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Review Article

Effectiveness of Telemedicine-Based Intervention on Breastfeeding Self-Efficacy in Iranian Women: A Systematic Review and Meta-Analysis

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Abstract

Background: Breastfeeding self-efficacy (BSE) is a modifiable factor that can enhance breastfeeding rates. Telemedicine constitutes safe and low-cost health services that can be developed for the interaction between professionals and clients. Therefore, this study aimed to review the effectiveness of telemedicine-based intervention on BSE in Iranian women.

Methods: This systematic and meta-analysis review was performed according to PRISMA guidelines. English databases including Web of Science, PubMed, Scopus, and Persian databases including SID, Magiran, and IranMedex was searched until Aug 1, 2023 to identify randomized control trials about telemedicine-based interventions on BSE in Iran. The search strategy was focused on terms and eligibility criteria. Data analysis was done using CMA V.2 software. The risk of bias in the included studies was assessed.

Results: Out of 385 articles, eight articles that met the inclusion criteria were included in the meta-analysis. The overall result demonstrated that telemedicine-based interventions have a positive impact on BSE compared with the control, especially in the long-term intervention (pooled SMD= 1.27; 95% CI= 1.01–1.53, *P*-value<0/001); heterogeneity (Cochrane's Q-value=51.94, *P*<0/001, I2=76.90%). In addition, twelve weeks of postpartum had more effect on BSE than the others. Also, breastfeeding intervention in the postpartum period was more effective compared with pregnancy. The publication bias among included studies was assessed by funnel plot.

Conclusion: This review could give insight to healthcare providers into the effect of telemedicine on BSE. Therefore, by strengthening BSE through telemedicine interventions, especially for women who do not have the conditions for face-to-face counseling, we can expect positive results.

Keywords: Breastfeeding; Breastfeeding self-efficacy; Telemedicine; Telehealth

Introduction

Breastmilk is the most nutritious food for growing infants, providing essential support and protection against infections. Breastfeeding self-efficacy (BSE) reflects a mother's confidence in breastfeeding, and is a modifiable factor that can enhance breastfeeding rates. Health providers can target this modifiable factor to improve breastfeeding indexes in mothers (1). On the other

hand, different counseling and supportive approaches, along with effective interventions in postnatal can promote and sustain exclusive breastfeeding (2). One of these counseling approaches is telemedicine.

Telemedicine constitutes safe and low-cost health services that can be developed for the interaction between professionals and clients, with the purpose of counseling or health-related factors, education and knowledge (3). In this way, telemedicine can remove barriers related to time and distance, enabling the prevention and treatment of diseases by improving health indicators (4). Therefore, this method has brought favorable and effective results in many areas related to pregnancy, childbirth (5, 6). The benefits of breastfeeding are an essential aim for the achievement of the Sustainable Development Goals and are considered one of the most important issues in recent years (7). Therefore, breastfeeding counseling using telemedicine can be of great help to all lactating women. By increasing breastfeeding self-efficacy, they can achieve the desired outcomes such as increased breastfeeding rates and duration, ultimately contributing to the growth of newborns and children (8). WHO has announced to countries that universal health coverage is not possible without the use of e-health strategies, with a focus on women's and children's health should be at the top. However, only a third of countries have reported the use of tools to develop policies and strategies for women's and children's health (9).

A systematic review showed that educational and supportive intervention can significantly improve breastfeeding self-efficacy up to 2 months after delivery (2), and in another systematic review improved first 4-6 wk postpartum (10), but those studies have not specifically focused on telemedicine interventions, especially in Iran. Therefore, due to the importance of breastfeeding counseling and the use of telemedicine in providing services and the lack of a systematic review study in Iran, this study was conducted with the aim of investigating the effectiveness of telemedicine-based intervention on breastfeeding self-efficacy in Iran.

