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**Review Article**

# Outcome's Classification in Mobile Applications Tailored to Parents of Premature Infants: A Systematic Review

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**Abstract**

**Background:** Integration of healthcare services for preterm neonates at home and hospital by mobile technology is an economical and convenient intervention, which is being increasingly applied worldwide. We aimed to classify the outcomes of mobile applications tailored to parents of premature infants.

**Methods:** This systematic review was conducted by searching the six main databases until May 2021. Mobile applications tailored to parents of premature infants and the reported outcomes of this technology were identified and classified. Quality of screened articles checked by MMAT tool.

**Results:** Overall, 10703 articles were retrieved, and after eliminating the duplicated articles, 9 articles were reviewed ultimately. Identified outcomes were categorized into three groups parental, application, and neonatal outcomes. In the parental outcomes, maternal stress/stress coping, parenting self-efficacy, satisfaction, anxiety, partnership advocacy/improved parent-infant relationship, feeling of being safe, reassurance and confidence, increase awareness, as well as discharge preparedness, were identified. In the application outcomes, application usage, ease of use/user-friendly, and usability of the designed application were placed. Finally, the neonatal outcomes include health and clinical items.

**Conclusion:** Mobile applications can be useful in prematurity for educating pregnant mothers, managing stress and anxiety, supporting families, and preparing for discharge. Moreover, due to the coronavirus condition, providing remote services for parents is an appropriate solution to reduce the in-person visits to neonatal care centers. Development of tailored apps can promote the neonates' health and reduce their parents' stress.

**Keywords:** Mobile applications; M-health; Prematurity; Preterm neonates; Systematic review

## Introduction

Low birth weight is one of the most important indicators of community health and one of the main causes of infant mortality (1,2). Preterm refer to the neonates who are born before 37 complete weeks of pregnancy and due to the low birth weight, as well as the complications associ-

ated with preterm birth, newborns with these conditions are considered high-risk (3). About 120 million babies are born worldwide each year, about 25 millions of whom are underweight at birth, and the proportion is about 50 percent in some parts of Asia (2,4). These neonates are taken care of in the neonatal intensive care unit (NICU) until they become medically stable (5).

Most of these neonates have considerable functional or developmental constraints when compared to normal weight newborns, and they are specifically at risk of delays in cognitive, linguistic, motor, and sensory processing skills (6,7). Currently, the complications resulting from prematurity are the main cause of neonatal mortality worldwide (6). Thus, protecting the health of neonates and infants is one of the major challenges ahead of low-income countries (3).

Although, the active involvement of parents in taking care of preterm neonates leads to increased breastfeeding, early discharge, and improved neurological development (6,8); the disease and long-term hospitalization of neonates in NICU are stressful for parents and prevent establishing a normal parental-neonatal relationship (9). Most parents experienced stress, anxiety, depression, decreased self-confidence, and self-efficacy (10,11). They spend 10-20 h per week seeking medical information regarding the conditions of their infant and require support during the hospitalization and after discharge (3). The parental need for providing medical information after hospitalization is associated with instrumental or practical support such as continuous home nurse visits, access to support groups, and education for taking care of the neonate (12).

A strategy for reducing these constraints is the use of mobile technologies, especially mobile applications (M-health) (13,14). Integration of healthcare services for preterm neonates through mobile technology is an economical and convenient intervention, which is being increasingly employed worldwide (3). Acceptability, practicality, being economical for patients, easy integration with daily activities, and generally portability of mobile technologies have made a promising means for handling parental stress (11) and establishing communication between healthcare providers and mothers of preterm neonates at home (5). Today, young parents trust mobile phones for communication and gain more awareness (3,15). Thus, considering the tendency of parents to use these tools and the advantages of digital technology interaction to resolve some emotional, logistic, and communication parent's needs, this kind of intervention can be practical in the care of preterm neonates (5,16).

