

Using a Mobile Health Application by Peer Counselors to Promote Exclusive Breastfeeding in Rural India - A Training Curriculum

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Research Article

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Abstract

Background: Despite strong evidence about the benefits of exclusive breastfeeding (EBF), rates have remained relatively unchanged over the past two decades in low-middle income countries. One strategy for increasing EBF is through community-based programs that use Peer Counselors (PCs) for education and support. The use of mobile health (mHealth) applications is gaining increasing applicability in these countries.

Research Aim: The present article describes our curriculum in the state of Karnataka, India for supporting new mothers to exclusively breastfeed using an mHealth application in rural India.

Methods: Twenty-five women from the community were trained to be PCs and to use an mHealth application to conduct breastfeeding counselling. The three-day training was based on the WHO breastfeeding course, translated and adapted to the local culture. The curriculum was validated by twelve nursing and obstetric experts. Pre-post evaluation of breastfeeding knowledge, self-efficacy, and skills were evaluated with a 30 item survey. Usability of the mHealth application was assessed post-training with a Usability Scale for Mobile Breastfeeding Education App.

Results: We observed a significant increase in the mean scores for knowledge ($P < .0001$) and skills ($P = .0006$) from pre to post training. Age of the PCs and their own breastfeeding experience correlated significantly with the acquisition of knowledge and skills. The mHealth app showed high usability scores.

Conclusions: The culturally adapted curriculum was effective in training women from a rural setting in the acquisition of EBF knowledge and skills and in the use of an mHealth application to support their training.

Plain English Summary

Exclusive breastfeeding (EBF) provides significant health benefits to newborns and infants, however, rates of EBF around the world, and in India particularly, are less than optimal. An effective strategy for increasing EBF is the use of peer counselors (PCs) to educate and support mothers. The use of mobile health (mHealth) applications (apps) on smartphones can provide PCs with additional resources for working with breastfeeding women.

Appropriate training for PCs is a critical first step in implementing programs focused on EBF with mHealth apps. We adapted the WHO's breastfeeding curriculum to the local culture and trained 25 rural mothers with prior breastfeeding experiences to serve as PCs. The three-day training included interactive lectures, demonstrations, case-based learning, and role-playing. PCs were provided with a branded BEST4Baby kit with contents to support their in-home counseling with mothers: We evaluated PCs on knowledge, self-efficacy, counseling skills, and usability of the mHealth app with a 30-item survey, adapted from the literature to reflect curriculum content and validated in advance. In comparing pre and post training scores, the PCs had significant improvement in knowledge, counselling and skills; the mHealth app was found to be highly usable.

A comprehensive review of the peer counselor training protocols and breastfeeding peer support programs revealed a wide divergence of content, type, tools, and aids as well as training duration, and type of curriculum used; few details were provided regarding the training content. Our study begins to fill this gap by providing information about such training for other programs.

Background

Exclusive breastfeeding (EBF) practices significantly decrease mortality and morbidity in children less than five years of age, resulting in improved child survival and health [1,2]. EBF during the first six months of life can reduce infant mortality by preventing diarrhea and acute respiratory infections [3]. Increasing the rate of EBF in the first 6 months of life to at least 50% is one of the six World Health Organization (WHO) global nutrition targets for 2025 [4].

Global rates of optimal breastfeeding practices, especially EBF, have remained stagnant over the past two decades both in India and other low- and middle-income countries (LMICs), with only one in three infants under 6 months being exclusively breastfed [3]. The most recent India National family health survey (NFHS) found that for the first six months of life, 56.4% of infants in Karnataka, India were exclusively breastfed [5]. Achieving EBF requires a multi-pronged approach that involves both health care providers and policy makers, along with community participation and support [6,7].

One strategy for increasing EBF is the use of community-based programs that use peer counselors to educate and support mothers. Such programs have shown to be effective in increasing initiation and duration of breastfeeding in diverse populations and settings, including LMICs. Successful peer counselor programs have been shown to address diverse health-related problems, including HIV prevention,

immunizations, alcohol use, and depression in several LMICs. [8,9,10,11,12,13,14,15,16,17,18]. Effective training of peer counselors is a crucial prerequisite for the success of such programs.

Mobile health (mHealth) applications (apps) use mobile devices such as smartphones or handheld mobile tablets to enhance teaching, collaboration, and provision of medical care [19]. Such mHealth apps are increasingly popular as a way to reach rural populations in LMICs that have strong internet access capability [20,21,22]. Because such access is commonly available in India, mHealth-based programs have the potential to provide scalable public health interventions [23].