Materials and Methods

This systematic review was registered with PROSPERO (CRD42023447817) and was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines(11). The main outcome of this review was breastfeeding self-efficacy, analyzed in terms of different timeframes, to indicate the short, and long-term effects of intervention. Subgroup analysis was done based on intervention time and parity.

Search Strategy

Three English electronic databases, including Scopus, PubMed, Web of Science, and Theses, as well as three Persian databases, namely, SID, Magiran, and Iranmidex, were searched. The search period from the databases started on 1 Aug 2023. Additional searches were identified by handsearching the reference lists of the other articles. Moreover, for the comprehensiveness of the search, the Google Scholar database was checked. The search was conducted using the Medical Subject Heading (MeSH) and keyword search terms based on the PICOS framework (participants, interventions, comparators, outcomes, and study design). Accordingly, population refers to Iranian primigravida or multigravida pregnant or postpartum women, intervention refers to any kind of telemedicine-based education or counselling, control refers to the routine maternal care, outcome refers to the breastfeeding self-efficacy, and study design refers to randomized control trial.

Key terms and synonyms for the search terms for each database were explored. The retrieval strategy of the broad search of the databases was as follows: ((“breastfeeding”) AND (“Mobile” OR “Telemedicine” OR “Smartphone” OR “Tele*” OR “E-Health” OR “telephone”) AND (Iran) AND (“Self-Efficacy” OR “Self-confidence” OR “Self-concept”)).

Selection criteria

Randomized control trial studies were included in this review. The studies that were focused on the

intervention group, educational, counselling and support interventions for Iranian breastfeeding mothers through eHealth and based on telemedicine, using mobile phones, applications, messages, etc., and the control group received usual care.

Study selection and data extraction

Relevant articles were identified from the databases and other sources by hand searching the reference lists of the potential eligible full-text articles. Duplicated records were removed by EndNote software, and the remaining articles were screened by titles and abstracts by two review authors independently. When there was disagreement or discrepancies on article selection, the corresponding author would screen articles and seek consensus. Full-text versions of eligible articles were evaluated for final review and data extraction relevant to the study objective. Data including authors, year of publication, design, participants, interventions, outcome, time of follow-up, listed in the Table 1.

Assessment of bias

Risks of bias in the included articles were assessed using the Cochrane risk-of-bias tool for randomized trials by two reviewers individually in terms of seven domains (random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting, and other biases) (12). Any disagreements that arose during the evaluation process were discussed in detail in the meeting.

Ethical considerations

This project was approved in the ethics committee of Mashhad University of Medical Sciences (IR.MUMS.NURSE.REC.1402.104). The authors have made every effort to avoid plagiarism and not to manipulate the data for personal interests. In general, the research team took all ethical aspects into account during identification, screening, extraction and data analysis.

Data analysis

Meta-analysis of pooled data was performed by The CMA software (Comprehensive Meta-Analysis) V.2 on breastfeeding self-efficacy as the primary outcome. Standard mean difference (SMD), (before and after mean of the intervention in the intervention and control groups) for continuous data with their corresponding 95% confidence intervals (CI) were calculated for analysis. The random effects model calculated pooled results for the interventions. Statistical heterogeneity between studies was evaluated with Cochran's Q test and quantified by I2 statistic. Heterogeneity could be qualified, respectively, as low when I2 value is 25%, moderate at 50%, and high at 75% (13). To assess sources of heterogeneity, sub-group analysis was performed based on Intervention time, Parity and time of outcomes measure. We categorized time of outcomes measure into short-term (less than 8 wk) and long-term (more than 8 wk) measurement. Additionally, sensitivity analysis was performed to check the influence of individual studies on the pooled estimate. Publication bias was assessed by visual inspection of the funnel plot (14). A formal statistical assessment of funnel plot asymmetry was done with Egger's regression asymmetry test (15). The level of significance was set at $P<0.05$.