Akbarian et al. described phone counseling as a low-cost method for encouraging and supporting mothers with preterm neonates and leading to a reduction in readmission in hospitals (17). Jallo et al. indicated the effectiveness of the mobile application in reducing stress in pregnant women at risk of preterm birth (11). The need for home visits in taking care of premature neonates has been reduced by using a web application (10). Moreover, a significant relationship was found between mobile-phone intervention and perinatal mortality reduction (18).

Several types of mobile applications designed and developed to help parents to engaged with pre and post-delivery problems' and complications (19–22). The authors concluded there are no available applications that address a variety of infant feeding subjects (23). As well, a structured review and quality assessment on mobile health applications for pediatric care showed that out of 90 tested applications, 27 items fulfilled the quality assessment and more studies are needed in pediatric care to ensure the quality and reliability of mobile applications (24). Eventually, a systematic review on investigating the extent and types of stress in fathers of newborns admitted in NICU showed that the stress in preterm fathers was greater than the term and healthy newborns, and the identified stresses included altered parental role, the appearance of the newborn, NICU environment, and staff communications (25).

Extensive studies have been performed in this area, considering the heterogeneity and diversity of investigations, there is limited evidence regarding the results of this technology such as satisfaction, promoting the knowledge level of parents,

and other outcomes (6,7,9). Accordingly, this research has been performed to undertake a systematic review of published studies for combining different evidence and identifying the knowledge gap in this area. Generally, the present research aimed to identify usage and classify the outcomes of mobile-based applications for families with preterm newborns and pregnant women who are at risk of preterm birth. Our hypothesis was that the M-health apps contains several outcomes which can be beneficial to neonates, parents, and society.

## Methods

The present study is a systematic review performed based on Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) (26).

The protocol of this systematic review has been registered by the international prospective of systematic review Institute (PROSPERO) with registration ID: CRD2021225081.

According to the published protocol (27), initially, all full-text articles that evaluated the provided services to pregnant women or families with preterm neonates through smart mobile phones and tablets were included. Then, six databases including PubMed (Medline), Scopus, Embase, Web of Science (ISI), ProQuest, and Cochrane Library databases were searched up to 31 May 2021. The search strategy was built on two core concepts and different combinations of "e-health, telemedicine, telehealth, web application, mobile application" with "preterm, premature", keywords (see Appendix 1). The search strategy was written separately for each database and the keywords were searched with or without double quotes (""). Also, they were combined using Boolean operators "AND" and "OR" and if required, "*" was applied in order to expand the search. In order to choose the relevant papers, PRISMA method was used. For this purpose, all related papers in this area were retrieved, and after eliminating the duplicate ones using Endnote software, the retrieved papers were reviewed independently by four authors based on their titles and abstracts. In addition, the full-text of articles were checked independently by two authors and the data were extracted by a data extraction form independently (two authors). In case of disagreement, the third author opinion has been regarded as the selection criteria.

### *Risk of Bias Assessment*

Based on our purpose was to classify the outcomes of mobile applications tailored to parents of premature infants, we intend to conduct a systematic review on the obtained data; therefore, performed a quality assessment of the included studies.

In order to evaluate the quality of the included papers, the mixed-method appraisal tool (MMAT) method, 2018 was utilized. It was developed in 2006 (28) and edited in 2011 (29).

MMAT is used to examine the quality of five study types including qualitative research, randomized controlled trials, non-randomized, quantitative descriptive, and mixed method studies. For each specified category, five criteria should be rated by "Yes", "No", and "Can't tell" labels. Tool's Developers opinion is to not calculate the total score from the ratings of each criterion. Also, they suggest to not dismiss any studies based on its quality (29).

In this study, the quality assessment of each paper was performed independently by two authors, and in case of disagreement, discussion and the third reviewer opinion were used. No study was excluded based on the results of this assessment. Besides, given the heterogeneity in studies design, it was not possible to perform a meta-analysis. Thus, the use of different mobile applications for preterm neonates and their outcomes was reported qualitatively.

