not applicable	5	1,222	2.014	1.389	2.920	60.9	0.62	6.58	0.037	0.480
Timing of intervention										
Antenatal	4	482	2.517	1.662	3.812	46.2	0.54	11.65	0.134	
Post-natal	9	4,268	2.356	1.396	3.977	85.2	0.43	13.00	0.000	
Antenatal + post-natal (combined)	17	9,112	2.502	1.843	3.397	85.1	0.78	7.98	0.000	
Not specified/not applicable	5	19,832	1.563	1.317	1.855	19.4	1.05	2.33	0.291	
Intensity of intervention (number of contacts)										0.545
≤3	9	3,144	1.843	1.277	2.659	69.9	0.62	5.49	0.001	
4–8	10	6,065	4.085	2.852	5.850	63.9	1.47	11.36	0.03	
≥9	11	5,726	1.813	1.329	2.472	67.7	0.70	4.68	0.001	
Not specified/not applicable	5	18,759	1.912	1.278	2.860	91.4	0.46	7.98	0.000	
Intervention targeted at										0.364
Mothers/pregnant women	29	14,745	2.197	1.802	2.678	81.6	0.91	5.31	0.000	
Health care provider	4	18,714	2.246	1.011	4.990	87.7	0.07	67.57	0.000	
Mother and/or other family member	1	72	2.333	1.010	5.391	N/A	N/A	N/A	N/A	

(Continues)

TABLE 3 (Continued)

Variable	No. of estimates	No. of participants	Pooled ES	Lower limit 95% CI	Upper limit 95% CI	I^2 (%)	Lower limit PI	Upper limit PI	*P* value	Meta-reg P value
Combined group/other	1	163	10.123	3.217	31.857	N/A	N/A	N/A	N/A	
By study size										0.547
<500 participants	18	3,487	2.422	1.858	3.157	77.2	0.88	6.63	0.000	
≥500 participants	17	30,207	2.135	1.586	2.875	87.3	0.73	6.29	0.000	

Note. CI: confidence interval; ES: effect size; RCT: randomized controlled trial; EBF: exclusive breastfeeding; SMS: short message service; PI: prediction interval.

TABLE 4 Summary of effect estimates for secondary outcomes

Variable	No. of estimates	No. of participants	Pooled ES	Lower limit 95% CI	Upper limit 95% CI	I^2 (%)
Exclusive breastfeeding at 0–1 month						
RCTs	19	53,034	1.268	1.163	1.382	78.3
All studies	27	57,642	1.315	1.220	1.418	87.5
Exclusive breastfeeding at 2–3 months						
RCTs	17	28,161	1.910	1.335	2.733	97.8
All studies	25	31,031	1.891	1.421	2.517	97.7
Exclusive breastfeeding at 4–5 months						
RCTs	15	6,982	1.757	1.411	2.187	72.9
All studies	26	10,345	1.842	1.538	2.207	79.5
Exclusive breastfeeding of infants less than 6 months (0–5 months)						
RCTs	5	8,057	1.604	0.677	3.802	84.4
All studies	7	8,961	1.503	1.028	2.197	80.1
Early initiation of breastfeeding						
RCTs	20	48,003	1.113	0.997	1.242	76.1
All studies	26	50,629	1.176	1.041	1.329	88.1
Continued breastfeeding at 12 months						
RCTs	3	820	1.463	1.029	2.079	68.8
All studies	4	1,402	1.367	1.039	1.800	62.2

Note. CI: confidence interval; ES: effect size; RCT: randomized controlled trial.

differ distinctively along country income category lines, with HICs generally having shorter breastfeeding durations overall, whereas LMICs tend towards later initiation but high overall initiation rates with low levels of breastfeeding exclusivity (Victora et al., 2016).

Our review fills the major gap from previous reviews by exploring effectiveness of various different interventions by context, setting, and intervention characteristics (e.g., duration and intensity) solely in LMICs and for the key WHO target of EBF until 6 months. Hitherto this had only been done with the outcome measured at any time point prior to 6 months (McFadden et al., 2017; Sinha et al., 2017) or for high and low/middle income countries combined (Haroon et al., 2013; McFadden et al., 2017; Sinha et al., 2015), with meta-analysis including all study designs (Sinha et al., 2017), despite the substantial differences in services, maternal attitudes, and practices between high and low/middle income countries.