Results

Overall, 385 articles were identified. After removing 223 duplicates with EndNote software, 165 articles were screened by titles and abstracts. Owing to irrelevant content, 121 papers were excluded. Then, the full text of potentially eligible articles was downloaded and assessed for inclusion criteria. Finally, 8 articles were included in the meta-analysis. The flow diagram of study search and selection for this review according to PRISMA framework and screening process or reasons for the exclusion of the articles are shown in Fig. 1.

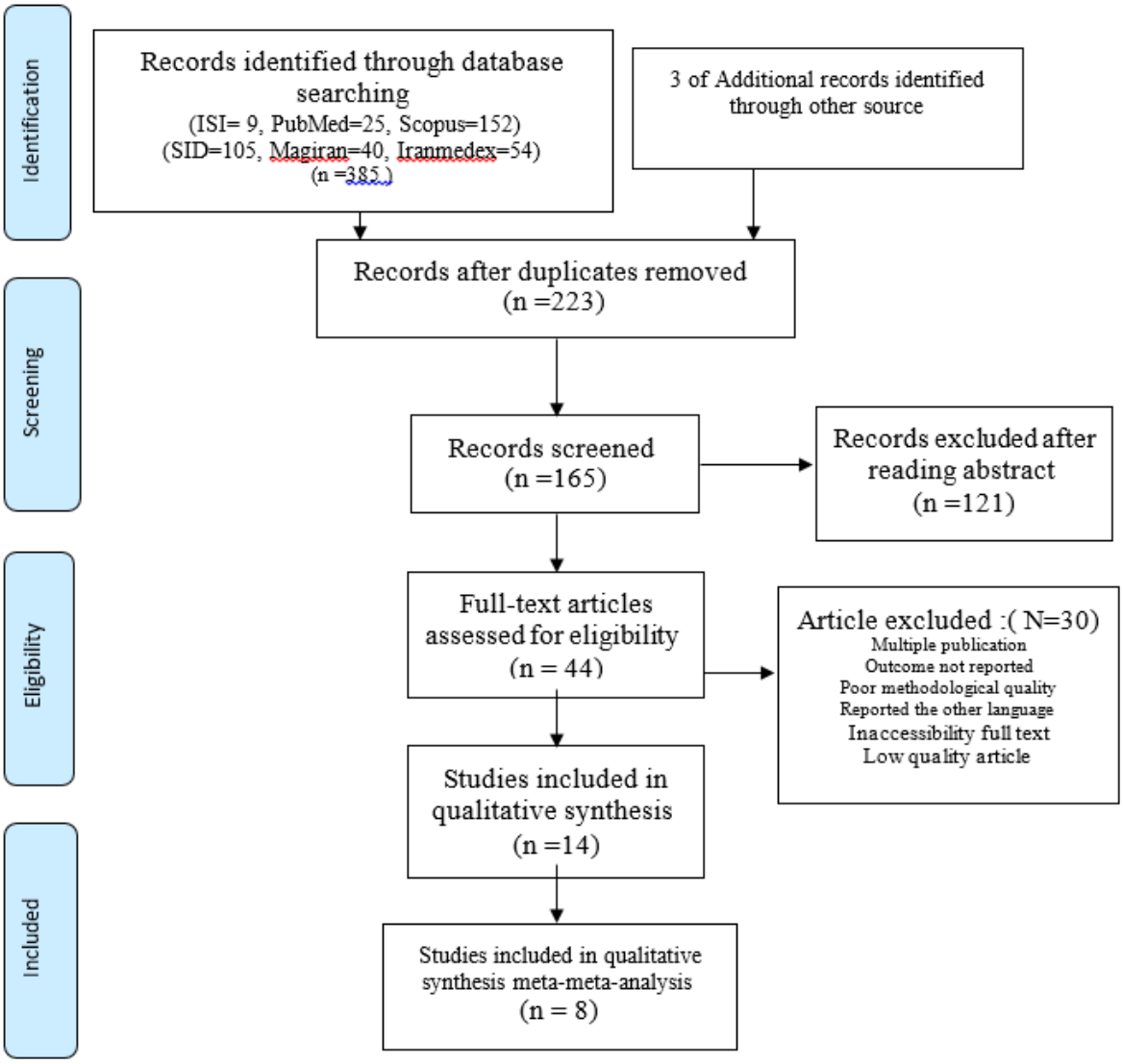

Fig. 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of study selection for inclusion in review