There is evidence that mHealth-supported community programs can improve behaviors of Indian mothers, including the uptake of health services among pregnant and breastfeeding women with HIV [24]. A recent meta-analysis of studies conducted in six countries suggested that mHealth may be associated with improved maternal breastfeeding attitude, knowledge, and initiation, and EBF duration [25]. Two additional reviews found evidence of positive results on EBF and other neonatal and maternal outcomes but stressed the need for both strong research methods and personalized contact [26]. It remains unknown, though, whether utilizing mHealth platforms to enhance peer counselor efforts is effective at improving infant feeding behaviors of mothers in India.

As part of an NIH-supported research project, we adapted the WHO's breastfeeding curriculum to the local culture and trained rural mothers with prior breastfeeding experiences to serve as breastfeeding Peer Counselors (PCs). The training prepared them to counsel and support antepartum and postpartum mothers around the topic of EBF and infant feeding. To maximize the utility of the peer counselors, we designed the delivery of training content via a mHealth app on a Samsung Android tablet. The present article describes our curriculum in the state of Karnataka, India for supporting new mothers to exclusively breastfeed. The Ethics Committee of the Jawaharalal Nehru Medical College from Belagavi, India approved the conduct of our work.

Peer Counselor Training Curriculum

Using the results of qualitative research that we conducted through focus group discussions, we adapted the World Health Organization's breastfeeding counseling course and Haider and colleagues' breastfeeding PCs training module to the cultural setting of the southern Karnataka state in the Kannada language [27,28,8]. Local breastfeeding situation and misconception and dangers of use of top feeding were incorporated in the curriculum since the results of our formative research described mixed practices about prelacteal and supplemental feeding, reflecting older, traditional views. Names and figures in the module were based on how women looked and spoke in local communities. The involvement of the mother-in-law was added, as well as specifics about cultural practices such the use of tim tim (herbal drops) and guti (locally made gruel mixtures). The research staff were experienced in the content area and are designated as national breastfeeding trainers in India; additional guidance was sought from twelve nursing and obstetric experts for the development of the curriculum.

Fifty-six potential peer counselors were identified by staff from five Primary Health Centers (PHCs) and 25 were selected who met the inclusion criteria of (1) residing in the local community; (2) having breastfed within the past 5 years; (3) having at least 10 years of formal education; (4) having an available mobile phone; (5) being familiar with operating an Android phone; and (6) being able to read, write, and communicate in the local language.

A three-day peer counselor training was conducted in the local language at the academic health center. Two days were dedicated to breastfeeding education. The last day was dedicated to a half-day on the use of the mHealth app with the remaining time for protocol training and skills assessment. Pedagogy across the three days included interactive lectures, demonstrations, brainstorming sessions, case-based learning, and role-playing.

Training materials comprised a branded BEST4Baby kit with the following contents to support in-home breastfeeding counseling sessions with new mothers:

- Life-size newborn doll to demonstrate positioning;
- A skin-colored sock to prepare breast model for demonstrating proper latching;
- A digital scale for weighing and to assess the growth of the infant;
- A nipple plunger to mitigate the problem of an inverted nipple;
- A Samsung Android tablet with BEST4Baby app pre-loaded with wireless service and secured to allow for its sole use with the app.

Training content included four key components: breastfeeding knowledge, counseling and communication skills, the use of the BEST4Baby app, and familiarity with overall peer counselors' responsibilities for each of the nine visits in the protocol for expectant or new mothers. Each session's learning objectives, the learning strategies, and the evaluation process were predefined. The curriculum was designed to educate peer counselors for delivering timely information related to the mother's stage of gestation (e.g., antepartum at 28-32 weeks and

32-36 weeks) and the infant's age (e.g., postpartum at 1-3 days, 15 days, 1 month, 2, 4 and 6 months) during nine home visits to provide support to the first time mothers to exclusively breastfeed. Tables 1 and 2 provide specific information about the curriculum content.

The BEST4Baby app was designed to reinforce training by allowing peer counselors to use the device during and after the training sessions and while in the field. The design of the app was included a step-by-step guide for each of the visits to cover relevant topics for that particular visit. The peer counselors were given the opportunity to use the app, including the process of logging in, scheduling visits, and practicing each visit. Time was allotted to interactively practice the content of the training modules incorporated in the app.