## Results

### *Study selection*

Initially, 10703 paper titles were retrieved, and after eliminating the duplicate items, 4759 cases were chosen for investigating the titles and ab-

stracts. Then, the full-text of 67 papers was evaluated, and eventually, nine items were chosen for the final investigation. The PRISMA flowchart related to the selection of papers is presented in Fig.1.

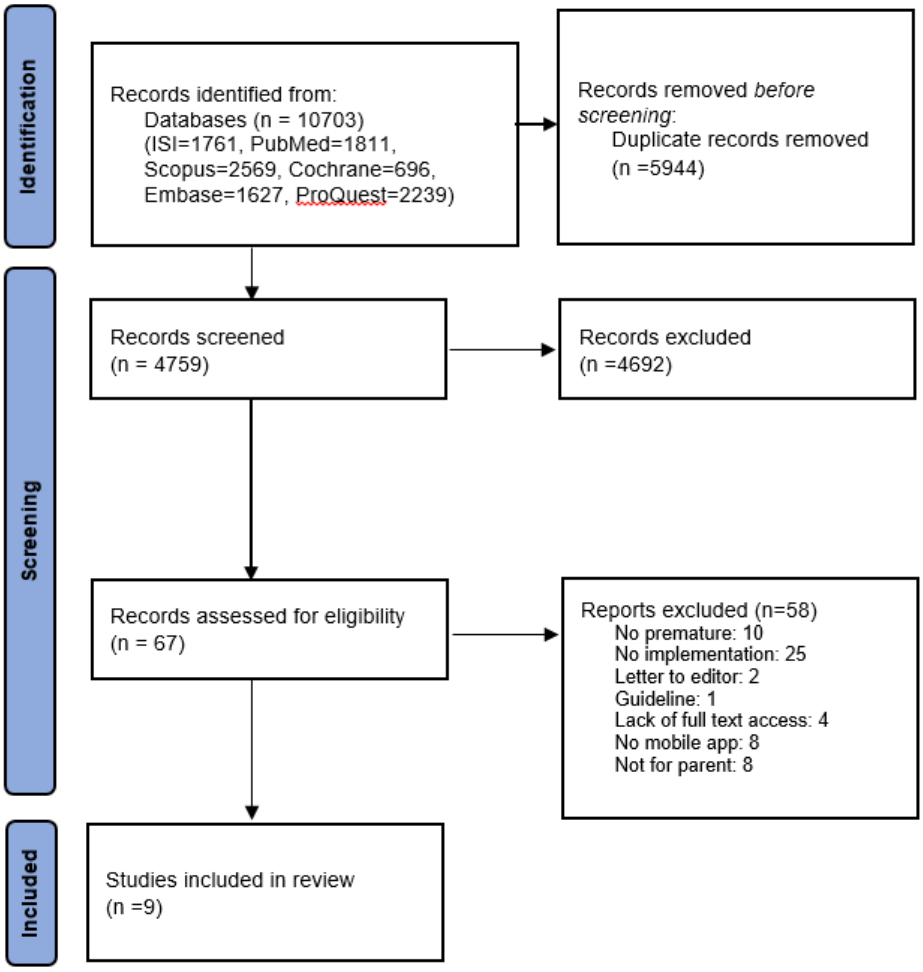


**Fig. 1:** PRISMA flow diagram of study identification

### *Study characteristic*

After reviewing the included articles, the general description of papers such as study purpose, number of participants, used tools, and platform for implementing the mobile application and evaluation method were extracted and displayed in Table 1.

Among the included studies, three were mixed method (11,25,32), two were case control (31,36), two were descriptive cross-sectional (34,35), and only one had been performed as RCT (30). Although no time constraint had been applied for the search of studies and all papers up to 18 May 2021 were searched, the distribution of studies across different years was initiated from the 2016 year. In the 2016 year only one paper (30), in 2017 and 2018 years two papers each (11,25,31,33), and in the 2019 year four related articles (32,34–36) were identified.