The Description of the eight studies is summarized in Table 1. All included articles were published in the English language. The time of BSE measurement varies from two wk to 16 wk after childbirth. We categorized them into short-term (less than 8 wk) and long-term (more than 8 wk) measurement. All included articles except one article (16) were used BSES-SF (The Breastfeeding Self-Efficacy Scale-Short Form).

Table 1: Summary of the included articles

Id (reference)	Parity(multiparty and prim parity)	Intervention time	Sample i	Sample c	Follow-up time (week)	Before(i)	After(i)	Before(c)	After(c)	Intervention type
1(17)	Both pg & mp	Postpartum(2–4 d after birth)	96	91	8	48.26+ 6.49	53.78 + 12.61	49.11 + 7.36	41.90 + 17.98	Mobile-based training
2(18)	Both pg & mp	Postpartum(new delivered)	65	65	4	52.53±7.19	63.66 ± 6.11	53.53± 5.85	57.04 ± 6.18	home-based education with cd and pamphlets
3(19)	Both pg & mp	Postpartum (child aged < 3 months)	40	40	12	119.08	145.92	125.10	125.50	Mobile app education
4(20)	Pg	Pregnancy(35–40 wk)	60	60	0	54.23±8.96	60.40 ± 4.92	52.72± 8.55	50.10 ± 7.60	Mobile instant messaging program in addition to the usual counseling Second week after Delivery.
5(21)	Pg	Pregnancy(28-32) to 4 month infant	33	32	16	49/39±12.97	53±12.34	45/03±13.95	41/71±7.79	Multimedia training group mobile software
6(16)	Pg	Pregnancy(28-32)	34	35	4	26.9±3.4	32±2.6	27.6±3.5	28.7±2.9	Telegram training packages as distance education program
					8	26.9±3.4	33.1±2.4	27.6±3.5	30±2.8	
7(22)	Pg	Pregnancy(24-28)	61	61	2	50.71±9.21	54.11±7.85	50.02±8.32	49.98±7.35	Telemidwifery method (individually on the social media platform)
					6	50.71±9.21	59.93±5.14	50.02±8.32	53.31±7.03	
8(23)	Both pg & mp	Postpartum(new preterm delivered)	32	32	4	33.18±4.63	44.69±9.51	31.71±4.28	32.59±7.36	Telephone counselling sessions were scheduled with maximum flexibility for the participants
					8	33.18±4.63	48.45±9.26	31.71±4.28	32.75±8.86	
					12	33.18±4.63	51.18±10.8	31.71±4.28	30.56±9.86	
					16	33.18±4.63	53.48±10.13	31.71±4.28	28.56 ±10.71	

The bias of RCTs included in the systematic review was assessed using the Cochrane tool, and the results are shown in Figs. 2 and 3. Of the 8 papers included, one papers did not mention the generation and allocation of random sequences (21), six papers did not mention whether the participants and intervention providers were blinded(16-18, 21-23), and six papers did not

mention whether the evaluator was blinded(16-18, 21-23). All studies reported the outcome indicators mentioned in the research protocol or method.

