ehealth Interventions in Prenatal and Postnatal Care in Iran: A Systematic Review

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A R T I C L E I N F O	**A B S T R A C T**
Article type: Review article	***Background & aim:*** Despite the growing popularity of electronic health interventions and their cost-effectiveness in the provision of care services and expansion of services to remote areas, its effectiveness in pregnancy and postpartum care has not been investigated. Therefore, this systematic review was conducted to review the effect of electronic interventions on the health of Iranian mothers.
Article History: Received: 04-Feb-2020 Accepted: 27-Apr-2020	***Methods:*** The English databases including PubMed, Scopus, Web of Science, and Google Scholar as well as the Iranian databases of SID, Magiran, and Irandoc were searched within 2013-2019 using related keywords in order to obtain the Persian and English articles. Finally, six articles entered the study after the exclusion of duplicate, unrelated, and low-quality papers.
Key words: Electronic Interventions Care Pregnancy Postpartum	***Results:*** In total, 124 articles were retrieved and finally 6 articles remained. Two were pre/post and four were randomized trial studies. The studies have been conducted on a variety of topics, including awareness of the risks of pregnancy and postpartum health, transtheoretical model structures, care satisfaction, and breastfeeding self-efficacy. Different methods were used in these studies including Telegram, SMS, and Multimedia software. In total, all studies reported an increase in care quality
	Conclusion: Electronic learning interventions can effectively help to improve prenatal and postpartum care; however, there is no sufficient evidence to show the associated long-term effects.

Introduction

Pregnancy is one of the most important stages in women's lives and requires the special attention of physicians and healthcare providers (1). Prenatal and postpartum care plays a fundamental role in the reduction of maternal mortalities and prevention from future complications and problems in children. The health of pregnant mothers leads to the health of neonates resulting in the health of the community (2). According to the literature, it was shown that during the postpartum period, mothers need to have a healthcare provider and receive healthcare services in a variety of settings. Therefore, in order to enhance and support the empowerment of mothers regarding self-care,

they are recommended to use more online social information, virtual networks, and support programs (3).

Recently, mobile health (mHealth) has emerged with a wide range of tools to overcome the limitations of the health system, which is a new method for the provision of information to improve individuals' knowledge and proper attitudes and motivate behavioral changes (4). The popularity of mobile phones has been rapidly growing in developing countries. In particular, people in low- and middle-income countries use a wide range of mobile technologies due to their cost-effectiveness and benefits for healthcare systems (5).

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mHealth, as a subset of electronic health (ehealth), refers to the use of mobile phones and wireless technologies to provide healthcare services. The World Health Organization has declared that the benefits of ehealth should be considered among the fundamental components of any strategy and most important programs for the collection of healthcare information in the 21st century (6). Currently, ehealth is increasingly used in health interventions to improve maternal health outcomes. Extending the influence of mobile phones in recent years has provided the potential for mhealth to enhance prenatal care covering the domains, such as low literacy, no access to services, marginalization, unskilled manpower, and poor financial resources (7).

By providing multiple resources, instant feedback, and ability to share information, the virtual world can help people quickly gain the information and knowledge they need and support a variety of applications, which facilitate individuals' interaction and communication as well as content sharing. In addition, the combination of mobile devices and applications can be useful in learning contexts and enhance learning in health education courses (8).

The growing development of mobile technology has provided new opportunities for mothers to receive safe accessible, coordinated, and effective healthcare (9). The results of a meta-analysis in 2019 showed that social media and mobile applications have the potential to be widely used in prenatal and postpartum care (6). In developed countries, pregnant women primarily use the internet, social media, and mobile applications to search for health information on gynecology and childbirth. In addition, pregnant women who use social media not only search for information online but also share their knowledge through online groups (10).

However, given the potential importance of this domain, performing studies on the role of mhealth in the enhancement of pregnancy and postpartum care in low-income countries, such as Iran, might provide valuable insights into related topics. Therefore, this systematic review was carried out to investigate the effects of electronic interventions on the health of Iranian mothers.

Materials and Methods

The present systematic review was conducted to identify interventional studies in which electronic learning (e-learning) is the main intervention in pregnant and postpartum Iranian mothers. The standard method of Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement was used in the present study (11). The current study was initiated using the above-mentioned instructions.

