

The effect of mother-infant skin-to-skin contact immediately after birth on exclusive breastfeeding: a systematic review and meta-analysis

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Abstract

In the new millennium, exclusive breastfeeding plays an important role in national and international policies. The effects of mother-infant skin-to-skin contact (SSC) after birth has been investigated in several studies. Given that there has been no overall estimate of this effects, the present study was conducted with the aim of investigating the effects of mother-infant SSC on the rate of exclusive breastfeeding through a systematic review and meta-analysis of randomized controlled trials. In the present study, the databases of Scopus, PubMed, Cochrane, SID, Magiran, IranDoc, and Google Scholar were searched to identify randomized controlled trials that evaluated the effects of mother-infant SSC immediately after birth on the rate of exclusive breastfeeding. The risk of bias and strength of evidence were examined according to the Cochrane Collaboration's tool and the Grading of Recommendation, Assessment, Development, and Evaluation approach, respectively. The data analysis was performed using Stata software. To assess the publication bias and heterogeneity, Egger's and Begg's tests and I^2 were used, respectively. In addition, the fixed effects model was employed to perform the meta-analysis. The heterogeneity of the factor of effects in the studies was determined as 16.2% ($p < 0.303$). There was no publication bias among the studies included; the p values of Egger's and Begg's tests were 0.168 and 0.386, respectively. The effects of mother-infant SSC on exclusive breastfeeding was statistically significant [odds ratio (OR)=2.19; 95% confidence interval (CI): (1.66-2); $p < 0.001$]. The subgroup analysis results in the normal vaginal delivery group included OR=2.45 [95% CI: (1.76-3.35); $p < 0.001$], for the cesarean delivery group the results were OR=1.44 [95% CI: (0.78-2.65); $p = 0.24$], the results for the duration of exclusive breastfeeding as of the discharge time up to 3 months were OR=2.47 [95% CI: (1.76-3.48); $p < 0.001$], and the results for the 3 to 6 months of exclusive breastfeeding were OR=1.71 [95% CI: (1.05-2.78); $p = 0.030$]. The study results showed that mother-infant SSC increased the rate of exclusive breastfeeding. Therefore, this finding could be used by maternal and infant health care providers to develop evidence-based intervention programs. (J Turk Ger Gynecol Assoc 2020; 21: 46-56)

Keywords: Mother-infant skin-to-skin contact, exclusive breastfeeding, systematic review, meta-analysis

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Introduction

Infants are quite vulnerable in the early stages of their life, and due to the higher speed of their growth than at other life stages, it is important that they are provided with sufficient energy, proteins, and other nutrients vital for their future health. Breastfeeding is the most ideal nutrition method at this stage. Hence, breastfeeding plays an important role in formulating

national and international policies on general health, child survival, and maternal health, in the new millennium (1-7).

Breastfeeding benefits will be maximized if practiced exclusively in the first 6 months after birth and then continued with supplementary nutrition up to 2 years. However, the reduction in the rate of exclusive breastfeeding is one of the most prevalent and serious problems at the present time. This



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rate is low in many world countries, having also been declining over the past few years in our country. In Iran, according to the Ministry of Health, the rate of breastfeeding has been plunging in recent years, with the exclusive breastfeeding rate having reached 56.8% and 27.9% by the end of the 4th and 6th month, respectively. This fact required the Office of Research and Technology of the Ministry of Health to develop the breastfeeding promotion program as one of the country's research priorities (1,8,9); based on this program, it is required that breastfeeding methods be developed and adopted.

Previous studies have shown that the life environment of infants before, during, and immediately after birth, the measures adopted during pregnancy and after birth, and the hospital policy affect the length of the breastfeeding period. These factors can affect the breastfeeding mechanism and the neonate's primary sucking behaviors, thereby leading to the discontinuation of breastfeeding and a reduction in the exclusive breastfeeding rate (10-12); hence, they are required to be taken into account because the early hours after birth are the most ideal time for a baby to start nutritional behaviors, such as searching and sucking. During this period, most babies respond to the tactile, warm, and olfactory stimuli of their mothers' body and become capable of sucking, and thus they start getting breastfed. Therefore, the early hours after birth are critical for the establishment and continuation of breastfeeding (1,10,13). Research has shown that the separation of the baby from the mother at birth, even for a short time, for the purpose of activities such as the evaluation of the baby, vitamin K injections, as well as the repair of an episiotomy and perineal injuries, could exert negative physiologic effects on the baby, including creating stress and increasing baby crying. As a result, the consumption of stored energy reduces the neonate's success in initiating nutritional behaviors, thereby affecting the stimuli and necessary responses to the development of sucking skills, effective breastfeeding, and the breastfeeding duration (10,13).