Interventions delivered in health systems and services and in home and family contexts each more than doubled EBF rates until 6 months, which is consistent with the combined LMIC and HIC findings from Sinha et al. (2015). Among RCTs only, two intervention delivery modes had PIs consistent with high level certainty that future interventions with these features would yield positive results: delivery by laypersons and interventions with four to eight planned contacts. Similar to other reviews (McFadden et al., 2017; Sinha et al., 2015, 2017), our effect estimates were associated with high heterogeneity thus should be interpreted with caution. We did not find convincing statistical evidence of differences between subgroups in meta-regression analyses, which contrasts with findings of McFadden et al. (2017). The McFadden review reported significantly greater effects on cessation of EBF before 6 months for lay support versus professionals, four to eight post-natal contacts versus fewer or larger numbers of contacts, and face to face versus telephone alone or other delivery modes (McFadden et al., 2017). We found no evidence from RCTs that interventions using telephone alone affected EBF rates; however, the pooled estimate of one RCT and one non-RCT (Studies 32, 56) was 1.58, though not statistically significant (95% CI [0.70, 3.56]); this is an area that should be explored in future LMIC studies. In addition, we did not find a significantly greater effect in the RR of EBF at 6 months in trials with interventions in multiple contexts, rather than just single contexts. Other authors have reported higher odds ratios of EBF at any time between 1 and 5 months for interventions in multiple contexts, but consistent with our findings, these were not statistically significant on meta-regression (Sinha et al., 2015; Sinha et al., 2017).

4.2 | Strengths and weaknesses of the study and in relation to other studies

This systematic review was conducted robustly according to standard protocols, with study selection and data extraction independently in duplicate. Unlike other reviews, we provide detail of risk of bias of individual studies and detail the interventions delivered. Sinha et al. (2017) reported an attenuation in effect in low quality studies and studies that did not take confounding into account. We focused on RCTs and cluster RCTs in the meta-analyses of the subgroups of intervention characteristics of delivery, and we provide a comprehensive range of prespecified subgroup analyses. To enable comparison with other systematic reviews and to include the full range of evidence about interventions that may be more feasible to implement outside of an RCT, we also reported subgroup analyses for all study designs. Limitations resulted from poor quality of reporting of some studies. There were also issues in harmonizing outcome measures due to varying recall criteria and follow-up periods between studies (even after including secondary outcomes to accommodate some of the variations) and in adjusting for clustering in cluster trials that did not provide values for the ICC and design effect. The high heterogeneity in many of the effect estimates even after subgroup analysis is likely due to the wide variety of interventions and contexts included in this review; thus, some caution is needed in interpretation of results. To help summarize the heterogeneity more clearly, when three or more studies were included in the meta-analysis, we calculated PIs to help ascertain whether the intervention would likely work in the majority of settings or whether due to unexplained heterogeneity would work well in some settings but less effectively, or not at all, in others.

The meta-analysis had insufficient studies conducted solely in the community context for a robust subgroup analysis of this setting, and there were also no studies from the work environment or policy context from LMICs that met our inclusion criteria. Our review also did not include sufficient number of randomized studies targeted at significant "others" such as fathers and mothers-in-law to determine their influence on EBF interventions; the few studies that were included were either non-RCTs (Studies 53, 55b) or did not have data that could be used in meta-analysis (Study 13).

5 | CONCLUSIONS

This review, based on high quality study designs, has conclusively established that interventions to improve breastfeeding exclusivity in LMICs on average resulted in a twofold increase in rates of EBF until 6 months of age: All interventions, except telephone alone, were effective. We concur with calls for scaling up of effective national breastfeeding programmes (Pérez-Escamilla & Hall Moran, 2016). Stakeholders in countries, regions, and communities should therefore identify and implement interventions that best suit their resources, cultural context, and health service delivery system, to reduce infant and under-five mortality.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

CONTRIBUTIONS

TFO, KJ, CM, and NT conceived the idea for the review. TFO developed the protocol and search strategy with input from KJ, CM, and NT. TFO and AAR undertook inclusion, exclusion, and data extraction with input from KJ and CM. TFO, KO, and KJ did risk of bias assessment. TFO undertook the meta-analysis with support from MP and KJ. TFO drafted the paper with input from KJ and CM. All authors critically reviewed the paper.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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APPENDIX A

ELECTRONIC SEARCH STRATEGY

String of search terms utilized:

1. Breast Feeding OR Breastfeeding OR (Exclusive AND Breastfeeding [All fields]) OR (Any AND Breastfeeding [All fields]) OR (Continued AND Breast feeding [All Fields]) OR Breastfeeding, early initiation, OR Lactation, Human OR Breast Milk [Index terms])
2. (Counseling OR education, peer OR Social media OR mass media OR health promotion OR health education OR community participation OR (intervention [All Fields]) OR family practice OR support, breastfeeding OR health worker OR physician OR workplace OR Policy OR Legislations OR law [Index Terms])
3. (BFHI [All Fields] OR (Baby Friendly Hospital Initiative [All Fields]) OR Baby Friendly Initiative [All Fields]) OR Baby friendly Hospital [All Fields]) OR Baby Friendly Community Initiative OR Rooming in OR Perinatal care OR Postnatal care OR health services OR hospital OR health facility OR health system OR healthcare system OR health program [Index Terms]
4. #1 AND (#2 OR #3)
5. Autobiography [Publication Type]) OR Biography [Publication Type]) OR Case report [Publication Type]) OR Editorial [Publication Type]) OR Guideline [Publication Type]) OR Interview [Publication Type]) OR Letter [Publication Type]) OR Legal case [Publication Type]) OR News [Publication Type]) OR Newspaper article [Publication Type]) OR Personal Narratives [Publication Type]) OR Video-audio media [Publication Type]
6. #4 NOT #5

APPENDIX B

REFERENCES OF STUDIES INCLUDED IN THE SYSTEMATIC REVIEW

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APPENDIX C
LIST OF STUDIES BY STUDY DESIGN

ID #	Study
Randomized controlled trial	
3	Aidam (2005)
4	Ansari (2014)
5	Aksu (2011)
6	Akter (2012)
7	Albernaz (2003)
10	Bashour (2008)
13	Bica (2014)
14	de Oliveira (2014)
15	da Silva (2016)
19	Coutinho (2005)
22	Feldens (2006)
25	Gu (2016)
28	Heidari (2016)
33	Khresheh (2011)
37	Kupratakul (2010)
38	Langer (1998)
39	Leite (2005)
47	de Oliveira (2006)
51	Sharma (2013)
56	Tahir (2013)
66	Vitolo (2005)
69	Wu (2014)
Cluster randomized controlled trials	
8	Arifeen (2009)
9	Azad (2010)
11	Bhandari (2003)
12	Bhutta (2011)
18	Brasington (2016)
23	Flax (2014)
26	Haider (2000)
29	Ijumba (2015)
30	Jakobsen (1999)
34	Kimani-Murage (2016)
35	Kirkwood (2013)
36	Kramer (2001)
40	Lewycka (2013)
44	Morrow (1999)
46	Ochola (2012)
48	Penfold (2014)
50	Rotheram-Borus (2014)
52	Sikander (2015)
57	Talukder (2016)
58	Tomlinson (2014)
60	Tylleskar (2011)
61	Engebretsen (2014)
67	Vitolo (2014)
68	Waiswa (2015)
70	Yotebieng (2015)
73	Hanson (2015)
Quasi-randomized controlled trials	
24	Froozani (1999)
31	Jesmin (2015)
32	Jiang (2014)
42	Lu (2014)
45	Neyzi (1991)
53	Su (2016)
71	Younes (2015)
Nonrandomized controlled trials	
1	Adhisivam (2016)
16	Bich (2014)
17	Bich (2016; referred to as 2015 earlier)
20	Davies-Adetugbo (2005)
21	Dearden (2002)
27	Haque (2002)
41	Li (2015)
43	Malowsky (2016)
54	Susiloretni (2013)
55	Susin (2008)
59	Turan (2003)
62	Valdes (2000)
65	Villadsen (2016)
72	Zeidi (2015)
Cross-sectional (observational) studies	
2	Ahmad (2012)
49	Reinsma (2016)
63	Venancio (2012)
64	Venancio (2016)