An electronic search of Persian databases, including SID, Magiran, and Irandoc, and English databases, namely PubMed, Scopus, Web of Science, and Google Scholar, was carried out within 2013-2019. Searching the aforementioned databases was conducted using the keywords in combination with their Persian equivalents, including ''Pregnant women'', "Pregnancy", "Prenatal", "Intervention educational", "mHealth", "m-Health", "Mobile health", Smart-phone", "Smartphone", "eHealth", "Apps", "Mobile applications", "Text message", "Short message", "Short message service", "SMS", "Multimedia message", and "Multimedia". In addition, NOT and OR operators were used. A manual search was also performed in magazines and dissertations. There was no restriction on the duration of the intervention. The review of published articles within 2013-2019 was carried out due to the expansion of e-learning in recent years.
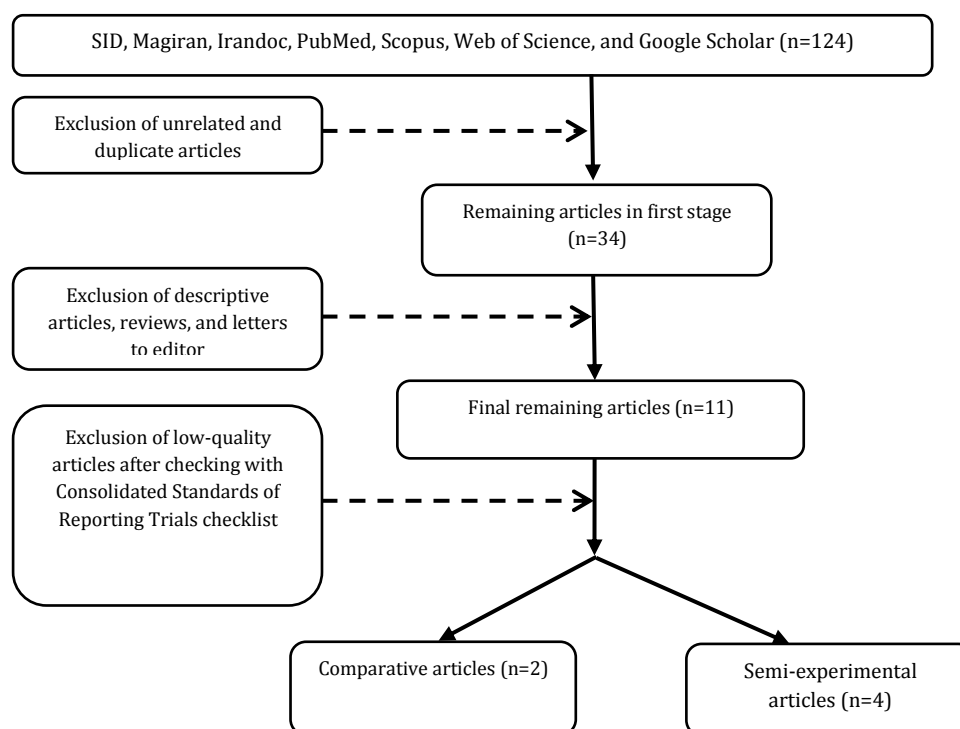
Firstly, the initial search was conducted by two authors separately. Then, the duplicate articles were excluded, and in the next step, unrelated papers were removed. The related articles were identified after reviewing the title and abstract of each study and eligibility criteria. Those studies that met the following criteria were selected to enter the study:
1) The intervention should be electronic.
2) The study was carried out in Iran.
3) The full text of the article should be available. Case studies, short articles, cross-sectional and descriptive-analytical studies, letters to the editor, as well as systematic and review articles were excluded. In the first step of the searching process, 124 articles were identified in the aforementioned databases. In the next step, through reading the titles and abstracts, unrelated and repetitive articles (n=90)

were removed. Subsequently, 23 papers, including descriptive articles, reviews, and letters to the editor, were excluded from 34 articles. The remaining 11 studies were reviewed for the quality assessment using the Consolidated Standards of Reporting Trials checklist. This checklist contains 37 items each of which is given a score of 0 and 1 (12). The studies with 70% of the score were selected for the review. Then, six articles were included after the final review and authors' consensus (Figure1).

A summary of the selected studies was presented in the checklist, including authors' names, year of publication, purpose of study, target group and sample size, study duration and location, used media, examined variables, method of the intervention, and results of the intervention (Table 1).

SID, Magiran, Irandoc, PubMed, Scopus, Web of Science, and Google Scholar (n=124)

Exclusion of unrelated and duplicate articles

Remaining articles in first stage (n=34)

Exclusion of descriptive articles, reviews, and letters to editor

Final remaining articles (n=11)

Exclusion of low-quality articles after checking with Consolidated Standards of Reporting Trials checklist

Comparative articles (n=2)

Semi-experimental articles (n=4)

Figure 1. Flowchart representing process of study selection for systematic review

Following the article searching process, six interventional studies entered the present review out of which four and two studies were semi-experimental and comparative, respectively. All semi-experimental studies were pretest and posttest with a control group. In the comparative studies, the e-learning group was examined through face-to-face training and using a booklet. The investigated variables in these studies were the awareness of the symptoms of pregnancy risk and postpartum health and well-being, transnational model structures, satisfaction with education, and breastfeeding self-efficacy.

