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Review

Breastfeeding After Breast Augmentation Surgery: A Scoping Review

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Abstract

The aim of this scoping review was to provide a comprehensive overview of research in the literature on breastfeeding experiences of mothers undergoing breast augmentation surgery and the factors influencing this, and to identify gaps in the literature that could inform future design and evaluation. The study was conducted as a comprehensive review based on the approach of Arksey and O'Malley. After scans of relevant databases, such as Scholar, Information Sciences Institute, Science Direct, Ovid, PubMed, and Scientific Information Database, all data were collected, summarized, and given a narrative explanation. In the literature, the correlation between topics involving women's health and aesthetic breast surgery could not be clearly shown. When certain illnesses appeared, aesthetic surgery was blamed, and women who had undergone breast augmentation surgery were undecided about breastfeeding when they became mothers. It was determined in this study that the effects on breastfeeding success in women who have undergone breast augmentation surgery fall principally under three headings: surgery type, placement of implant material, and surgery complications. It is crucial to provide detailed information about the possible consequences of this surgery to women of reproductive age considering this surgery.

Keywords: Aesthetic surgery, breast augmentation, breastfeeding, silicone

Introduction

Breast augmentation has long been the most widespread plastic surgery operation globally (Schiff, 2014). It involves improving the size and appearance of the breasts by placing gel, saline, or silicone breast implants above or below the breast muscle (Qureshi et al., 2018). According to worldwide statistics data from the International Society of Aesthetic and Plastic Surgery (ISAPS) in 2020, breast augmentation surgery is one of the most commonly performed aesthetic operations worldwide (16%), and Turkey ranks eighth among the countries in the world for this surgery (ISAPS, 2020).

Breast augmentation can be achieved through prepectoral, retropectoral, retroglandular, and retromuscular surgical techniques according to the place of the inframammary, axillary, or umbilical implant location (Bompy et al., 2019; Pillay & Davis, 2022).

Implants located by the prepectoral technique affect breastfeeding with regard to the amount of milk produced more compared to the retropectoral technique. In surgical techniques in which the areolas and nipples are completely affected, it is necessary to carefully monitor the baby's adequate weight gain because of the possibility of a reduction in milk production and, if necessary, to supplement it with commercially produced formula (CDC, 2021).

The risk of disruption of breastfeeding following breast augmentation surgery is related to breast surgery performed for aesthetic purposes rather than reconstructive surgery, such as mastectomy. As this surgery is performed optionally, it is necessary that women make an informed decision on whether or not to perform it and are informed of all short-term and long-term risks (Schiff, 2014). It is also important to inform the surgeon of any plans for pregnancy and breastfeeding to determine the appropriate type of surgery. The effect of the operation on breastfeeding is related to the type of intervention and the surgical technique. Leaving at least 1 year between breast augmentation surgery and pregnancy may be recommended as a way of decreasing the likelihood that milk production will be affected (Shaikh & Sigman-Grant, 2006; Tran et al., 2014).

Currently, there is much discussion about aesthetic surgery both in scientific circles and in the visual and printed media (Cronemberger, 2012). An important part of the information accessed by search engines on breast augmentation and especially its effect on breastfeeding may be misleading or incorrect. In particular, the relationship between topics relating to women's health and aesthetic surgery on the breasts has not been explained clearly, and aesthetic surgery is blamed for causing a number of illnesses. This has caused confusion among patients and health professionals (Roberts, 2013).

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Therefore, the aim of this study was to examine the relationship between breast augmentation operations, one of the most commonly performed aesthetic surgeries, and to review information available on this topic and present it to health professionals. In this regard, a comprehensive review has been conducted to show the key concepts that could affect breastfeeding in women who have undergone breast augmentation surgery, as well as guide future research by mapping the literature and identifying gaps in it.

Research Questions

1. Does breast augmentation surgery affect women's breastfeeding?
2. What are the factors affecting breastfeeding in women with a history of breast augmentation surgery?

Methods

Study Design

This study was a scoping review based on the Arksey and O'Malley (2005) approach.