We evaluated participants in the breastfeeding training curriculum on knowledge, self-efficacy, skills in counseling, and usability of the mHealth application. These skill sets were evaluated employing a 30 item survey, adapted from the literature, to reflect curriculum content, validated in advance by twelve nursing and obstetric content experts [29,30]. The survey contained 20 knowledge items (e.g., colostrum is the first breast milk; breastfeeding helps in mother and child bonding); three counseling items (e.g., mother has a complaint about something that you, as a peer counselor, know little about. how do you respond?); two self-efficacy items (e.g., how confident are you in your ability to address mother's concerns about breastfeeding?) and five observational skill items (e.g., is the infant correctly positioned?). Possible scores ranged from 0 to 20 on knowledge, 0-3 on counseling, 0-8 on self-efficacy, and 0-10 on skills subscales. At the end of the training, we also evaluated the usability of the app, using a modified System Usability Scale, a simple, widely available 10-item survey based on a 5-point Likert scale [31]. In addition to descriptive statistics, we ran mixed-effect linear regression models to assess pre-post training changes.

The 25 peer counselors had an average age of 29 years (SD 4.4; range 23-40), 88% were married for an average of 11 years; 56% had attended at least 11-16 years of school and 76% had some form of formal work experience. Mean scores significantly improved from pre- to post-training on the breastfeeding knowledge ($p < .0001$), counseling ($p = .0006$), and skills ($p = .0006$) modules. Scores on the self-efficacy module did not change significantly. After the half-day training, scores on the Peer Counselor Usability Scale for the app were found to be highly usable, with the 25 peer counselors reporting an average score of 87.5 (SD ± 8.2 ; range 72.5-100).

Conclusion

This study described and evaluated a new training curriculum for peer counselors to support breastfeeding practices with effective counseling and a mHealth app. Results demonstrated that the training curriculum was effective in significantly increasing the acquisition of PC's knowledge, counseling, communication skills, and the ability to use the mHealth app.

Despite not having substantial prior knowledge and training in breastfeeding counseling, PC's obtained their skills through focused training, interactive pedagogy, and support to effectively perform their counseling tasks. Limited literature is available describing training curricula for peer counselors to promote breastfeeding within the local context. A comprehensive review of the peer counselor training protocols and breastfeeding peer support programs revealed a wide divergence of content, type, tools, and aids as well as the duration of the training, and type of curriculum used; in several studies, few details were provided regarding the training process [32].

Effective training and support of peer counselors is a crucial step in ensuring the success of community-based peer support programs and is one of the proven effective strategies for increasing breastfeeding initiation and duration [33, 34, 35]. Our work highlights the need for a standardized training program and the development of training tools/aids, as well as the utilization of a mHealth app to support the implementation of a peer counselor breastfeeding program. Similar to this study, all training must be adapted to local needs, provide up-to-date scientific information, and ensure skills development.

Peer counseling training programs cited in earlier studies have used different modules and curricula for training (see examples in [34]). A systematic review and meta-analyses examined the effectiveness of community-based peer counseling on breastfeeding practices and found that most of the studies conducted in both developed and developing countries, employed the WHO/UNICEF breastfeeding manual/course for peer counselor training [34]. Our curriculum had three key components: improving breastfeeding knowledge, counseling and communication skills, the use of a specially designed mHealth app, and elucidation of the peer counselors' responsibilities during each of the nine visits to expectant or recently delivering mothers. While there exist varying modules for expanding breastfeeding knowledge and skills, we believe this to be among the first curricula which incorporate a specific mHealth app to enhance the impact of peer counselor training on breastfeeding practices within a nine-visit breastfeeding intervention that provides "just-in-time" information to mothers.

To our knowledge, a mHealth app for use by Peer Counselors to support lactation counseling has not been previously reported. Breastfeeding apps have been developed for use by mothers and support networks including fathers [21, 22, 36]. The BEST4Baby mHealth app was specifically designed to provide a step-by-step guide for the peer counselors to conduct each of nine visits and provide relevant content at each visit. Building the content for the mHealth app and training women having limited experience with smartphone usage were among the greatest challenges in implementation.

Our work highlights the value of developing a structured, effective training curriculum for peer counselors in implementing a community-based breastfeeding initiative. Apart from facilitating acquisition of knowledge and skills, the training also provided the peer counselors with the ability (self-efficacy) to interactively use the mHealth app to support the BF program. The curriculum recognizes the importance of a mHealth app in implementing the program and ensuring adherence to the intervention protocol. The long-term impact of such PC training on breastfeeding practices needs further study and ideally should be evaluated in diverse settings employing a larger group of peer counselors. The implementation fidelity of the training curriculum requires further validation.