In all studies, the feedback of participants was obtained by telephone calls in order to check the reception of e-learning content. In addition, in studies carried out by Haqhani et al. (15) and Mohammadirizi et al. (18), the subjects expressed more satisfaction with receiving e-learning than the usual training. Most of the interventions observed in the current study involved educational interventions using multimedia CDs, and their results showed that most of the interventions were more effective than regular training, such as using a booklet.

Table 1. Studies on mobile health in pregnant and postpartum Iranian mothers

Authors First name/Publication year	Aim of study	Target group and sample size	Study duration/Location	Used media	Examined variables	Intervention	Results of intervention
Azam Rahmani (13) 2019	Determination of effect of transtheoretical model based on reduction of prevalence of gingivitis among pregnant women	160 pregnant mothers (4-40 weeks)	24 weeks Sanandaj, Iran	Sending messages, images, and educational clips via Telegram	Self-efficacy, benefits, barriers, and stage to change behavior	Designing before and after in two intervention and control groups; educational intervention for 3 weeks; receiving feedback	Significant change in rate of tooth cleaning behavior in intervention group (P<0.01); significant change in mean score of perceived benefits and gingival index in intervention group (P<0.01)
Zeinab Eskandari (14) 2019	Investigation of effectiveness of mobile-based education regarding signs of pregnancy risks	120 pregnant mothers (6-40 weeks)	5 weeks Tehran, Iran	Sending 35 SMS daily	Knowledge and behavior of danger signs of pregnancy	Following up intervention and control groups before, after, and 2 months after intervention; sending reminder messages 2 weeks later; receiving feedback	Significant change in the mean score of knowledge and behavior score in intervention group (P<0.01)
Fariba Haqhani (15) 2016	Determination of effect of distant learning program via sending SMS during pregnancy on knowledge and satisfaction of pregnant women	300 pregnant mothers (6-40 weeks)	36 weeks Isfahan, Iran	Multimedia software and sending daily SMS	Awareness of pregnancy warning signs and satisfaction with education	Following up intervention and control groups up to end of pregnancy; sending SMS related to gestational	Significant change in average knowledge score in intervention group (P<0.001); satisfaction of 98.7% of pregnant mothers with program

						age; checking participants' satisfaction with training method	
Masoomeh Rajabi Naeini (16) 2015	Comparison of effectiveness of education with multimedia software and face-to-face education in pregnant women's knowledge of danger signs	120 mothers (6-15 weeks)	10 weeks Karaj, Iran	Multimedia software developed by Ministry of Health	Pregnant women's knowledge of danger signs	Comparing two groups using multimedia software or face-to-face training	Significant change in average knowledge score in both groups after intervention (P<0.001)
Mandana Mir Mohammad Ali (17) 2014	Investigation of effect of educational package on breastfeeding self-efficacy after delivery	300 postpartum mothers	12 weeks Saveh, Iran	Visual multimedia software	Breastfeeding self-efficacy	Comparison in three groups; providing pamphlet, 30-minute CD, 20-minute face-to-face training	Significant change in average self-efficacy score in intervention group (P<0.001)
Soheila Mohamadirizi (18) 2013	Comparison of effect of electronic learning and booklet on women's satisfaction with postpartum care	72 mothers after primary childbirth	2 weeks Isfahan, Iran	Multimedia software containing text, animation, audio and video, and images in various formats offline	Satisfaction with education	Comparing two groups of electronic learning and using booklets; checking participants' satisfaction with training method	Significant change in average satisfaction score in intervention group (electronic learning) (P<0.01)

Results

Following the article searching process, six interventional studies entered the present review out of which four and two studies were semi-experimental and comparative, respectively. All semi-experimental studies were pretest and posttest with a control group. In the comparative studies, the e-learning group was examined through face-to-face training and using a booklet. The investigated variables in these studies were the awareness of the symptoms of pregnancy risk and postpartum health and well-being, transnational model structures, satisfaction with education, and breastfeeding self-efficacy.

In all studies, the feedback of participants was obtained by telephone calls in order to check the reception of e-learning content. In addition, in studies carried out by Haqhani et al. (15) and Mohammadirizi et al. (18), the subjects expressed more satisfaction with receiving e-learning than the usual training. Most of the interventions observed in the current study involved educational interventions using multimedia CDs, and their results showed that most of the interventions were more effective than regular training, such as using a booklet.