Study Process

The five-stage approach of Arksey and O'Malley (2005) consists of determining the research question, identifying relevant studies, study selection, scoring data, summarizing, and reporting (Arksey & O'Malley, 2005). The flowchart shows a summary of the stages (Figure 1). In addition, reporting items (PRISMA) preferred for systematic reviews and meta-analyses and a control list (Tricco, 2018) were used for comprehensiveness (Figure 2). In addition, the compilation protocol of the Joanna Briggs Institute (JBI) was considered when conducting the study (Peters et al., 2020). In this protocol, there are eight questions about the sample, the study environment, the validity and reliability of the interventions, standard and objective measurements, confounding factors and control strategies, valid and reliable measurement of results, and appropriate statistical analysis. An analysis of the data obtained according to this protocol and a methodological quality assessment was conducted.

Search Process and Study Identification

Despite the undeniable benefits of breastfeeding, there is insufficient data in the literature on whether women who have undergone breast augmentation surgery at reproductive age can breastfeed and the difficulties they may encounter in the process. This topic is important in the field of nursing, and the basic research question concerning the lack of sufficient evidence in this field is a factor affecting the breastfeeding of women who have undergone breast augmentation surgery. The data for this research were collected between March 1, 2023, and April 30, 2023. In this regard, to determine the search strategy, first, a limited search was conducted in the EBSCO and PubMed databases, and the search keywords were determined by considering the title, summary, and keywords of the articles reached. In the second stage, relevant databases, such as Google Scholar, PubMed, Medline, Embase, Cochrane Central Register of Controlled Trials, ScienceDirect, Scopus, and Web of Science, were scanned without year limitations with keywords such as (lactation OR breast feeding OR breastfeeding) AND (silicone OR breast implant OR mammaplasty OR mammoplasty OR breast augmentation OR implants). In the third stage, other relevant studies in the reference lists of the accessed articles were accessed. The scans were performed in English and Turkish using various combinations of the Boolean operators, such as OR and AND. Research articles in Turkish and English, which had complete text availability, were included in the study. Publications, such as inaccessible articles, books, and book sections, reviews, systematic reviews, meta-analyses, and letters to the editor, were not included. As a result of the searches, 2356 articles were found. After removing duplicated articles (1419) and articles that did not meet the inclusion criteria based on their titles (937), 482 articles remained. Of these, 439 were eliminated due to the inaccessibility of the full text. The full texts of the remaining 48 articles were reviewed using JBI checklists. Fifteen of the reviewed articles were not included in the evaluation because the method was not clear, the sample was insufficient, valid and reliable measurement tools were not used, and the statistical analysis used and the findings were not interpreted correctly. As a result of this review, 22 articles were included in the review. The PRISMA-ScR flowchart showing the screening and selection process of the studies is presented in Figure 2.

Content analysis was applied as the research method, and kappa analysis was used to test reliability. The kappa coefficient, developed by Cohen, is a statistic measuring the fit between raters for qualitative (categorical) components. The kappa coefficient measures the reliability of comparative fit between two raters and is a statistical method for separating N items into C categories (except for accept–accept and reject–reject, where both raters agree). The formula below is used to find the kappa coefficient:

$$k = \frac{p_o - p_e}{1 - p_e} = 1 - \frac{1 - p_o}{1 - p_e},$$

For the kappa analysis, the raters are scored as follows: $\kappa = 1$ for complete agreement between the 2 raters, and $\kappa = 0$ for no agreement between them. A kappa value close to 1 indicates excellent agreement between the raters on the same data. A reliability level of at least 0.60 or 0.70 between coders is considered adequate (Cohen, 1960). The evaluators in the study consisted of 2 individuals who are proficient in English and Turkish, have conducted national and international studies in the field of breastfeeding, specialize in women's health and disease nursing, and have expertise in statistics. The results emerging in this review were categorized under 3 basic headings: *surgery type and implant location, implant material,* and *the development of surgical complications*. Cohen's kappa coefficient was calculated as 0.87 (agreement strength: very high).

Eligibility of Resources

More than a thousand articles were excluded from the study as they did not meet the inclusion criteria. After removing duplicate articles, examining titles for relevance to the topic, and checking the validity of the sources and the accessibility of the articles, 22 articles with suitable topics and coverage were examined. Articles that did not fit the inclusion criteria as a result of keyword searches, as well as articles that did not meet the topic coverage, were excluded from the final examination.

