

# mHealth interventions to improve self efficacy and exclusive breastfeeding: a scoping review

**O**ptimal breastfeeding practice is essential and could reduce the under-5 mortality rate (World Health Organization (WHO), 2021). Breastfeeding is reported to be the 'highest impact intervention' potentially capable of preventing up to 823 000 child deaths annually, particularly in low- and middle-income countries (Rollins et al, 2016). Breast milk is considered the best source of nutrition for most infants. Nevertheless, the average global rate of exclusive breastfeeding between 2015 and 2020 was approximately 44% (WHO, 2021).

Several factors are known to influence exclusive breastfeeding, including maternal age, race, marital status, multiparity and socioeconomic factors (Pineda, 2011). Women may experience barriers to early breastfeeding initiation as a result of an infant's health condition (Dian Isti Angraini, 2016), sore nipples (Delvina et al, 2022) or returning to work (Asrina et al, 2022). Women may also believe that the infant does not like breastmilk (Wu et al, 2020) or experience difficulties transitioning from expressing breast milk to breastfeeding. They may be concerned that their infant will contract a maternal illness or experience perceived or actual breast milk supply deficiencies. Pacifier use (Mamemoto et al, 2013), separation from the infant (Oliveira and Valle Volkmer, 2021) and low breastfeeding self-efficacy (Siqueira et al, 2023) are also known to play a role in exclusive breastfeeding rates.

## Breastfeeding self-efficacy

Breastfeeding self-efficacy plays an important role in maintaining maternal confidence in breastfeeding and is significantly related to positive breastfeeding outcomes. Therefore, developing women's self-efficacy is likely to improve exclusive breastfeeding practice (González et al, 2013). Self-efficacy is defined as a mother's assurance of her ability to breastfeed her infant (Akyıldız and Bay, 2023), which can be measured using a breastfeeding self-efficacy scale (Dennis, 2006). Breastfeeding self-efficacy can significantly predict breastfeeding duration and exclusivity among women in the

## Abstract

**Background/Aims** The exclusive breastfeeding rate in developed and developing countries is low, and is significantly affected by maternal breastfeeding self-efficacy. Mobile health (mHealth, using mobile devices to carry out public health interventions) may help increase self-efficacy and exclusive breastfeeding. The aim of this study was to explore the existing literature on mHealth interventions to increase self-efficacy and exclusive breastfeeding.

**Methods** This scoping review included an electronic search of PubMed, Science Direct, ProQuest, Google Scholar and IJSR. Randomised controlled trials and quasi-experimental studies published in English between 2014 and 2023 about breastfeeding self-efficacy and exclusive breastfeeding were screened for eligibility.

**Results** Overall, 12 studies were included. Thematic analysis showed that primary interventions were delivered using smartphone applications such as WhatsApp, Telegram or video, and most participants were women with infants of normal birth weight.

**Conclusions** Delivering breastfeeding education using mHealth may increase self-efficacy and exclusive breastfeeding. Further research is needed to assess the effects of mHealth on breastfeeding self-efficacy and exclusive breastfeeding among women with infants who have health conditions, such as those born preterm or of low birth weight.

## Keywords

Breastfeeding self-efficacy | Exclusive breastfeeding | mHealth

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immediate postpartum period (McCarter-Spaulding and Dennis, 2010; He et al, 2022). It has also been linked to breastfeeding behaviour (Glassman et al, 2014), practice (Parmar and Viswanath, 2018), satisfaction (Awaliyah et al, 2019), and breast milk production (Wormald et al, 2021).

Ngo et al (2019) reported that breastfeeding self-efficacy is associated with several factors, including maternal age, occupation, breastfeeding experience, type of birth, skin-to-skin contact with the infant and extent of breastfeeding. Factors that have been found to negatively affect breastfeeding self-efficacy include difficulty latching, perceived lack of supply (Li et al, 2022), type of birth, maternal and neonatal complications, hospital routine, time and duration of mother–newborn attachment and lack of support (Gerçek et al, 2017), particularly from relatives (Rodríguez-Gallego et al, 2022).

### Impact of the pandemic

The COVID-19 pandemic reportedly affected breastfeeding education and demonstrations (Hu et al, 2022). Hospital restrictions reduced services in maternal rooms, including therapy, lactation consultations and social work (Yesil et al, 2023).