The study by DiGirolamo et al. (14) showed that the delay in starting breastfeeding was the major risk factor in the premature interruption of breastfeeding. Hence, skin-to-skin contact (SSC) between the mother and the infant is recommended at the first moments after birth so as to promote breastfeeding. SSC between the mother and the infant is a method in which the naked newborn is placed in the prone position on the mother's bare chest immediately after birth or during the first 24 hours after birth. During mother-infant SSC, the interaction between the mother and infant is enhanced, leading to an increase in the neonate's response to the mother's body stimulation and the development of nutritional behaviors in the baby (15-17). Most studies have shown that SSC is beneficial for the mother and the baby. Nevertheless, there are conflicting studies on the

relationship between mother-infant SSC and breastfeeding. Mahmood et al. (18), Gouchon et al. (19), Marín Gabriel et al. (20), and Vaidya et al. (21) reported that mother-infant SSC immediately after birth increases exclusive breastfeeding significantly. However, in the studies by Moore et al. (32) and Carfoot et al. (22), there was no significant relationship observed between mother-infant SSC and the exclusive breastfeeding rate (13).

Systematic reviews and meta-analyses are essential tools for summarizing the evidence available in a precise, accurate, and reliable manner (23). Despite the fact that several studies have been performed on the effects of mother-infant SSC on exclusive breastfeeding, the contradictory findings of these studies necessitate performing a meta-analysis that provides clear and coherent results and a comprehensive guide for policy makers and researchers. Thus, the present meta-analysis was performed with the aim of investigating the effects of mother-infant SSC immediately after birth on exclusive breastfeeding.

Materials and Methods

In the present systematic review and meta-analysis, all studies on the effects of mother-infant SSC immediately after birth on exclusive breastfeeding were investigated using the following search terms: breastfeeding, breast feeding, lactation, or human milk; SSC, skin-to-skin mother-infant contact, SSC or kangaroo mother care (KMC) methods; KMC; exclusive breastfeeding, breastfeeding exclusivity, and breastfeeding status; and randomized clinical trials, and their Persian equivalents in the electronic databases of SID, Magiran, IranDoc, Scopus, PubMed, ISI Web of science, Cochrane, and Google Scholar from 2000 up to April 2018. In addition, a manual search was performed in the reference section of relevant trials, systematic reviews, and meta-analyses to identify trials missed by the electronic search. The search and selection processes of the trials are shown using the PRISMA flowchart (Figure 1), with the PRISMA checklist used to report the meta-analysis results.

The inclusion criteria were (1) studies with an randomized-control trial (RCT) design, (2) the interventions that consisted of SSC defined as the placing of the naked neonate in the prone position on the mother's bare chest within 10 minutes of birth, (3) the participants consisted of mothers and healthy infants between 37 to 42 weeks of pregnancy, and (4) the primary outcome was exclusive breastfeeding up to six months after birth. There was no secondary outcome included.

To study the selection, first, the abstracts and keywords of relevant articles and their eligibility were examined in view of the inclusion criteria. Secondly, the full texts of the articles were reviewed independently by two authors for eligibility and discussed until consensus was reached.

The risk of bias was examined for each study by two independent evaluators using the Cochrane Collaboration's tool. In the event of a disagreement between the two evaluators, the issue would be resolved by a third researcher. Using the mentioned tool, 6 types of biases were assessed, including selection bias (random sequence generation and allocation concealment), performance bias (examining the blinding of participants and personnel), detection bias (the blinding of outcome assessors), attrition bias (incomplete outcome data), reporting bias (selective reporting), and other sources of biases. Based on the degree of each type of bias, the studies were assessed and reported with low, high, and uncertain risks (24,25).

To assess the overall strength of the evidence, the Grading of Recommendation, Assessment, Development, and Evaluation (GRADE) approach was adopted.

The extracted data were registered on relevant forms. The two authors extracted data from the full text of the articles independently, based on the data collection form.

The collected data included the authors' names, publication years, study designs, sample sizes, tools, outcomes, and the risks of bias assessment. After data collection, the extracted data were assessed. The data analysis was performed using the STATA 14.1 program. The effect level was calculated as the odds ratio, with the odds of exclusive breastfeeding in the intervention group divided by that of the control group. Next, subgroup analysis was performed based on the type of delivery and duration of exclusive breastfeeding to assess heterogeneity among the studies.

I^2 and its p-value were used to assess heterogeneity among the studies. In addition, a fixed effects model was applied to the pooled data and a meta-analysis was performed. Publication bias among the studies was assessed statistically using Egger's and Begg's tests, and visually using a funnel plot.