Declarations

Ethical Approval and Consent to Participate

Ethics Board approval was obtained from KLE University in India and Thomas Jefferson University in the United States. Informed consent was obtained from all participants.

Consent for Publication

All authors have consented to this publication.

Availability of Data

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests with any sponsoring organization or for-profit interests represented, discussed, or implied in the article text.

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Authors' Contributions

RB, NM, and UC have all made substantial contributions to the conception of the work, the design and implementation of the training curriculum, and the analysis and interpretation of data;

TM, YW, VS and KC have contributed to the analysis and interpretation of data, as well as the creation of software used in the work

PL, FJ, PJK, SG and RD have all contributed to the drafting and revising of the work.

GW and CK have made substantial contributions to implementation of the training curriculum and the acquisition of the data.

All authors have read and approved the submitted version and have agreed to be personally accountable for their own contributions and for any questions related to the accuracy and integrity of all parts of the work.

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Tables

Table 1. Peer counsellor training content

Session	Day 1	Time
1	Registration; consent form signing; pre-test	30 min
2	Introduction Importance of breastfeeding and recommended practices <ul style="list-style-type: none"> - Benefits of exclusive breastfeeding for 6 months - Benefits for the mother - Benefits for the child - Benefits for the family - Recommended practices - How breastfeeding works - 	1 hour
3	- Local breastfeeding situation and misconception	1 hour
4	Importance of Early initiation of EBF and pregnancy counselling	30 min
5	Demonstration of correct positioning and attachment <ul style="list-style-type: none"> - Helping mothers hold the infant appropriately, with proper positioning - Recommended rules of correct attachment - Results of poor attachment - How to produce sufficient milk - How mother will understand that the infant is getting enough milk - 	30 min
6	Breastfeeding video and explanation	45 min
7	Expression of breast milk – Demonstration and practice	45 min
Day 2		
8	Review of day 1 training	1 hour
9	Care of pregnant and lactating mothers and family planning <ul style="list-style-type: none"> - Mother's food and rest during pregnancy - Iron tablets - Check-up - Delivery related information - Family planning - 	30 min
10	Counselling skills with demonstration	1 hour
11	Counselling in pregnancy and role play (by the participants)	1 hour
12	Counselling in breastfeeding mother and role play	1 hour
13	Common breastfeeding difficulties and role play	2 hour
14	Review and clarification	90 min
15	Peer counsellor responsibilities and practical training sessions	1 hour

Day 3		
16	App training with study protocol training	3 hour
17	Protocol review	3 hour
18	Post test	30 min

Table 2: Peer counselor training curriculum

Day Session	Content	Learning Objectives	Learning Activity	Evaluation
Day 1: Session 1-4	Breastfeeding knowledge	Importance of breastfeeding and recommended practices Local breastfeeding situation and misconception Importance of Early initiation of EBF Care of Pregnant and Lactating Mothers and Family Planning	Brain storming Case based Interactive lectures	Pre and post questionnaire
Day 1: Session 4-7	Breastfeeding skills	Demonstration of correct positioning and attachment Assessment and observation of breastfeeding Expression of breast milk	Demonstration and practice with breastfeeding model and doll Breastfeeding video Assessment and observation of breastfeeding in real patients using the WHO Breastfeeding observation form	Pre and post questionnaire with LATCH* criteria
Day 2 Session 8-9	Counseling skills during visits Breastfeeding mothers and mothers with breastfeeding problems	Understand counseling skills - - Learning and listening - - Confidence building and helping skills - - Using non-verbal and verbal technics to encourage mother to talk	Demonstration Interactive lecture /Brain storming case scenarios/role play of different scenarios Practice sessions -counseling sessions of real mothers in the postnatal ward Debriefing/ reflections	Pre and post Questionnaire
Day 2: Session 10	Peer counseling training	Understand responsibilities of peer counselors at each visit	Interactive lecture Role plays	
Day 3 Session 11	Use of Mhealth app	Understand usage and application of mobile app Study protocol training	Interactive lecture Demonstration and Practice	Peer Counselor Usability Scale for Breastfeeding Education App

*LATCH= "L" = how well the infant latches onto the breast; "A" = amount of audible swallowing noted; "T" = mother's nipple type; "C" = mother's level of comfort; "H" amount of help the mother needs to hold her infant to the breast.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [CTRIRegistrationBEST4BabyStudyAugust232017.pdf](#)