**Table 1:** Summary characteristic of the included studies

| *Author (Ref)* | *Year* | *country* | *Study purpose* | *participants* | *Tools/ platform* | *Evaluation method* |
|---|---|---|---|---|---|---|
| Garfield et al. (30) | 2016 | United States | To determine whether parents of VLBW infants in the NICU transitioning home with the NICU-2-Home smartphone and have shorter LOS than control parents. | 90 VLBW parents (usual care: 44, usual care+NICU-2-home:46) | Mobile-android | self-efficacy and satisfaction |
| Jallo et al. (11) | 2017 | VIRGINIA USA | To examine the efficacy of a mobile device delivered stress coping app | 15 pregnant women | Mobile-IOS | acceptability, feasibility, effectiveness, |
| Krishnamurti et.al (25) | 2017 | USA | To develop an engaging, usable smartphone app that communicates personalized pregnancy risk and gathers risk data | 16 women | Mobile-NA | usability |
| Kwong et.al (31) | 2018 | Australia | To determine if parents of EP/ELBW and term-born control infants were able to use the Baby Moves app to provide a video of sufficient quality | 451 infants (226 EP/ELBW case; 225 control) | Mobile-android and IOS | NA |
| Kim et.al (32) | 2019 | United States | To develop an educational mobile application and test the feasibility | 28 parents (18 mothers and 10 fathers) | Mobile-android and IOS | Feasibility, usability |
| Holm et.al (33) | 2018 | Denmark | To explore the in-depth parental experiences of a neonatal telehomecare service | 49 parents of preterm infants (27 families) | Tablet-IOS | semi-structured interview |
| Holm et.al (34) | 2019 | Denmark | To compare growth and breastfeeding | 220 infants (124: control 96: case) | Tablet-IOS | Observation |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | rates amongst infants being managed in the NICU (conventional care) and neonatal tele-home-care | | | |
| Nourani et al. (35) | 2019 | Iran | To develop a mobile application to educate mothers of premature infants | 60 participants for Information needs: 20 mothers of premature for usability testing. | Mobile-NA | Usability |
| Banerjee et al (36) | 2019 | UK | To improve infant health outcomes and parent experience through education | 37 infants for IFDC mobile app<br>57 infants: Control | Mobile-android and IOS | Observation |

* VLBW: very low birth weight, NICU: neonatal intensive care unit, LOS: length of stay, EP: extremely preterm, ELBW: extremely preterm, NA: Not Applicable

Most studies (n=4) had been performed in the United States (11,25,32,37) followed by two studies in Denmark (33,34), and then only one study in Iran (35) and the UK (36). In 7% of the cases, the neonates had gestational age (GA) <37 wk and were premature (11,30–34,36). In two cases, an application had been designed for mothers at risk of premature neonates (25,35). Finally, in one case the study population consisted of both term and preterm neonates (31). The longest duration of intervention was 26 months (33) and the shortest one was seven days (35). In other cases, the intervention had been performed between eight days and one year (25,30–33,36,38).

The content was delivered to the users based on a different format such as sending images, voice, and video communication. As observed, in most cases (37%), the communication has been performed in text format (25,30–33,35,36,38). It was followed by (29%) through images (30,32–36,38), 21% by video (31–35,39), and eventually 13% through voice communication (11,31,33).

Among the examined studies, six mobile applications were related to educating pregnant mothers or mothers with preterm newborns (11,25,30,32,35,36). Out of them, one was tracking the status of the newborn (25) and another was about consultation (11). Two studies had dealt with monitoring fetal development and maternal support (33,34), and only one study was related to assisting the neonatal status assessment (31).

As mentioned, the major communication methods were mobile phones (n=7) (25,30–32,35,36,38). Moreover, the operating system for implementing the application was android in one case (30), IOS in three cases (31,32,36), and three cases were in both android plus IOS (31,32,36). In two cases the used platform had not been mentioned (25,35).

### *Quality appraisal*

The qualitative assessment indicated that three studies had mixed methods design (11,25,32). Furthermore, among the studies, only one study had the largest rate of "Yes" response (33). Further details in this regard are provided in Table 2.