Results

In the primary search, 326 articles were obtained, with a total of 12 trials that met the inclusion criteria of the study. Out of the 12 studies, 5 studies were conducted in Iran, 3 India, and the other 4 were conducted in Pakistan, Italy, the United States, and Spain. Exclusive breastfeeding was assessed by asking questions from mothers on the phone or via face-to-face interviews in most studies ($n=9$). The language of 6 studies was English, and 3 studies were in Persian. The data extracted from the studies included in the meta-analysis are presented in Table 1. The results of assessing the risk of bias in the studies, using the Cochrane Collaboration's tool, are shown in Figures 2, 3.

Publication bias was assessed statistically using Egger's and Begg's tests. The p values of the Egger's and Begg's tests were 0.168 and 0.386, respectively, indicating that no publication bias existed among the studies included. The symmetric pattern of the funnel plot also confirmed the preceding statistical tests visually (Figure 4).

The heterogeneity of the measure of effects among the studies was assessed based on I^2 , which was 16.2% ($p<0.303$). However, a random effects model was applied to all calculations because it was assumed that some of the differences between the studies could be factual.

All studies were included in the meta-analysis, which resulted in an odds ratio (OR) of 2.19 with 95% confidence interval (CI) (1.66-2.89), implying that the effects of mother-infant SSC on exclusive breastfeeding were statistically significant ($p<0.001$). The forest plot, the odds ratio, its CI, the corresponding weight of each individual study, the pooled OR, its CI, and the I^2 index are shown in Figure 5.

Next, subgroup analysis was performed based on the type of delivery and periods of exclusive breastfeeding to examine the impact of these two variables on the results (Figures 5, 6). The

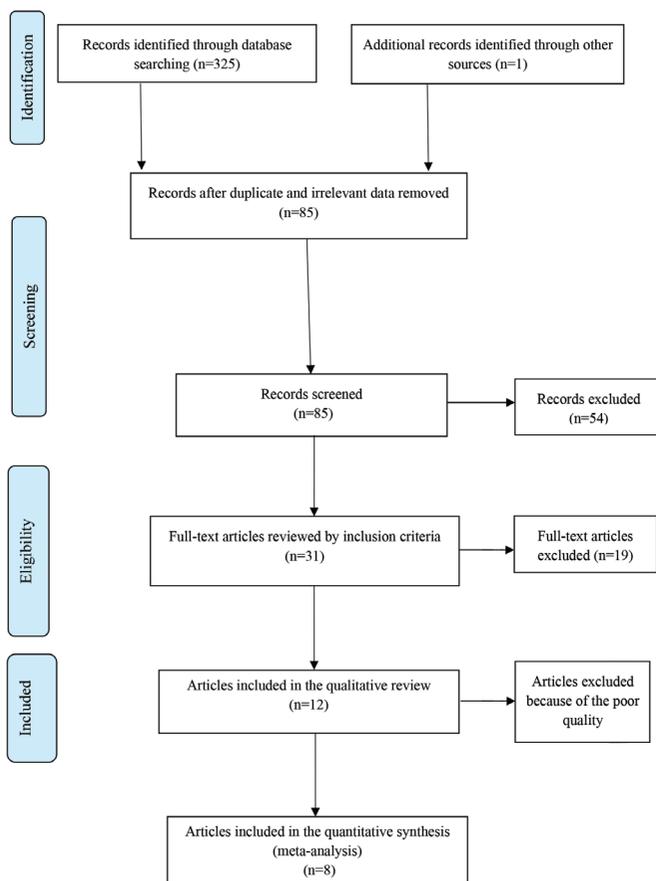


Figure 1. The PRISMA flowchart of the study's selection process

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Table 1. Features of 12 clinical trials included in study

No	Author year location of the study	Design	Participants	Intervention	Comparison	Dropout rates (%)	Tools	Outcomes
1	Sharma (34) 2016 India	RCT	Two-hundred mother-infant pairs	Mother-infant SSC (n=100)	Routine care (n=100)	0.5	Record breastfeeding status	A significantly higher proportion of neonates was exclusively breastfed at 6 weeks of age in the SSC group in contrast to the control group (72% vs 57.6%, p=0.04)
2	Khadivzadeh et al. (26) 2016 Iran	RCT	One-hundred fourteen mother-infant pairs	Mother-infant SSC (n=46)	Routine care (n=46)	19.3	Interviews with mothers	The rate of exclusive breastfeeding was significantly higher in the SSC group. There was a significant difference between the two groups in exclusive breastfeeding from birth to day 28 (40.4% vs 20%, p=0.03), and in the last 24-hour report of day 28 after birth (70.2% vs 46.7%, p=0.02)
3	Srivastava et al. (39) 2014 India	RCT	Two-hundred and ninety-eight mother-infant pairs	Mother-infant SSC (n=150)	Routine care (n=148)	10	Direct interviews or telephonic interviews with mothers	At the first follow-up visit (day 4-5), nearly 86.1% of the newborns in the study group were exclusively breastfed whereas only 66.9% of the newborns in the control group received exclusive breastfeeding (p=0.002). Exclusive breastfeeding rates at the 6 th week's follow-up visit were 85.2% and 63.6% for the study group and control group newborns, respectively (p<0.0001)
4	Nasehi et al. (38) 2012 Iran	RCT	Hundred and ten women with term babies	Mother-infant SSC (n=54)	Usual post-cesarean breast-feeding (n=56)	0	Patients asked about exclusive breastfeeding	In the follow-up period, 45 individuals (83.3%) of the intervention group and 42 individuals (75%) of the control group had exclusive breastfeeding, with this difference not being significant