APPENDIX D
CHARACTERISTICS OF STUDIES AND INTERVENTION: NONRANDOMIZED CONTROLLED TRIALS AND OBSERVATIONAL STUDIES

Study ID	Study & location	Study design	Participants	Intervention characteristics	Primary outcome assessed? (EBF 6 months)
01	Adhisivam (2016) India	NRSI	Primiparous mothers in post-natal wards of a tertiary hospital	*Health systems and services* Single, video-based health education programme post-natally, reinforced by lactation counsellor CG: standard care	Yes
02	Ahmad (2012) Pakistan	Observational (retrospective cohort)	Mothers breastfeeding after delivery, with at least one previous child	*Health systems and services* Single antenatal counselling conducted in previous pregnancy CG: standard care	Yes
16, 17	Bich (2014) Viet Nam (with Bich, 2016)	NRSI	Wives 7–30 weeks pregnant & their husbands	*Health systems/services, home/family and community settings* Antenatal & post-natal home visits (four visits) + fathers' group counselling sessions + mass media + community mobilization activities CG: standard care	Yes
20	Davies-Adetugbo (2005) Nigeria	NRSI	Pregnant women recruited in third trimester	*Community setting* Training of health staff + formation of community BF support groups CG: health staff not trained	No
21	Dearden (2002) Guatemala	NRSI	LLLG BF counsellors. Pregnant women were recruited for LLLG activities	*Home/family & community setting* Antenatal & post-natal BF promotion & support activities by La Leche League: mother-to-mother support groups (one focus), home visits, community education, referrals. Supported by community liaisons CG: health staff did not receive special training	No
24	Froozani (1999) Iran	Quasi-experimental	Primipara or women unsuccessful with BF in previous child, with healthy FT infant	*Health systems/services & home/family setting* Post-partum BF education programme, with follow-up visits at home or in hospital until 4 months CG: standard care	No
27	Haque (2002) Bangladesh	NRSI	Pregnant women attending maternity centres for delivery	*Health systems and services* Repeated BF counselling post-partum (eight sessions) until 12 months CG: standard care	No
31	Jesmin (2015) Bangladesh	Quasi-experimental	Pregnant, >32 weeks gestation, had FT healthy infant by C/S	*Health systems and services* Post-natal support in the post-operative period by health professionals CG: standard care	No
32	Jiang (2014) China	Quasi-experimental	Primipara with singleton fetus, having mobile phone	*Home/family setting* Weekly SMS on BF from 28th week of pregnancy until 12 months after delivery CG: standard care	Yes
41	Li (2015) China	NRSI	Primiparous women with singleton delivery	*Health systems/services & home/family setting* Perinatal health education course for pregnant women through multimedia lectures, video playback, experiential learning & brochures. Post-partum visits in special circumstances CG: standard care	No
42	Lu (2014) China	Quasi-experimental	Primipara, FT live singleton, intention to BF + rural household registration	*Health systems/services & home/family setting* Health education model of support, skill and self-confidence (3S) + weekly telephone follow-up CG: standard care	Yes
45	Neyzi (1991) Turkey	Quasi-experimental	Primips with vaginal delivery, birth weight >2,500 g	*Health systems/services & home/family setting* Single group BF education session + video on BF practice in hospital post-natally; second session at home on Days 5–7 post-partum. CG: had group session on another topic + home visit not focused on EBF	Yes

(Continued)

Study ID	Study & location	Study design	Participants	Intervention characteristics	Primary outcome assessed? (EBF 6 months)
49	Reinsma (2016) Cameroun	Observational	Mothers 18–50 years & infants 0–8 months residing in study areas	*Health systems and services* Training of nutrition counsellors & integration into existing ante- & post-natal health care services to improve IYCF CG: standard care	No
53	Su (2016) China	Quasi-experimental	Primiparous females with singleton fetus + father in intervention group	*Health systems and services* Single, group education session conducted ante-natally with fathers in intervention group CG: standard care	Yes
54	Susiloretni (2013) Indonesia	NRSI	Pregnant >28 weeks, willing to deliver with village midwife + fathers & other family member	*Health systems & services, home/family & community setting* Multilevel EBF promotion conducted through home visits, advocacy, training & media CG: standard care	Yes
55	Susin (2008) Brazil	NRSI	Couples living together with healthy FT infant, have initiated BF & domiciled in study area	*Health systems and services* Single health education session on BF promotion given to mothers in IG1, mothers + fathers in IG2; plus 18-min video followed by open discussion, & leaflets on BF promotion CG: standard care	No
59	Turan (2003) Turkey	NRSI	Primiparous women	*Community setting* Antenatal group participatory education programme; eight sessions over 1 month CG: standard care	No
62	Valdes (2000) Chile[a]	NRSI	Women delivered at selected facility and exclusively breast feeding on Day 30	*Health systems and services* Post-natal. Monthly counselling & support sessions for working women during well-baby visits CG: standard care, including BF hospital support until Day 30	Yes
63	Venancio (2012) Brazil	Observational	Infants <1 year attending immunization clinics	*Health systems & services* Assessment of effect of BFHI on infant feeding outcomes	No
64	Venancio (2016) Brazil	Observational	Mothers with infants <6 months at clinic visit	*Health systems & services* Evaluation study of BFHI implementation through training & certification of basic health units on infant feeding practicesCG: did not receive intervention elements	EBF < 6 months Continued BF 12 months
65	Villadsen (2016) Ethiopia	NRSI	Pregnant women receiving ANC at study facilities	*Health systems & services* Participatory ANC strengthening intervention in public health delivery system within study area CG: standard care	EBF 1 month
71	Younes (2015) Bangladesh	Quasi-experimental	Women 15–49 years & resident in intervention communities	*Community setting* Participatory learning & action cycle, focusing on health issues for under 5 s including BF promotion. All clusters received health services strengthening initiatives	Yes
72	Zeidi (2015) Iran	NRSI	Primipara recruited at 7–8 months of pregnancy	*Health systems/services* Three hospital-based group educational sessions CG: standard care	No