As a result of the reorganisation of service delivery, parents reported concerns for their infants' wellbeing, parent–infant bonding, confidence in breastfeeding, access to healthcare providers and the ability to breastfeed during the pandemic (Garfield et al, 2021). It has also been reported that parents struggled to obtain support, and experienced multiple breastfeeding barriers and cessation of breastfeeding as a result of social restrictions (Brown and Shenker, 2021). As a measure to counter these ongoing concerns, the use of online media and in-person services may improve breastfeeding self-efficacy and exclusive breastfeeding (Sakalidis et al, 2022).

### Mobile health

Mobile health (mHealth) is the practice of using mobile devices to provide health interventions and is widely used to promote health and share health education. mHealth enables users to access information easily and reduces the frequency of hospital visits (Xu and Long, 2020). The fast access to health information and direct communication that the use of technology facilitates could be of particular use in low- and middle-income countries (Marcolino et al, 2018). mHealth media literacy education programmes can be used to share breastfeeding information with

women through web-based education programmes or smartphone applications (Azis et al, 2021).

A number of systematic reviews have explored health education to improve breastfeeding self-efficacy (Brockway et al, 2017; Ghasemi et al, 2019; Maleki et al, 2021; Hubschman-Shahar, 2022; Seddighi et al, 2022a) and exclusive breastfeeding practice (Olufunlayo et al, 2019; Buckland et al, 2020; Gavine et al, 2022). However, these studies varied in the type of education media used and the population studied. In addition, education media used in previous studies may not have been suitable for use during the pandemic, where healthcare providers were limited in their ability to provide direct education.

To the authors' knowledge, no published scoping and systematic review has been carried out to explore the effect of mHealth interventions on breastfeeding self-efficacy and exclusive practice. This review's aim was to explore the empirical literature on mHealth interventions to improve breastfeeding self-efficacy and exclusive practice, and in particular, to identify the types of intervention used and the populations involved.

## Methods

The electronic search was carried out in September 2022, using the population/problem/patient, intervention, comparison, outcome and study design strategy. The primary source of literature was online databases, including Google Scholar, IJSR, ProQuest, PubMed and Science Direct. Arksey and O'Malley's (2007) framework was used to guide the review process. The research question was 'what is the empirical literature on the effects of mHealth interventions on improving breastfeeding self-efficacy and exclusive breastfeeding practices?'

### Search methods

The five stages of the scoping review were identifying the research question, identifying relevant studies, selecting the studies, charting the data and then collating, summarising and reporting the results. This study used the population/participant, concept and context approach, in which the participants were women who breastfed, the concepts were mHealth, breastfeeding self-efficacy and exclusive breastfeeding, and the context was developed and developing countries.

The search phrases used are shown in *Box 1*. Relevant articles from the online databases were selected based on the inclusion criteria and screened for duplication using Mendeley. The inclusion criteria selected randomised controlled trials and quasi-experimental studies published from 2014 to 2023 in English that used mHealth to deliver breastfeeding promotion, and included breastfeeding self-efficacy and exclusive breastfeeding practice as the study outcomes. Inaccessible articles and those where the full text was not available were excluded.

#### Box 1. Search terms

'Exclusive breastfeeding' AND 'mHealth' AND 'social media education' AND 'infant' AND 'breastfeeding self-efficacy' AND 'randomized controlled trial' AND 'quasi experiment'.

The full-text articles were downloaded and a standardised data form used to extract the author(s), year of publication, country, design, setting, interventions, respondents, time of measurement and main outcomes.

### Search outcomes

A total of 827 references and 30 full-text articles were screened and subjected to quality assessment, with 12 articles meeting the criteria for inclusion (Figure 1). A summary of the included articles is shown in Table 1.

Four of the studies were conducted in Iran, three in Turkey, one in Myanmar, one in Malaysia, one in Brazil, one in Sweden and one in Australia. For each included study, two researchers independently extracted the data using Microsoft Excel (Beggs et al, 2021) and assessed the validity and quality. Each researcher's work was verified by the other. Disagreements between the two researchers were discussed and resolved to reach a consensus. The quality of the articles was not assessed based on the nature of the scoping review methodology (Arksey and O'Malley, 2007).

### Synthesis

Thematic analysis was used to identify key elements of the reviewed studies. Two researchers independently reviewed the articles to identify the key themes until a consensus on coding themes was reached. Key themes were added to the extraction tool, and each paper was assigned a key theme and sub-themes. The researchers discussed the final themes and sub-themes after all articles were coded (Beggs et al, 2021). The themes examined the types of article, participants, measured variables, setting and types of mHealth.