Table 1. Continued

No	Author year location of the study	Design	Participants	Intervention	Comparison	Dropout rates (%)	Tools	Outcomes
5	Thukral et al. (40) 2012 India	RCT	Mother-infant pairs n=41	Mother-infant SSC (n=20)	Routine care (n=21)	15	Asked the mothers about the feeding method	EBF ¹ rates in 48 hours (95.0 vs 38.1%) and 6 weeks (90 vs 28.6%) were significantly higher in the SSC group than in the control group (p=0.001)
6	Mahmood et al. (18) 2011 Pakistan	RCT	One-hundred and eighty-three mother-infant pairs	Mother-infant SSC (n=92)	Routine care (n=91)	12	IBS ²	In the SSC group, 85.3% of the infants were exclusively breastfed in one month as against 65.7% in the CC group (p=0.025)
7	Gabriel et al. (20) 2010 Spain	RCT	Three-hundred and fifty healthy mothers with term babies	Mother-infant SSC (n=117)	Routine care (n=113)	34	Telephone calls	Mothers in the SSC group exclusively breastfed babies more frequently upon discharge, but no difference was found in one month of the life
8	Gouchon et al. (19) 2010 Italy	RCT	Ninety-six mother-child pairs	Mother-infant SSC (n=17)	Routine care (n=17)	64	Phone follow-ups	The SSC newborns were attached to the breast earlier (9 SSC newborns and 4 controls after 30 min) were breastfed (exclusively or prevalently) upon discharge (13 SSCs and 11 controls) and in 3 months (11 SSCs and 8 controls)
9	Kamalifard et al. (36) 2010 Iran	RCT	Eighty primipara mothers	Mother-infant SSC (n=40)	Routine care (n=40)	0	Telephone interviews	The mean of the duration of exclusive breastfeeding in the SSC group was 119.8±13.2 days, and in control group, it was 110.75±24 days. The mean difference was statistically significant (p=0.04)
10	Keshavarz and Bolbol Haghighi (35) 2010 Iran	RCT	One-hundred and sixty mother-infant pairs	Mother-infant SSC (n=80)	Routine care (n=80)	0	Telephone interviews	tfeeding up to 6 months (p<0.05) was greater than RC, h (89.3.0 vs 75.3%, p=0.03) 33

Table 1. Continued

No	Author year location of the study	Design	Participants	Intervention	Comparison	Dropout rates (%)	Tools	Outcomes
11	Safarabadi Farahani et al. (37) 2009 Iran	RCT	Hundred mother-infant pairs	Mother-infant SSC (n=50)	Routine care (n=50)	0	Face-to-face interviews	No statistically significant differences was found in duration of exclusive breastfeeding (101.2±27.84 vs 88.7±42.47; P < 0.85) in 4 months)
12	Moore and Anderson (13) 2007 U.S	RCT	Twenty-three mother-infant pairs	Mother-infant SSC (n=12)	Routine care (n=10)	17	IBS	No significant differences was found in breastfeeding exclusivity in one month (1.50±1.1 vs 2.10±2.2; p=0.45)

RCT: Randomized-control trial, SSC: Skin-to-skin contact, ¹EBF: Exclusive breastfeeding, ²IBS: Infant breastfeeding status