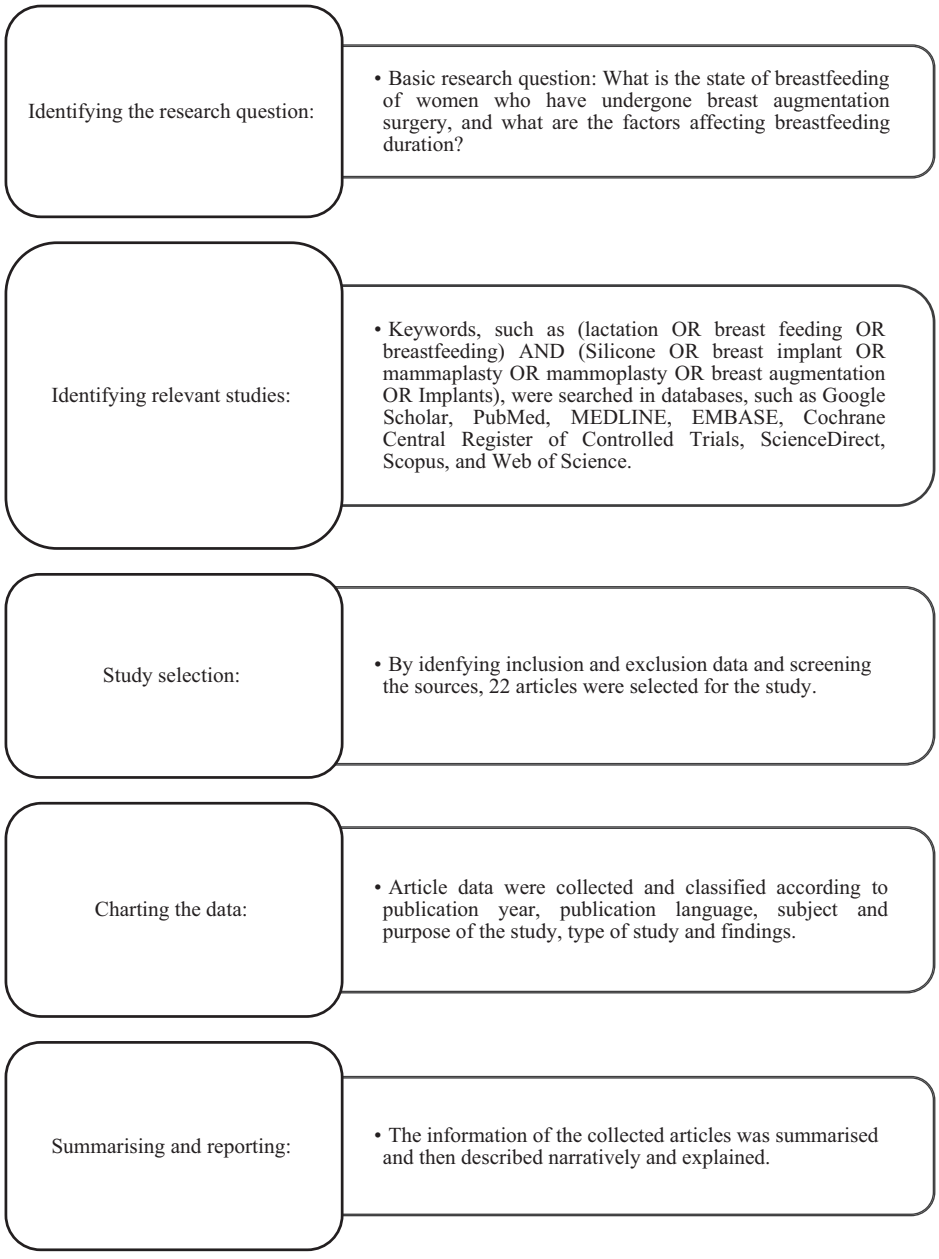

Figure 1.
Flowchart of the Process of the Study Based on Arksey and O'Malley's Five-Stage Approach.

As a result, when scanning with the determined keywords, all articles on "silicone nipple, breastfeeding, and breast augmentation" were discussed, while articles containing "silicone nipple, silicone pacifier, post-mastectomy reconstructive surgery, breast reduction, and breast augmentation not related to breastfeeding" were not included in the study. All data related to the topic in the examined articles were collected, described narratively, and interpreted.