### Results

A total of 12 articles were included. The measured variables were breastfeeding self-efficacy (Chaves et al, 2019; Mohammadian et al, 2021; Seyyedi et al, 2021; Uzunçakmak et al, 2021; Seddighi et al, 2022b; Pilus et al, 2022; Dağlı and Topkara, 2022; Akyildiz and Bay, 2023; Hmone et al, 2023) and exclusive breastfeeding (Gallegos et al, 2014; Ericson et al, 2018; Taheri et al, 2022).

### Setting

The research settings included hospitals (Ericson et al, 2018; Chaves et al, 2019; Mohammadian et al, 2021; Taheri et al, 2022; Uzunçakmak et al, 2022; Akyildiz and Bay, 2023; Hmone et al, 2023), clinics (Pilus et al, 2022) and community centres (Gallegos et al, 2014; Seyyedi et al, 2021; Dağlı and Topkara, 2022; Seddighi et al, 2022b).

### Types of mHealth

The studies used a range of different methods to communicate education material. Two used text

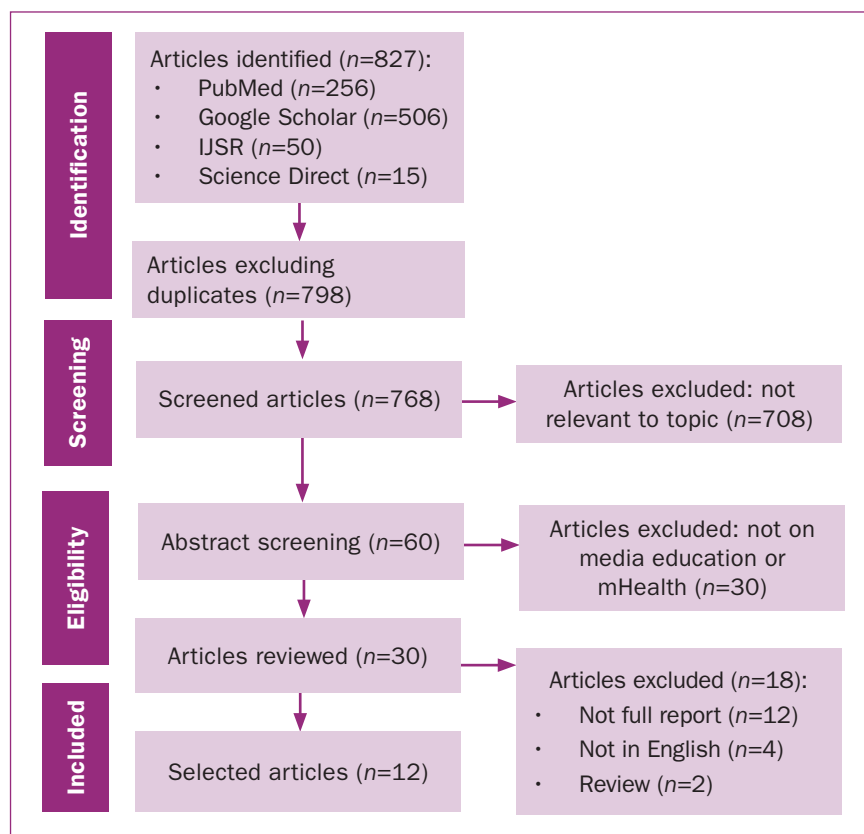


Figure 1. PRISMA flowchart for article selection

messaging (Gallegos et al, 2014; Hmone et al, 2023), one used video calls (Akyildiz and Bay, 2023), one used WhatsApp (Uzunçakmak et al, 2022) and three used smartphone applications (Seyyedi et al, 2021; Chaves et al, 2022; Seddighi et al, 2022b). Others combined face-to-face contact with WhatsApp (Pilus et al, 2022) or smartphone-based methods (Ericson et al, 2018; Mohammadian et al, 2021; Taheri et al, 2022). Dağlı and Topkara (2022) used a combination of telephone calls and text messaging.

The intervention duration ranged from 2 weeks to 6 months. Three studies carried out interventions over 2 weeks (Ericson et al, 2018; Mohammadian et al, 2021; Akyildiz and Bay, 2023), one lasted 4 weeks (Uzunçakmak et al, 2022), three were carried out over 8 weeks (Gallegos et al, 2014; Pilus et al, 2022; Seddighi et al, 2022), one over 2 months (Chaves et al, 2019), one over 3 months (Seyyedi et al, 2021), and three over 6 months (Dağlı et al, 2022; Taheri et al, 2022; Hmone et al, 2023).