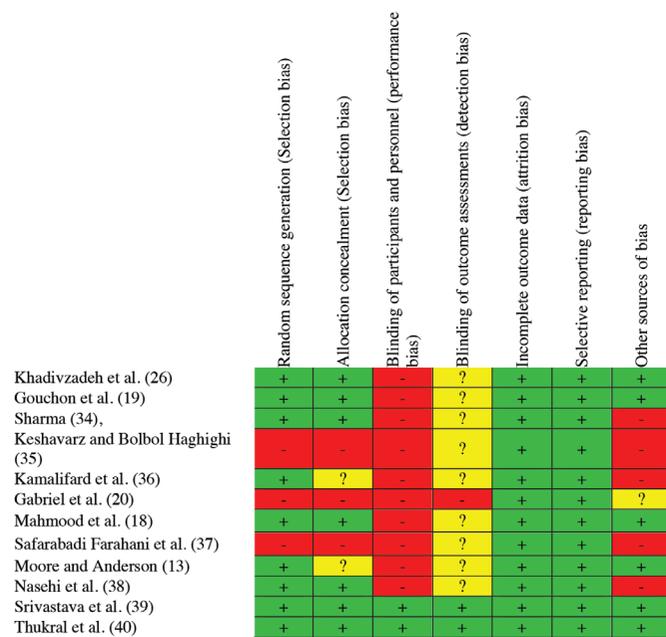


Figure 2. Author's judgments of risk of bias items for each study included

subgroup analysis, based on the type of delivery, resulted in lower heterogeneity among the studies in the normal vaginal delivery group ($I^2=14.9\%$, $p=0.319$), yet lower heterogeneity in the cesarean delivery group ($I^2=0.0\%$, $p=0.682$). However, the measure of the effects OR was 2.45 with a 95% CI (1.76-3.35) for the normal vaginal delivery group and 1.44 with a 95% CI (0.78-2.65) for the cesarean delivery group (Figure 6). The same pattern was observed when the subgroup analysis was performed based on the duration of exclusive breastfeeding (from the discharge date up to 3 months, as well

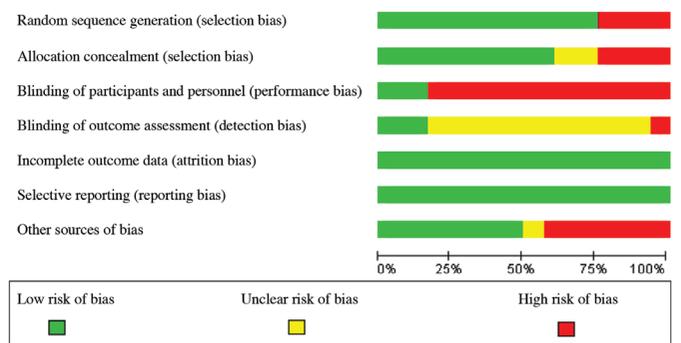


Figure 3. Authors' judgments of risk of bias presented as percentages across all included studies

as 3 to 6 months). In addition, heterogeneity increased in one group ($I^2=58.1\%$, $p=0.26$) and decreased in the other ($I^2=0.0\%$, $p=0.745$). Similarly, the subgroup analysis did not change the measure of the effects significantly. The OR values were 2.47 with a 95% CI (1.76-3.48) in the first group, and 1.71 with a 95% CI (1.05-2.78) in the second group (Figure 7).

The sensitivity analysis showed that the restriction of the meta-analysis did not change the results significantly, but improved the quality of the body of evidence evaluated based on the GRADE approach (Table 2).

Discussion

In this systematic review and meta-analysis, 12 RCTs were reviewed that had investigated the effects of mother-infant SSC on exclusive breastfeeding. The results of this meta-analysis indicated that mother-infant SSC had more statistically significant effects on exclusive breastfeeding than routine care. In the analysis of the subgroups performed based on the type

of delivery and duration of exclusive breastfeeding, it was determined that mother-infant SSC had a statistically significant effect on exclusive breastfeeding.

Past research has shown that the life environment of the baby before, during, and immediately after birth, the measures adopted during pregnancy and after birth, and the hospital policy affect the breastfeeding of neonates and are strong predictive factors of the duration of exclusive breastfeeding (26-28). One of the midwifery interventions in hospitals is the separation of the mother from the baby for medical reasons, immediately after birth. The reasons cited by hospitals for isolating the mother from the baby include monitoring the baby quickly after birth to stabilize their physical and medical conditions, preventing mother-to-baby infection transmission, providing more time for the mother's sleep and comfort,

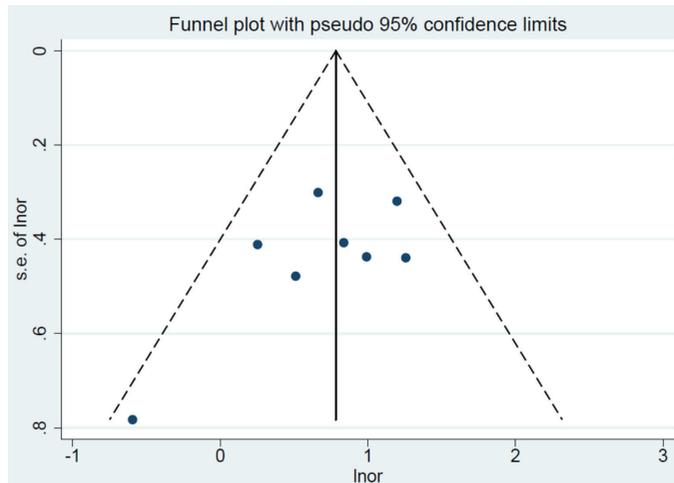


Figure 4. The funnel plot for the publication bias x-axis is the natural logarithm of the odds ratio and the y-axis is the standard error of the natural logarithm of odds ratio

and assessing the baby medically (26). Research in this field showed that the separation of the mother from the neonate after birth could exert adverse effects on the mother and the baby; this could result in reducing the interaction between the mother and the baby, making the baby fail to display nutritional behaviors, causing delays in lactation, reducing the mother's self-esteem and self-efficacy in relation to breastfeeding, impairing breastfeeding, reducing the breastfeeding duration, and finally leading to the use of other foods (1,27,29,30).