### *Classification of the studies in terms of the reported outcomes*

According to the included studies in this systematic review, the outcomes were categorized into

three groups parental, application, and neonatal outcomes, as provided in Table 3.

**Table 2:** Qualitative assessment

| *Author (Ref)* | *Q1* | *Q2* | *Q3* | *Q4* | *Q5* | *Q6* | *Q7* | *Q8* | *Q9* | *Q10* | *Q11* | *Q12* | *Q13* | *Q14* | *Q15* | *Q16* | *Q17* | *Q18* | *Q19* | *Q20* | *Q21* | *Q22* | *Q23* | *Q24* | *Q25* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Garfield (30) | - | - | - | - | - | Y | Y | Y | N | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Jallo (11) | Y | Y | Y | Y | C | - | - | - | - | - | - | - | - | - | - | Y | Y | Y | C | Y | Y | Y | N | C | N |
| Krish-namurti (25) | Y | Y | Y | Y | C | - | - | - | - | - | - | - | - | - | - | Y | Y | Y | C | Y | Y | Y | Y | N | N |
| Kwong (31) | - | - | - | - | - | - | - | - | - | - | Y | Y | Y | C | Y | - | - | - | - | - | - | - | - | - | - |
| Kim (32) | Y | Y | C | C | C | - | - | - | - | - | - | - | - | - | - | Y | Y | Y | C | Y | Y | Y | N | N | C |
| Holm (33) | Y | Y | Y | Y | Y | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Holm (34) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | Y | Y | Y | Y | - | - | - | - | - |
| Nourani (35) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Y | Y | Y | C | Y | - | - | - | - | - |
| Banerjee (36) | - | - | - | - | - | - | - | - | - | - | Y | Y | Y | N | Y | - | - | - | - | - | - | - | - | - | - |

*Y: Yes; *N: No; C: Can't tell

**Table 3:** The outcomes reported in the selected papers

| ***Parental outcomes*** |
|---|
| - Maternal stress/ stress coping (11,25,33)<br>- Anxiety (11,32)<br>- Satisfaction (30,33)<br>- Parenting self-efficacy (30)<br>- Partnership advocacy/ Improved parent-infant relationship (32,33)<br>- Feeling of being safe (33)<br>- Reassurance and confidence (33)<br>- Increase awareness (31–33)<br>- Discharge preparedness (32,33) |
| **Application outcomes** |

- App usage (25,30)
- Ease of use/ Userfriendly (11,31,33)
- Usability (25,32,35)

**Neonatal outcomes**

- Nutrition (mode of feeding/ full enteral feeding/ seek feed/ breast milk/ breastfeeding rate, daily intake vitamin) (25,34,36)
- Growth rate/ GA & BW at discharge (34,36)
- LOS (30,34,36)
- Mortality (36)
- BPD (36)
- IVH (36)
- NEC (36)
- ROP (36)
- Oxygen therapy (36)
- Late-onset sepsis (36)

*LOS: length of stay, BPD: bronchopulmonary dysplasia, IVH: intraventricular hemorrhage, NEC: necrotizing enterocolitis, ROP: retinopathy of prematurity

### *Parental outcomes*

Three studies dealt with parental stress following application usage (11,25,33). For example, a study performed on measuring the stress level indicated that the parental stress before and after using the application significantly decreased 22 points in visual analog stress scale (VASS) (11). On the other hand, no significant difference was observed in the score of perceived stress scale (PSS) and self-efficacy scale (CSES) to determine the level of stress and its management at the onset and eight days after completion of study (median-22 at the onset and eight days later) (11). Further, the study results showed parental satisfaction with the meetings held through videoconference (33), and few parents reported anxiety after imploring the application (11,32).

The use of application resulted in an improved general level of parenting self-efficacy in the mothers of the intervention (7%) compared to the control group (less than 1%) (30). Regarding partnership and advocacy, the results of 86% of the participants indicated that following the use of the application, more discussion was performed about pregnancy and prematurity among the parents (32). This would lead to improved relationships between parents and children as well as establishing an equal parental role in taking care of the newborn and making a feel of being safe among the parents (33). Further, it was also effective in creating empowered parents as well as establishing a feeling of calm and confidence at home (33).