### Participants

Three studies were carried out with primiparous women (Chaves et al, 2019; Seyyedi et al, 2021; Dağlı and Topkara, 2022), two with nulliparous women (Uzunçakmak et al, 2021; Taheri et al, 2022), and five involved multiparous women (Gallegos et al, 2014; Ericson et al, 2018; Akyildiz

**Table 1. Summary of included studies**

Study	Methods	Intervention	Participants	Setting	Key findings
Gallegos et al (2014)	Non-concurrent prospective comparison trial	Automated text message, lasted 8 weeks	Multiparous women	Australia	Positive impact on breastfeeding behaviours, mothers more likely to continue exclusive breastfeeding ( $P<0.001$ )
Ericson et al (2018)	Randomised controlled trial	Person-centred proactive telephone support, lasted 2 weeks	Multiparous women with preterm infants	Sweden	No difference between groups in exclusive breastfeeding, maternal satisfaction, attachment or quality of life. Intervention group reported significantly less stress
Chaves et al (2019)	Randomised controlled trial	Telephone intervention, monitored until infants were 2 months old	Primiparous puerperal women	Brazil	Self-efficacy significantly increased in intervention group at 4 months ( $P=0.011$ ). Duration significantly increased in intervention group at 2 months ( $P=0.035$ )
Mohammadian et al (2021)	Randomised controlled trial	Continuous telephone counselling, lasted 2 weeks	Women with preterm infants	Iran	Self-efficacy significantly higher after intervention, 4 months after discharge ( $P=0.001$ )
Seyyedi et al (2021)	Randomised controlled trial	Smartphone intervention, monitored until infants were 3 months old	Primiparous women	Iran	Self-efficacy significantly increased in intervention group ( $P<0.001$ )
Dağlı and Topkara (2022)	Randomised controlled longitudinal trial	Tele-education, monitored until infants were 6 months old	Primiparous women	Turkey	Self-efficacy significantly higher in intervention group ( $P<0.05$ )
Pilus et al (2022)	Two-arm, parallel, single-blind, cluster randomised controlled trial	Face-to-face and WhatsApp health education, lasted 8 weeks	Primigravida or multigravida women	Malaysia	Self-efficacy significantly higher in intervention group at 8 weeks ( $P<0.001$ )
Seddighi et al (2022b)	Convenience and random block sampling	Mobile-based training, lasted 8 weeks	Women with low birth weight infants	Iran	Self-efficacy significantly increased after intervention ( $P<0.001$ )
Taheri et al (2022)	Randomised controlled trial	Distance education, monitored until infants were 6 months old	Nulliparous women	Iran	Prevalence of exclusive breastfeeding at 6 months significantly higher in intervention group ( $P=0.028$ )
Uzunçakmak et al (2022)	Randomised controlled trial	Social media support, lasted 4 weeks	Primiparous women	Turkey	Self efficacy significantly higher in intervention group at 3 and 6 months ( $P<0.05$ )
Akyildiz and Bay (2023)	Randomised controlled trial	Video calls, lasted 2 weeks	Multiparous women	Turkey	Self-efficacy significantly higher in intervention group at 2 weeks ( $P=0.007$ ) and 1 month ( $P=0.001$ )
Hmone et al (2023)	Randomised controlled trial	Text message intervention, monitored until infants were 6 months old	Multiparous women in late pregnancy	Myanmar	Breastfeeding self-efficacy significantly increased in intervention group ( $P=0.030$ )

and Bay, 2022; Pilus et al, 2022; Hmone et al, 2023). One study was carried out specifically with women

with preterm infants after discharge from the neonatal intensive care unit (Mohammadian et al, 2021) and one

involved women with low birth weight infants (Seddighi et al, 2022b).

## Discussion

This scoping review examined the existing empirical literature on mHealth interventions to increase breastfeeding self-efficacy and exclusive breastfeeding practice. The review highlighted that self-efficacy is a modifiable factor that can influence exclusive breastfeeding practice.

Technology has been incorporated into health education programmes to deliver computer- and telephone-based breastfeeding education (Joshi et al, 2016; Dodou et al, 2021; Lewkowitz and Cahill, 2021). These programmes can provide online antenatal education (Grassley et al, 2017), through the use of social networks (Cavalcanti et al, 2019), smartphone applications (Griffin et al, 2021) and social media (Conrad et al, 2020).