To solve the problem, skin contact between the mother and the neonate was introduced, in which the baby was placed on their abdomen in chest-to-chest contact with the mother. The principle of skin contact between the mother and the baby is derived from studies on animals. It has been demonstrated in animal studies that some of the instinctive behaviors seen in neonates are essential for their survival, with the neonates' survival being dependent on close contact with the mother. From the standpoint of ethologists, the early postnatal hours when the fetus is transmitted to the ectopic, undergoing rapid and profound physiologic changes, are critical in the neonate's adaptation in a short time so as to survive. Ethologists believe that the early hours after birth are ideal for starting baby's nutritional behaviors, such as searching and sucking, and are sensitive and critical times for breastfeeding because most babies respond to tactile, warm, and olfactory stimuli of the mother's body. Hence, the separation of the mother and baby immediately after birth could lead to the discontinuation of such instinctive behaviors (31). During SSC, the interaction between the mother and the baby increases, thereby leading to the development of nutritional behaviors that result in the baby's sucking on the mother's breasts and being nourished. It has been reported in relevant research that breastfeeding started

Table 2. The Grading of Recommendation, Assessment, Development, and Evaluation evidence profile for the effects of mother-infant skin-to-skin contact immediately after birth on exclusive breastfeeding for the type of delivery and duration of exclusive breastfeeding

Subgroups	Study results Odds Ratio (95% CI)	Heterogeneity (I ²)	GRADE
Overall	2.19 (1.66-2)	16.20	Moderate: downgraded by one level due to the lack of blinding in most of studies
Normal vaginal delivery	2.45 (1.76-3.35)	14.90	Moderate: downgraded by one level due to the lack of blinding in most of studies
Cesarean	1.44 (0.78-2.65)	0.00	Low: downgraded by one level due to the lack of blinding in most of studies; downgraded by one level due to imprecision
Discharge up to 3 months	2.47 (1.76-3.48)	58.10	Low: downgraded by one level due to the lack of blinding in most of studies; downgraded by one level due to unexplained heterogeneity
3 to 6 months	1.71 (1.05-2.78)	0.00	Moderate: downgraded by one level due to the lack of blinding in most of studies

CI: Confidence interval, GRADE: Grading of Recommendation, Assessment, Development, and Evaluation