[a]Chile was classified as LMIC until 2013.

CG: control group; IG: intervention group; NRSI: nonrandomized study of intervention; BFHI: baby-friendly hospital initiative; BF: breastfeeding; EBF: exclusive breastfeeding; ANC: antenatal care; FT: full term; IYCF: infant and young child feeding; C/S: caesarean section; SMS: short message service; LLLG: La Leche League Guatemala.

APPENDIX E
BIAS SUMMARY TABLE FOR RANDOMIZED STUDIES

Study ID	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other sources of bias	Bias judgement
Aidam (2005)	Low	High	High	UC	UC	UC	High
Aksu (2011)	Low	UC	High	Low	UC	UC	High
Akter (2012)	Low	UC	High	UC	UC	UC	High
Albernaz (2003)	Low	Low	Low	UC	UC	UC	Low
Ansari (2014)	Low	UC	UC	Low	Low	UC	Low
Arifeen (2009)	UC	UC	UC	Low	Low	UC	Low
Azad (2010)	Low	High	High	UC	UC	UC	High
Bashour (2008)	Low	Low	Low	UC	UC	UC	Low
Bhandari (2003)	Low	Low	Low	UC	UC	UC	Low
Bhutta (2011)	Low	Low	Low	UC	Low	Low	Low
Bica (2014), de Oliveira (2014), & da Silva (2016)	Low	High	Low	UC	UC	UC	High
Brasington (2016)	UC	UC	UC	UC	UC	UC	UC
Coutinho (2005)	Low	UC	Low	Low	UC	UC	Low
Feldens (2006)	Low	UC	Low	UC	Low	Low	Low
Flax (2014)	Low	UC	Low	Low	Low	UC	Low
Gu (2016)	Low	UC	UC	High	UC	UC	High
Haider (2000)	Low	Low	High	UC	UC	Low	High
Heidari (2016)	UC	UC	UC	UC	UC	UC	UC
Ijumba (2015) & Tomlinson (2014)	Low	High	Low	Low	Low	UC	High
Jakobsen (1999)	UC	UC	UC	High	Low	UC	High
Khresheh (2011)	Low	Low	High	High	UC	UC	High
Kimani-Murage (2016)	Low	High	UC	UC	UC	UC	High
Kirkwood (2013)	Low	High	High	Low	Low	UC	High
Kramer (2001)	Low	Low	High	Low	Low	Low	High
Kupratakul (2010)	Low	Low	UC	Low	Low	Low	Low
Langer (1998)	Low	Low	UC	Low	Low	UC	Low
Leite (2005)	Low	Low	Low	Low	Low	Low	Low
Lewycka (2013)	Low	High	UC	Low	UC	UC	High
Malowsky (2016)	Low	UC	UC	High	UC	UC	High
Morrow (1999)	Low	Low	High	Low	UC	UC	High
Ochola (2012)	Low	UC	Low	High	Low	UC	High
De Oliveira (2006)	UC	High	Low	Low	Low	UC	High
Penfold (2014) & Hanson (2015)	Low	UC	High	Low	Low	Low	High
Rotheram-Borus (2014)	UC	UC	UC	Low	Low	UC	Low
Sharma (2013)	Low	Low	UC	High	UC	UC	High
Sikander (2015)	UC	UC	Low	Low	Low	UC	Low
Tahir (2013)	Low	High	Low	Low	UC	UC	High
Talukder (2016)	Low	Low	Low	UC	UC	UC	Low
Tylleskar (2011) BF[a]	Low	High	Low	Low	Low	UC	High
Tylleskar (2011) U	Low	High	Low	Low	Low	UC	High
Tylleskar (2011) SA	Low	High	Low	High	Low	UC	High
Vitolo (2005)	UC	High	High	Low	Low	Low	High
Vitolo (2014)	Low	UC	Low	UC	UC	UC	Low
Waiswa (2015)	Low	Low	High	UC	Low	UC	High