In addition, most of the participants (94%) believed that the use of application lead to improvement and elevation of their medical knowledge level regarding taking care of premature neonates (31,32). The parents who gained a higher level of experience and specialized knowledge felt a greater sense of security (33).

Moreover, the usage of application was effective in making discharge preparedness for parents. In this regard, the results suggested that the intervention group had a greater feeling of discharge preparedness compared to the control group (32,33).

### *Application outcomes*

Application-related outcomes were also reported in selected studies. In this regard, two studies had dealt with examining application usage (25,30). The maximum and minimum mean use of the application was reported 9.7 and 1.3 times per day (30). Further, in another study, the frequency of application usage at the first, second, and third stages of the study was reported 9.0, 9.36, and 9.25 times respectively (25). The important point

is that there was a strong relationship between the pregnancy week and usage of the application; the mothers would use the application more frequently within the early weeks of pregnancy (25). Further, when the daily mood status of women was undesirable, the extent of usage would grow (25). The parents had a positive view towards the quality of the application with regards to a suitable user interface, ease of use, and user-friendliness (11,31,33). Moreover, 89% of the parents had a favorable view about the use of text notifications in an application (32). The results of the study conducted on assessment of general movement showed that reminder notification and different features in the application were very desirable, and would be considered a suitable method for sending videos to physicians (31). In one study, the usability of the designed application had been measured using QUIS (questionnaire for user interface satisfaction) questionnaire, where the minimum mean was related to the application screen display and layout (7.96) and the maximum to overall reaction to the application (8.52), though generally the usability of the designed application was assessed as 'good' score (35).

### *Neonatal outcomes*

Another categorization of the reported outcomes were health and clinical issues. In this regard, vitamins consumption during pregnancy and breastfeeding rate would increase by employing the designed applications (25). Nevertheless, no significant difference was observed in exclusive breastfeeding among the newborns in the telehomecare and control groups, and only in very preterm singleton, more infants in the telehomecare group had breast-feeding compared to the control group (34). On the other hand, in another study, this level was comparable between the two groups (46% vs. 39%) (36). Further, the exclusive maternal milk (breastfeeding or bottle) in the intervention and control group was determined 68% and 54% respectively and the neonates in the intervention group reached full feeding earlier (36). In addition, regarding full seek feeding (removal of nasogastric/orogastric feeding), the intervention group reached these conditions earlier than the comparison group (36). On the other hand, no significant difference was observed in the median weight of the newborns for pregnancy age at the discharge time between the intervention and control groups (34), and the mean daily weight gain was almost the same in the two groups (13g in the intervention and 14g in the control group per day) (36).

Another reported outcome was LOS. The studies showed that LOS was 1 day shorter for the above-average user compared to the control group (30). In neonates with GA>32, this level was reported 5 days in the intervention group, and in the neonates with GA≤32, 10 days lower than the control group (34). These results were in line with the findings of another study in which the median LOS was lower for the newborns in the intervention group compared to the control (41 vs. 55 days) (36).

The application usage did not have considerable effects on mortality, IVH, NEC, ROP, the median duration of oxygen therapy, BPD, and late-onset sepsis outcomes, and there was no significant difference between the intervention and control groups in these outcomes (36).

## Discussion

In this study, eventually, 21 outcomes were identified categorized in parental, application, and neonatal outcomes. In the parental outcomes, maternal stress/ stress coping, parenting self-efficacy, satisfaction, anxiety, partnership advocacy/ improved parent-infant relationship, feeling of being safe, reassurance and confidence, increase awareness, as well as discharge preparedness were identified (11,30,40–43). In the application outcomes; application usage, ease of use/user-friendly, and usability of the designed application were placed (11,30–33,35,43). Finally, the neonatal outcomes include health and clinical items (11,25,30,32,35,36). The most frequently reported outcomes were stress management (11,25,33), increasing the knowledge and awareness of parents (31–33), ease of use (11,31,33), and usability of the system (25,32,35).