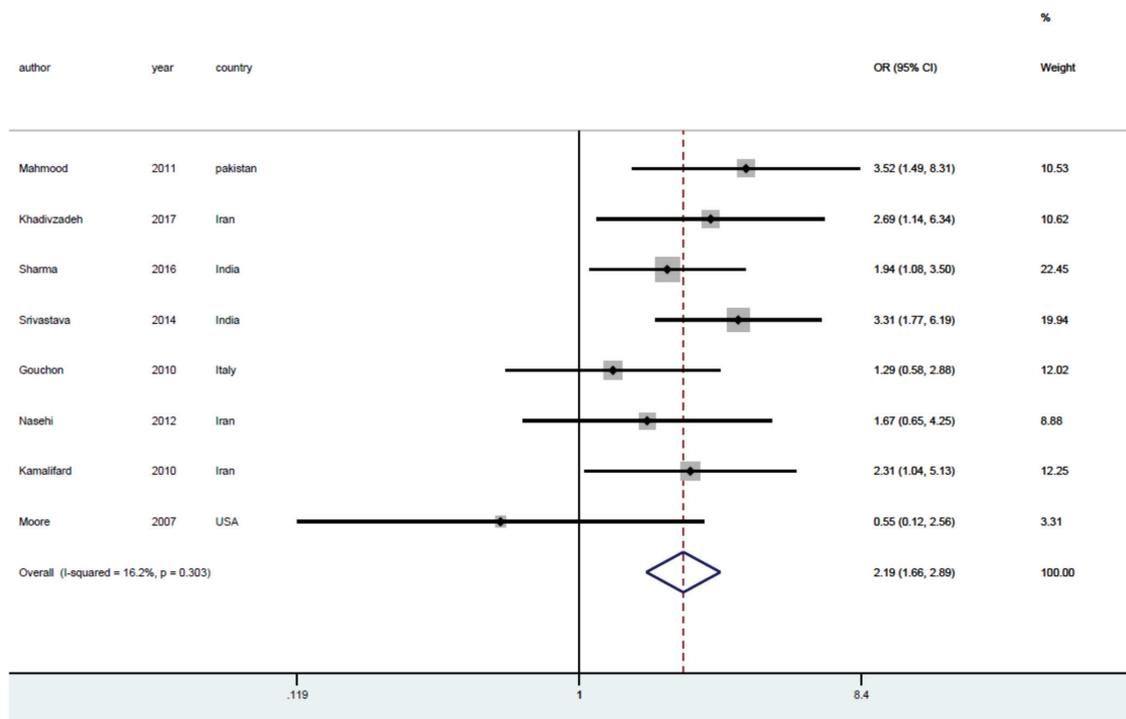


Figure 5. The effects of mother-infant skin-to-skin contact on exclusive breastfeeding based on the odds ratio. The horizontal lines denote the 95% CI, the Square (■) shows the point estimate (the size of the square corresponds to its weight); the diamond shows (◇) the combined overall effects of treatments.

OR: Odds ratio, CI: Confidence interval

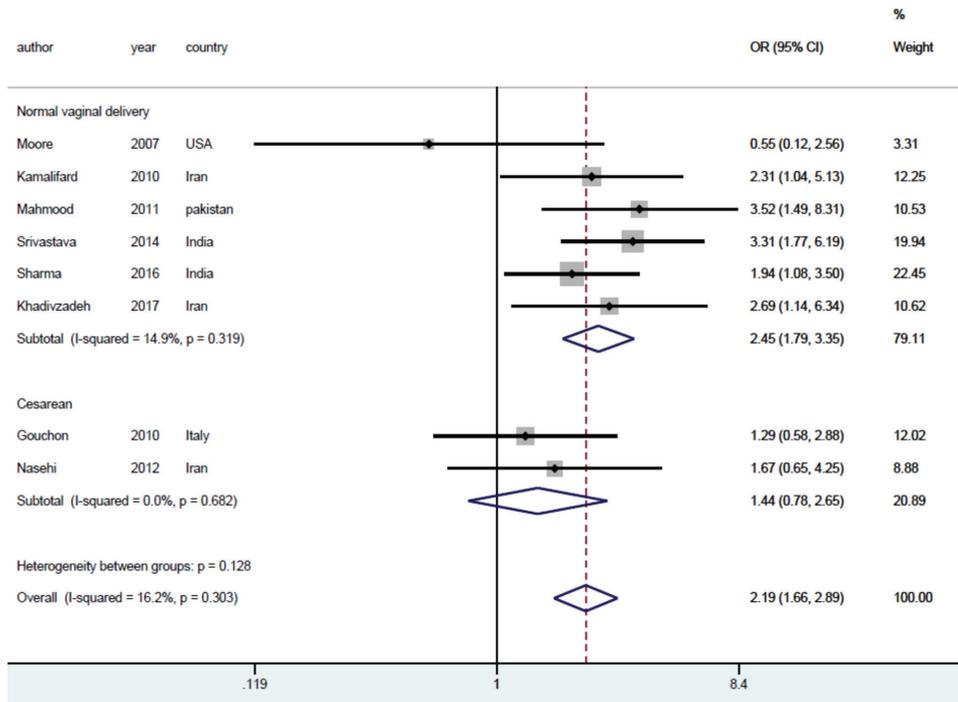


Figure 6. The effects of mother-infant skin-to-skin contact on exclusive breastfeeding based on the type of delivery. The horizontal lines denote the 95% CI, the square shows (■) the point estimate (the size of the square corresponds to its weight); the diamond shows (◇) the combined overall effects of treatments