Many of the articles included in the present review described smartphone-based breastfeeding education interventions. Smartphones are widely used in health promotion interventions as their use is now commonplace. Smartphone applications can empower individuals to actively contribute to the treatment process, increase awareness of the need to optimise their health and minimise health costs (Wahyudi and Rahman, 2019). Smartphone-based interventions thus provide excellent opportunities for breastfeeding education (Azis et al, 2021). Applications that involve learning activities designed to increase breastfeeding knowledge can facilitate independent learning in women, helping them feel more confident about breastfeeding their infants (Surianee Ahmad et al, 2020).

Social media is widely used for social communication and sharing information and can affect people's behaviour (Uwalaka and Nwala, 2020). WhatsApp can be used to provide easily accessible education to support breastfeeding (Lok et al, 2022). A WhatsApp group can also be a forum for network building, providing a space for mothers to share knowledge and experiences of breastfeeding and complementary feeding (Putri et al, 2020). WhatsApp's effectiveness has been established in increasing knowledge among parents (Manav et al 2021), providing breastfeeding peer support (Fan et al, 2022) and allowing midwives to provide breastfeeding support (Yurtsal and Hasdemir, 2022). However, it is important to consider the platform used when introducing mHealth to maternity services. For example, Ghaffari et al (2017) found that providing education for women through the social network Telegram, the most popular network among Iranian people was well received by their participants.

Breastfeeding education can be provided via videos and infographics. Health education and counselling

require media that incorporate different narratives and entertainment–education media, to increase community members' knowledge (Adam et al, 2021). Animated videos are engaging and often easier for viewers to recall, thus helping women to retain information (Aisah et al, 2021). Video-based training and educational media may also increase breastfeeding knowledge and overall training effectiveness among breastfeeding peer counsellor groups (Monoto and Alwi, 2018). Additionally, videos can be used to improve health professionals' breastfeeding knowledge, attachment support and confidence in positioning and teaching hand expression skills (Wallace et al, 2018).

Combining an educational video with simple illustrations, expressive images and complementary text in accessible languages contributes to raising awareness and changing behaviour. Tonel et al (2023) asked respondents to provide feedback on an educational video, and reported that the use of lines, colours and images that aligned with textual information was an essential tool in educational technology for reducing the knowledge gap between nursing and the target audience.

It was notable that almost all studies in the present scoping review included only normal-weight infants; only one study recruited women with low birth weight infants. As women with low birth weight infants are less likely to exclusively breastfeed (Hallowell et al, 2016), there is a need for health education to increase self-efficacy and exclusive breastfeeding in this population. Disruption to woman–infant bonding can begin while in hospital; physical separation when infants are in the neonatal care unit delays suckling and negatively impacts the release of breast milk (Siqueira et al, 2023). Therefore, direct education is crucial to build woman–infant attachment (Uzunçakmak et al, 2022).

## Implications

A variety of mHealth interventions have been used as effective tools in health promotion to educate and support women to breastfeed. Healthcare professionals can use mHealth to improve breastfeeding self-efficacy and exclusive breastfeeding practice, particularly in cases of physical restrictions, such as during the COVID-19 pandemic. Healthcare professionals should consider this to improve overall breastfeeding and exclusive breastfeeding duration by providing health education to support these practices. They should be trained in guided self-efficacy theory, to allow them to provide relevant breastfeeding education and increase women's self-efficacy. Educational media can be used during pregnancy and through to the postpartum period to educate women and their family members (Wong et al, 2021).

## Key points

- Higher breastfeeding self-efficacy is known to predict longer exclusive breastfeeding practice.
- mHealth interventions are popular and effective tools for delivering breastfeeding education.
- A variety of mHealth interventions can be used to provide education to improve breastfeeding self-efficacy and exclusive breastfeeding.
- Most breastfeeding mHealth interventions have been developed for normal weight infants. There are few interventions targeted specifically at populations at risk, such as low birth weight infants.

## Conclusions

mHealth interventions can be used to increase exclusive breastfeeding practice, through the use of texts, videos, social media and smartphone applications. Promoting breastfeeding education using mHealth benefits women, infants and healthcare providers.

These interventions can be used to promote continuous breastfeeding education in maternal and neonatal services, particularly among women known to experience lower rates of breastfeeding, such as those with infants of low birth weight. Further studies should develop a comprehensive breastfeeding mHealth platform, involving various health disciplines, to provide high-quality information to increase breastfeeding self-efficacy and exclusive breastfeeding, particularly among women with low birth weight infants. **BJM**

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## CPD reflective questions

- How do women in your practice perceive online breastfeeding education?
- What types of intervention would be most effective in promoting exclusive breastfeeding in your practice?
- What education media do you use in your daily practice to improve breastfeeding self-efficacy and monitor exclusive breastfeeding?

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