Results of systematic review study on the impact of m-health interventions in improving maternal and neonatal care showed that mHealth interventions cause to increase maternal and neonatal service utilization through increased antenatal care attendance and facility-service utilization (44). In another systematic review study, improving the self-efficacy, and newborn care confidence, promoting skills for postnatal care like cord care, thermal care and appropriate breastfeeding achieved by mHealth intervention for postnatal care (45). Increasing quality of care, reducing hospitalizations and costs, improving patient-centered outcomes, and increasing self-management are feasible with mHealth equipment (46). Current study results showed the use of applications was effective in stress management in pregnant mothers, and lead to diminished parental stress (11,25,33) in some cases which can be useful to policy makers for future programming. In similar studies, using different intervention methods such as CD player (38) and mp3 player (47) has also reduced the stress of hospitalized women. Considering the adverse impact of stress on the health status of people (48), its reduction was a positive point, especially among pregnant women. By reviewed studies, the use of the mobile application is effective in self-efficacy and improving the relationship between parents, and establish a sense of security and confidence for them (30,32,33). In this regard, designing the FaceTime application for newborns separated from their parents improved the family-infant relationship (49). In addition, qualitative research on free mobile telephone intervention showed that active participation of service providers along with mothers, motivated both of them to communicate by mobile phone for maternal health issues (50).

Improving the parents' awareness and knowledge was another outcome that was achieved by using the mobile application (31–33). Results of using mHealth and Interactive Voice Response (IVR) technology showed this is an acceptable and feasible way of improving the awareness of rural Cambodian mothers (51). Likewise, an informatics system to communicate between parents and health care providers promotes parental education (52).

Feeling satisfied after using the mobile application was another reported outcome in reviewed studies (30,33). Moreover, developing and testing a telemedicine application to support the very low birth weight infants cause to improve the health conditions and satisfaction (10). Totally, the progress in family involvement, education, discharge planning, and follow-up provided by system cause infants to transition home even earlier and thereby provide a cost savings (53).

Reviewed studies indicated that there was no significant difference in clinical outcomes such as mortality, BPD, IVH, NEC, ROP, sepsis, and oxygen therapy before and after using the mobile application (2,36). Moreover, there was no significant difference in perinatal mortality between the intervention and control group by using a mobile application (54).

In general, the parents of premature infants have different needs for their responsibility and stress management; e-health benefits can be increased to them (55). The use of mobile phones near newborns might has a harmful impact, related to the light, noise, and radio waves of a smartphone (56) and leads to resistance to parents using it. Moreover, one of the important concerns over utilizing the mobile application in healthcare is related to confidentiality, safe transfer of information, and proper and reliable data storage (57,58). In addition, sometimes access to internet-based technologies may not be possible for those with low sociodemographic status or poor health literacy (59). The main audiences of this study are the developers interested in implementing the new technology in neonatal field specially designing mobile applications. Overall, developing this kind of tools can be promoting the mother's knowledge and improve the healthcare and neonatal outcomes in premature neonates.

One of the most important limitations of this study was the heterogeneity of the reported outcomes in studies. Besides, due to the different samples or designs, the outcomes comparison was not unachievable.

## Conclusion

Parents of premature neonates are a vulnerable group who require constant training and support. M-health has considerable potential for training and promoting healthcare services. In addition, these applications would lead to improved parental experience and acquiring knowledge for empowering them. Further, considering the COVID-19 pandemic, providing virtual and online services for parents is one of the suitable solutions to reduce in-person visits. Although the primary findings of this study are somehow varied, it supports further research on use of mobile applications as a different approach in prematurity care. Meanwhile, using low sample size, it may not be possible to reach a suitable conclusion about the effectiveness and efficacy of these technology-based tools. Results can guide the parents and pregnant mothers to choose a suitable app for use, while to policy makers to provide a safe guideline for future applications development.

## Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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## Conflict of interest

The authors declare that there is no conflict of interest.

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