OR: Odds ratio, CI: Confidence interval

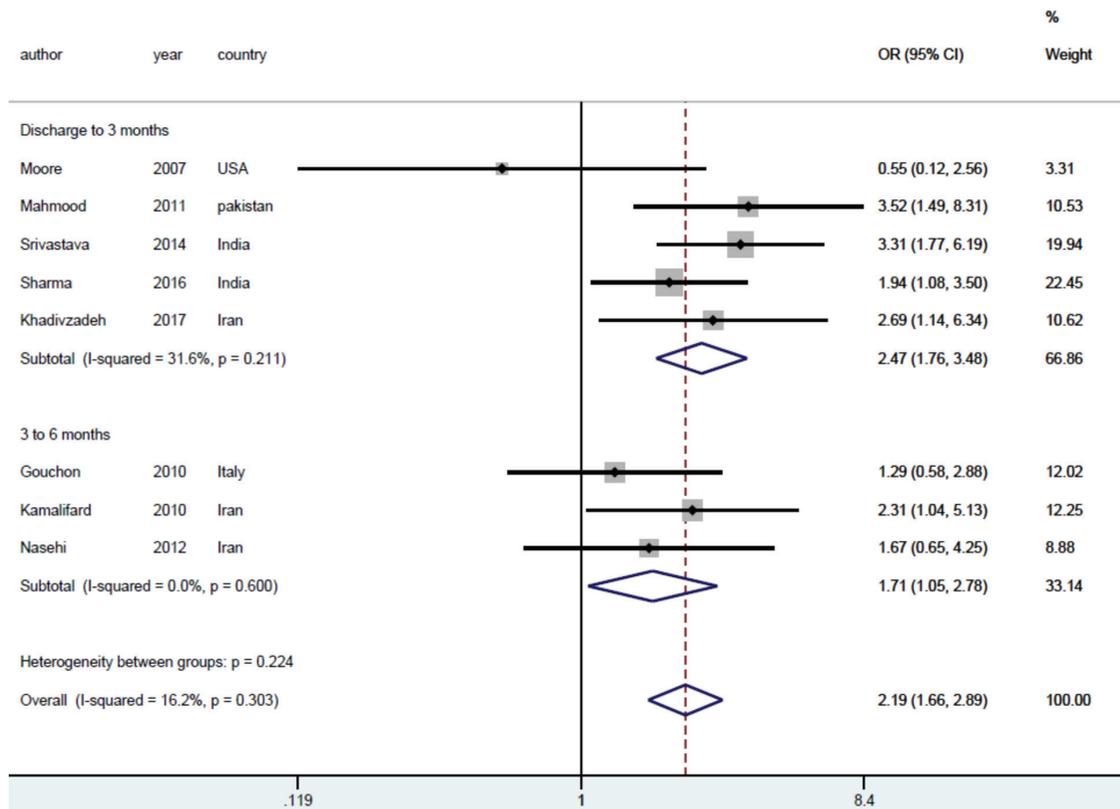


Figure 7. The effects of mother-infant skin-to-skin contact on exclusive breastfeeding based on the periods of exclusive breastfeeding. The horizontal lines denote the 95% CI, the Square (■) shows the point estimate (the size of the square corresponds to its weight); the diamond shows (◇) the combined overall effects of treatment

OR: Odds ratio, CI: Confidence interval

immediately after birth ensures greater continuity. Postnatal skin contact between the mother and the baby is one of the measures recommended by the World Health Organization and UNICEF to increase the rate of breastfeeding because of the importance of this issue and based on the existing evidence (1,13,26,31).

In the same vein, Moore et al. (32) study showed that postnatal skin contact between the mother and the neonate exerted beneficial effects on exclusive breastfeeding. Although this study confirmed the beneficial effects for the mother and neonate, it had some limitations that justified the need for the current study. Some of the limitations included the examining of several different variables in the study that reduced the accuracy of the search, and the non-inclusion of all eligible studies by the data extracted, especially the ones published in Persian, which resulted in a decrease in the input of the final sample size into the meta-analysis and the affect analysis.

Forster and McLachlan (29), in a narrative review, stated that skin contact between the mother and neonate was one of the ways of boosting breastfeeding. In fact, the study

by Foster was merely a literature review. By contrast, the present study is a systematic and meta-analytic review; this type of study provides the best evidence for judging the impact of interventions in medicine and their use in clinical settings.

Given that exclusive breastfeeding can provide specific nutrients, both in quality and quantity for the neonate by the end of the 6th month after birth, it provides all the neonate's nutritional needs necessary for normal development. In addition, given that the reduction in the exclusive breastfeeding rate is one of the major public health problems (33), the need for identifying ways of establishing and maintaining exclusive breastfeeding is evident. In this regard, according to the results of the present study, the postnatal skin contact of the mother and neonate could increase the exclusive breastfeeding rate. It is suggested that contact between the mother and baby be adopted as a care method by maternal and child health care providers, such as midwives, doctors, and students responsible in childbirth (34-40).

One of the strengths of the present study is that it is the first systematic and meta-analytic review study in Iran to

investigate the effects of postnatal mother-neonate skin contact on exclusive breastfeeding. One of the limitations of this study is the quality of the studies included in terms of their methodologies. Thus, it is recommended that clinical trials be performed using more qualitative methodologies to obtain more positive evidence.

Conclusion

The articles reviewed in this systematic review and meta-analysis showed that mother-infant SSC increased the exclusive breastfeeding rate. Thus, contact provides the best postnatal care for neonates. In spite of the evidence provided and the benefits of close postnatal contact between the mother and baby, this is not practiced satisfactorily in Iran. In addition, in many cases, the mother and neonate are separated after birth to perform conventional hospital practices, which seems to play an important role in causing lactation disorders. Perhaps this is the reason why, despite the benefits of exclusive breastfeeding in the first 6 months after birth, exclusive breastfeeding rates have declined in our country over the past few years. Thus, the results of the present study could be used in evidence-based decision-making by policy makers and service providers in the field of maternal and child health care as a guide for increasing the exclusive breastfeeding rate.

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