Fig. 2: Summary of risk of bias

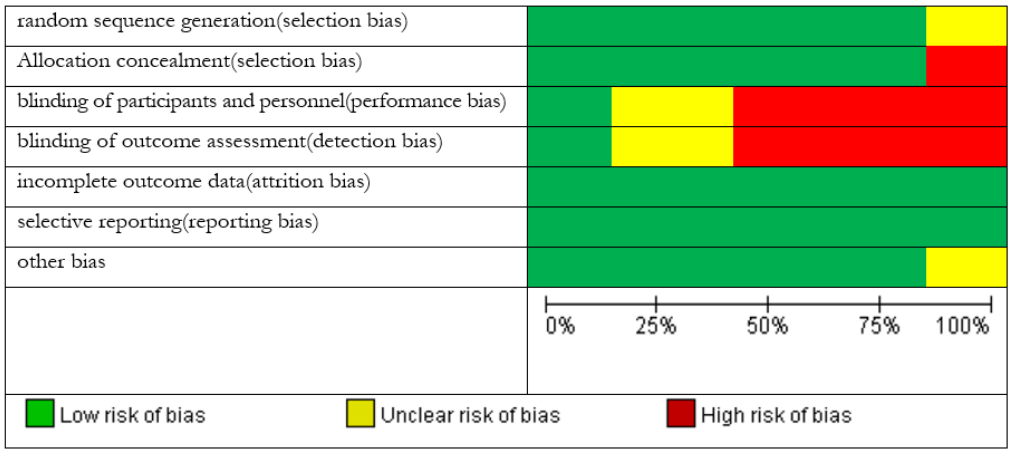

Fig. 3: Bias risk assessment chart.

The overall result demonstrated that telemedicine-based interventions have a positive impact on BSE compared with the control intervention (pooled SMD= 1.27; 95% CI= 1.01–1.53, *P*-value<0/001); heterogeneity (Cochrane's Q-value=51.94, *P*<0/001, I^2=76.90%)) (Fig. 4).

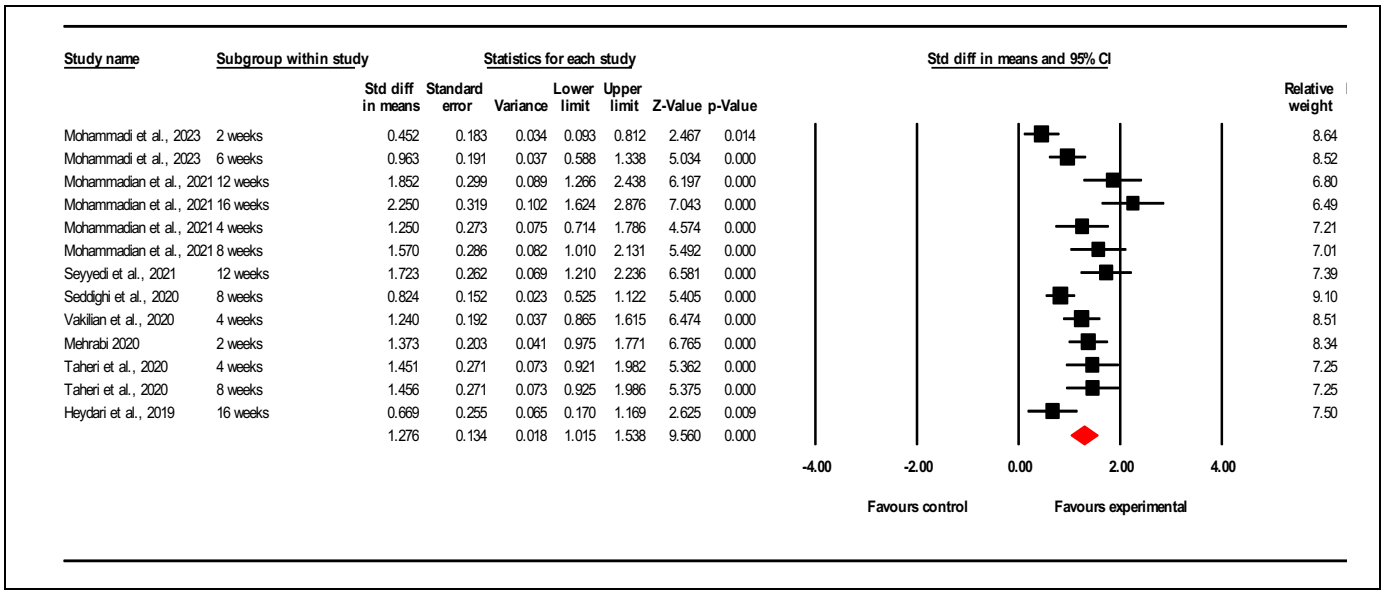

Fig. 4: Forest plot of studies that investigated the influence of telemedicine-based intervention on the self-efficacy of breastfeeding