(Continued)

Study ID	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other sources of bias	Bias judgement
Wu (2014)	UC	UC	High	Low	UC	UC	High
Yotebieng (2015)	Low	Low	UC	Low	Low	UC	Low

Note. UC: unclear.

[a]With Engebretsen (2014).

APPENDIX F

BIAS SUMMARY TABLE FOR NONRANDOMIZED STUDIES OF INTERVENTIONS

Study ID	Bias due to confounding	Bias due to participant selection	Bias in measurement of interventions	Bias due to departures from intended interventions	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of the reported result	Bias judgement
Adhisivam (2016)	Serious risk	Low risk	Low risk	No information	Low risk	No information	Low risk	Serious risk
Ahmad (2012)	No information	No information	Serious risk	No information	Critical risk	Serious risk	Moderate risk	Critical risk
Bich (2014/2016)	Moderate risk	Low risk	Low risk	Low risk	Low risk	Moderate risk	Low risk	Moderate risk
D-Adetugbo (1997)	No information	No information	Moderate risk	Moderate risk	Moderate risk	Serious risk	Low risk	Serious risk
Dearden (2002)	Moderate risk	Moderate risk	Moderate risk	Serious risk	No information	No information	Low risk	Serious risk
Froozani (1999)	Moderate risk	Low risk	Low risk	No information	Low risk	Moderate risk	Moderate risk	Moderate risk
Haque (2002)	No information	Low	Low risk	No information	Serious risk	No information	Low risk	Serious risk
Jesmin (2015)	Moderate risk	Moderate risk	No information	No information	Moderate risk	No information	Low risk	Serious risk
Jiang (2014)	Moderate risk	Moderate risk	Low risk	Low risk	Low risk	Low risk	Moderate risk	Moderate risk
Li (2015)	Moderate risk	Moderate risk	Low risk	No information	Low risk	Low risk	Low risk	Moderate risk
Lu (2009)	Moderate risk	Low risk	Low risk	No information	Low risk	Low risk	Low risk	Moderate risk
Neyzi (1991)	Low risk	Moderate risk	Low risk	No information	Moderate	Low risk	Moderate risk	Moderate risk
Reinsma (2016)	Moderate risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Moderate risk
Su (2016)	Serious risk	Moderate risk	Low risk	Low risk	Low risk	Moderate risk	Moderate risk	Serious risk
Susiloretni (2013)	Moderate risk	Moderate risk	Low risk	Low risk	Low risk	Moderate risk	Low risk	Moderate risk
Susin (2008)	Moderate risk	Moderate risk	Low risk	No information	Low risk	Low risk	Low risk	Moderate risk
Turan (2003)	Moderate risk	Serious risk	Low risk	No information	Moderate risk	Moderate risk	Low risk	Serious risk
Valdes (2000)	Serious risk	Moderate risk	Low risk	No information	No information	Serious risk	Low risk	Serious risk
Venancio (2012)	Moderate risk	Low risk	Low risk	Serious risk	Low risk	Low risk	Low risk	Serious risk
Venancio (2016)	Serious risk	Moderate risk	Moderate risk	No information	Low risk	Low risk	Low risk	Serious risk
Villadsen (2016)	Moderate risk	Low risk	Low risk	Moderate risk	Low risk	Moderate risk	Low risk	Moderate risk
Younes (2015)	Serious risk	Moderate risk	Low risk	Low risk	Moderate risk	Moderate risk	Moderate risk	Serious risk