Discussion

The present systematic review was conducted to investigate the effects of electronic interventions on the improvement of health-promoting behaviors of pregnant and postpartum women. Maternal health interventions have become common around the world with the rapid advancement of technology and enhancement of communication infrastructure. However, the number of articles published in the domain of pregnancy and postpartum care is relatively limited, compared to that reported for other interventions (19).

The results of two studies (16, 18) comparing education through multimedia CDs with traditional methods showed the power of ehealth interventions, compared to that of traditional methods. The findings of several studies confirmed the aforementioned result (20, 21) and emphasized the use of electronic interventions to improve the effectiveness of community health services in logistics management, accident reporting, and emergency management. By integrating all levels of healthcare staff, ehealth makes it possible to expedite emergency visits and communicate with the providers of specialized services, such as midwives (22).

In two studies (14, 15), sending text messages was used resulting in higher scores regarding pregnant mothers' knowledge of pregnancy risk symptoms; however, the difference was not statistically significant. Currently, the use of mobile phones is widespread, and most pregnant mothers have mobile phones; nevertheless, the benefits of mobile phones include the simplicity and possibility to provide relevant content for the user immediately and services related to the user's situation and cost-effectiveness of text messages. In addition, the ease of access to mobile phones makes it useful to send SMS in health education programs (23). According to the findings of a study conducted by Sahu et al. (24), most health intervention programs send SMS because they can simultaneously perform multiple and complex functions.

Furthermore, the results of a review in 2018 showed that sending SMS in low- and middle-income countries is used more than applications for basic functions, such as training and health-promoting, reminding, and data collecting (19). Two studies carried out in Nigeria and China compared the effects of ehealth interventions using SMS on health-promotion with those reported for routine care. The results of both trials revealed that the rate of breastfeeding increased in the intervention group after 6 months which was higher than the control group (25, 26).

In another study (13), Telegram as a social network was used to train mothers. According to the findings of a survey conducted in 2018, most respondents said that social media was their main source of social support (92%). In addition, 43% of the subjects used blogs to communicate with other mothers, and 99% of the women utilized the internet to find answers to their questions. Moreover, 89% of the subjects used social media to ask questions and seek advice on pregnancy issues and/or their role as parents. These results indicated that social media plays an important role in mothers' lives. Healthcare providers need to become

familiar with social media resources to support mothers (27).

A systematic review carried out by Sherifali et al. in 2018 also showed the effectiveness of electronic interventions, including the use of SMS and social networks, in weight management during pregnancy and postpartum women (28). The results of a review (2017) of the studies performed in East Asia, Sahara, Middle East, and South Asia indicated that electronic interventions are significantly enhancing the quality of prenatal and postpartum care and are used as techniques to collect pregnancy information. The aforementioned study also concluded that mhealth solutions during pregnancy and postpartum period can improve prenatal and postpartum care services in low- and middle-income countries (7).

Given the significant achievements regarding the use of ehealth strategies in the healthcare of pregnant mothers, another study conducted in Tanzania proposed it as a model to be adopted by health ministries in low-income countries and international agencies (29). Despite the availability of various applications in Iran, the present study demonstrated that no article investigated mobile applications in this regard indicating a lack of scientific documentation in the design of prenatal and postpartum care applications. According to the present review, it was also claimed that ehealth research projects are typically described as weak and vague. This creates challenges for the integration of effective evidence and unintended consequences that cannot be explained, makes scaling difficult, and prevents the effective transformation of research into practice.

It is recommended that health researchers, sponsors, and publishers prioritize transparent electronic reporting. Although the evidence suggests the benefits of using ehealth, especially mhealth, during prenatal and postpartum care, it is convincing to provide evidence-based recommendations for policymakers and planners to make informed decisions. In case of no sufficient information in this regard, decision-making will be difficult (30).

The present study had several limitations. In this study, due to the heterogeneity of the data, there was no possibility to carry out a meta-analysis. In addition, it is required to perform further studies to address the methodological limitations of the studies in this domain. There is also a need to use a variety of health education theories in designing electronic interventions. Moreover, future studies should provide information on the cost, effectiveness, and unintended effects of digital education.

Conclusion

The use of ehealth interventions on mothers can be an effective method to provide services for the improvement of maternal and neonatal outcomes. The emerging trend of strong empirical research projects, feasibility studies, governmental interventions, and health integrations in the healthcare system is encouraging and can provide a way to improve decision-making for the implementation of health interventions.

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Conflicts of interest

Authors declared no conflicts of interest.

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