The subgroup analysis was conducted based on time of outcome measurement. Short-term and long-term measurement of BSE, respectively (Pooled SMD=1.10; 95% CI= 0.78–1.41, *P*-value<0/001; heterogeneity (Cochrane's Q-value=17.07, *P*=0.004, I^2=76.71%)), (Pooled SMD= 1.44; 95% CI= 1.01–1.88, *P*<0/001; heterogeneity (Cochrane's Q-value=31.44, *P*<0/001, I^2=81.19%) demonstrated a positive impact (Fig. 5).

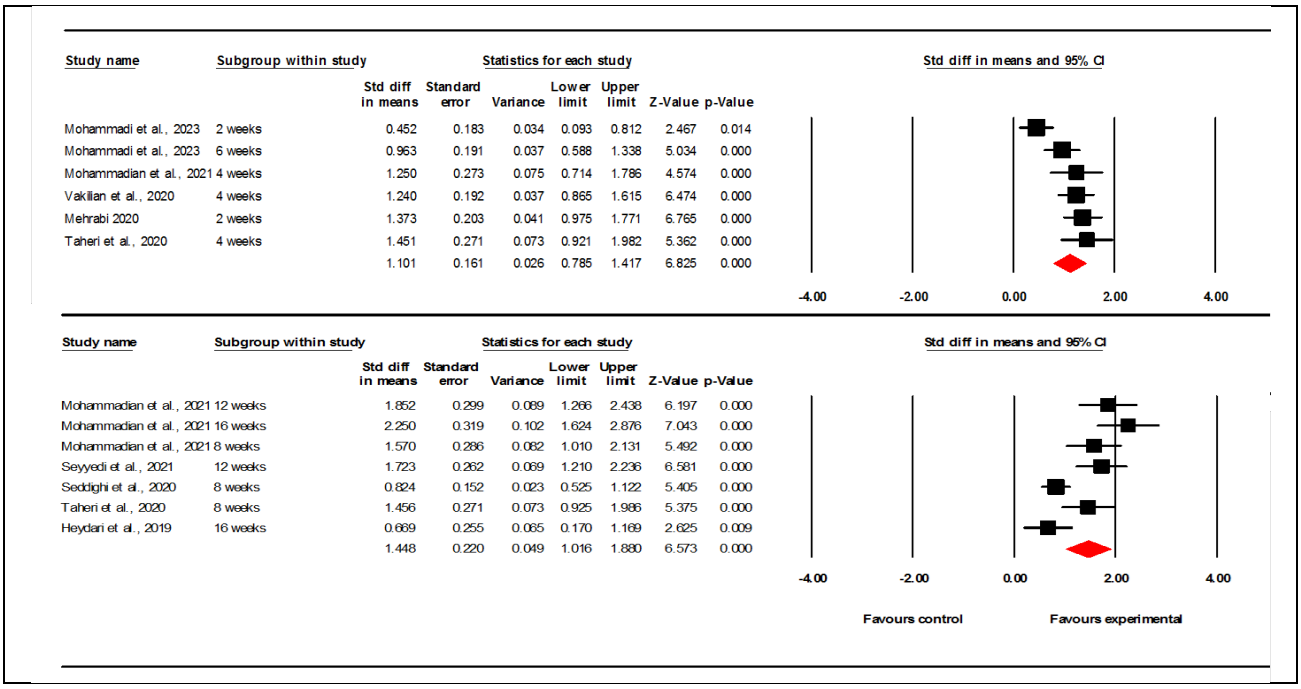

Fig. 5: Forest plot of subgroup analysis based on time of self-efficacy measurement.

In addition, subgroup analysis of Intervention time, Parity and each follow-up period was shown in Table 2. Twelve weeks of postpartum had most effect on BSE (SMD 1.77; 95% CI 1.39–2.16) than the others. Subgroup analysis of Intervention time showed that breastfeeding education in postpartum period was more effective compared with the education in pregnancy (SMD 1.48; 95% CI 1.11–1.85) was more than that of the primiparous (SMD 1.04; 95% CI 0.68–1.39). Subgroup analysis of Parity showed that the effect of education on both primiparous and multiparous (SMD 1.43; 95% CI 1.03–1.82) was more than that of the primiparous (SMD 1.11; 95% CI 0.77–1.44).

Table 2: The result of subgroup analysis on the breastfeeding self-efficacy

Subgroups	SMD (95% CI)	p-value	No. of study	I^2
2 wk	0.90	0.048	2	91.17
4 wk	1.29	<001	3	0.00
8 wk	1.24	<001	3	74.00
12 wk	1.77	<001	2	0.00
16 wk	1.44	0.067	2	93.31
Primiparous	1.11	<001	4	56.18
Primiparous & Multiparous	1.43	<001	4	77.39
Pregnancy	1.04	<001	4	74.51
Postpartum	1.48	<001	4	76.58

The sensitive analysis showed that there were no obvious changes in SMD of BSE after excluding each of the studies one by one. Therefore, our results were reliable. The publication bias among included studies was assessed by funnel plot. The asymmetry of the funnel plot showing the presence of publication bias (Fig. 6).

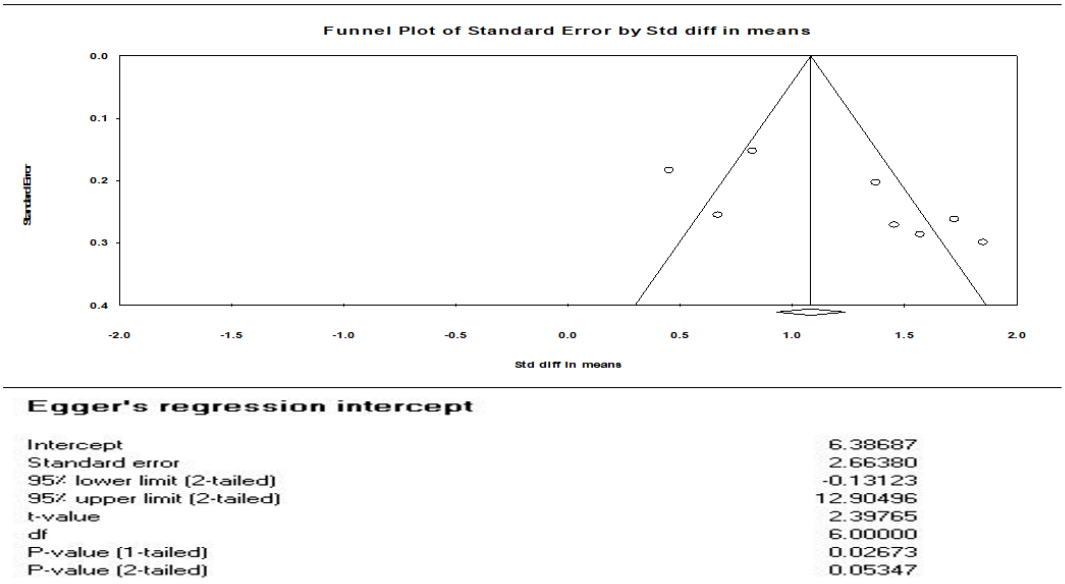

Fig. 6: The funnel plot of included studies reporting telemedicine intervention on breastfeeding self-efficacy

Discussion

The results from the pooled RCT data highlighted the positive impact of telemedicine-based intervention on the self-efficacy of breastfeeding compared with the standard or usual care. This finding parallels Galipeau's et al. meta-analysis that reported positive effect of interventions on breastfeeding self-efficacy (10). However, interventions significantly improved breastfeeding self-efficacy with a small effect size (SMD=0.4) during the first 4 to 6 wk. The difference in effect size in Galipeau's study and our study can be explained due to several reasons. They included many types of interventions, including face-to-face, telemedicine, group, and individual interventions into the meta-analysis, which cannot reflect the exact effect of telemedicine intervention. In addition, they included studies were published from 2006 to 2016 and there were no studies from Iranian population in their study. Another meta-analysis showed that Mobile Health-based interventions notably improved breastfeeding efficacy, participants' attitudes toward breastfeeding, and the rate of exclusive breastfeeding compared with usual care at 2-6 months after delivery (24). Although the results of this study were in line with our study, the small number of included studies to evaluate the effectiveness of interventions on BSE, and the absence of a study with Iranian population make their study different from our study. Although the use of phone for training or follow-up was effective for improving BSE, it was less effective compared with direct education (25). The contrast between this study and our study can be explained by the fact that in their study, the population of different countries was included, but our study focuses on the population of Iranian women. The effect of education on the BSE was significantly greater in Asian countries than in other countries. Factors such as religion, tradition, culture, beliefs, and customs can affect breastfeeding self-efficacy (18).

The subgroup analysis based on the follow-up period showed that telemedicine interventions in the Long-term measurement of BSE had more effect on BSE than short-term measurement. However, this finding is in contrast with Maleki's study. They declared that educational intervention had most effectiveness on BSE in the first week of postpartum (25). Their study included a wide range of interventions, which was different from our study. Telemedicine can improve self-efficacy over a longer period of time by removing barriers to face-to-face appointments.

The subgroup analysis based on telemedicine intervention during the postpartum period showed better improvement in BSE than during pregnancy. In line with our results, Brockway et al. in a meta-analysis study, reported improvement only in group which received intervention during the postpartum period (1). The effect of the intervention was significant when the intervention was provided during both prenatal and postnatal (10). In contrast to our results, Maleki et al. reported breastfeeding education during pregnancy was more effective compared with the postpartum period (25). This contrast could be explained by type of participants. The majority of their included study was primiparous which need more information during pregnancy. While education during pregnancy about breastfeeding is crucial, teachings during this period may be forgotten and may require repetition after childbirth, especially when individuals are practically engaged in breastfeeding, and new questions may arise.

The subgroup analysis based on parity reported both primiparous and multiparous benefit from telemedicine intervention. This may be because in the first pregnancy, there is no information about breastfeeding and there is a need for training. Multiparous also need education because it may have been forgotten over time, and telemedicine can be good and easy way.

Strengths and Limitations

This review study has several strengths. This is the first work that systematically review the effects of telemedicine-based interventions on breastfeeding self-efficacy among Iranian moth-

ers. Another is the comprehensive search of multiple electronic databases in a wide range of time is another strong point. One of the limitations of this study was the lack of grey literature search due to the lack of access to such documents. Therefore, we suggest that other studies should be conducted where access to such documents is possible.

Conclusion

Thus, this review could give better insight to healthcare providers into the effect of telemedicine on breastfeeding self-efficacy. Women who have confidence in their ability to breastfeed are more likely to breastfeed exclusively for a longer period. Therefore, by strengthening BSE through telemedicine interventions, especially for women who do not have the conditions for face-to-face counseling or education, we can expect positive results. This study recommends telemedicine consultation as the best choice to increase breastfeeding self-efficacy and as a result successful breastfeeding. Therefore, in developing countries, where breastfeeding is the key to reducing infant mortality, interventions based on telemedicine are considered a useful method.

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 they have no conflicts of interest.

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