Results

In the literature, breastfeeding following breast augmentation surgery has been examined under 3 headings: success or failure at breastfeeding, the mother's perception of breastfeeding and the decision to continue breastfeeding or to use formula, as well as the role of health-care professionals in protecting, encouraging, and supporting breastfeeding (Filiciani et al., 2016; Marcacine et al., 2018; Ram et al., 2022; Roberts et al., 2015). Studies have indicated that although women who have undergone breast augmentation are often willing to breastfeed, they have experienced negative biological conditions brought about by the surgery that limit their ability to continue to breastfeed (Camargo et al., 2018).

In a cohort study in Israel that examined the effect on breastfeeding of breast augmentation surgery in primigravida women

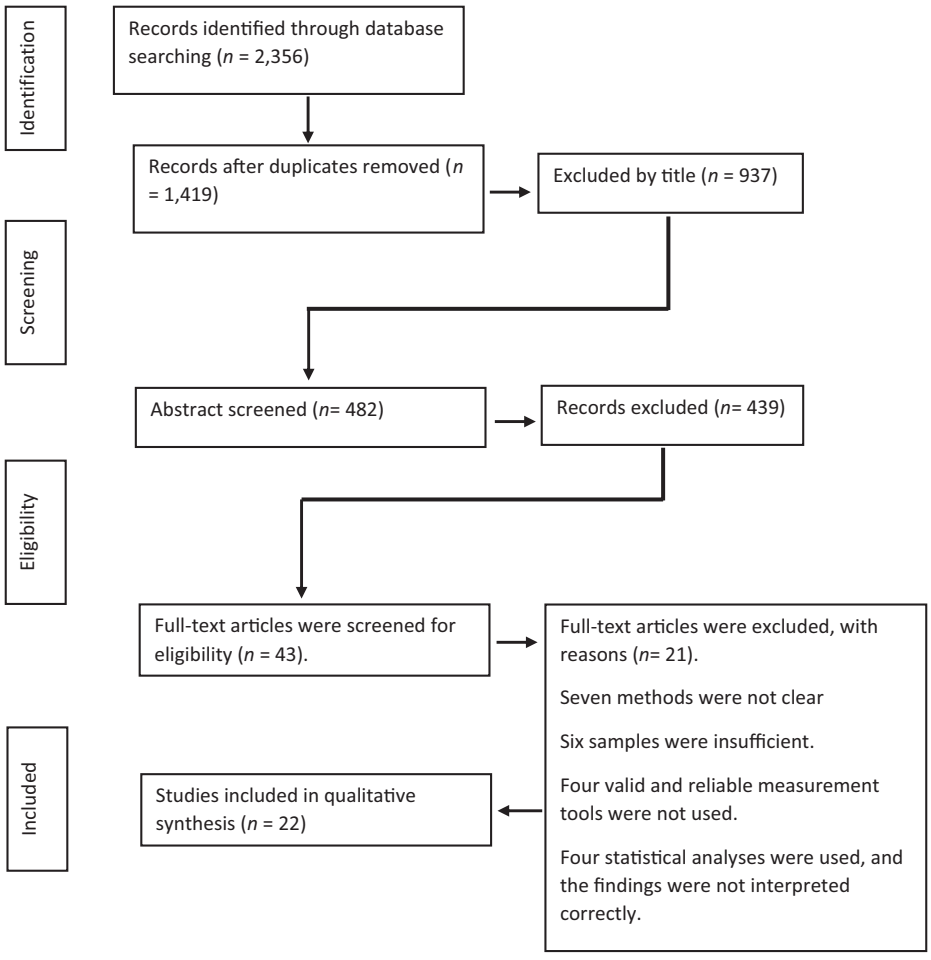

Figure 2.
Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow Diagram for the Scoping Review Process.

(2022), 14,919 women were assessed who had either undergone ($n=3913$) or not undergone ($n=11,006$) breast augmentation surgery. The rates of breastfeeding in the first 3 months following the birth of the women who had undergone breast augmentation surgery (70.7%) were found to be statistically significantly less than those of women who had not (85.1%). It was emphasized that in this study, breast implants had a significant negative effect on breastfeeding rates (Ram et al., 2022). In a similar article by Roberts et al. (2015) assessing the effect of breast augmentation surgery on breastfeeding, it was found that 79% of women who had undergone surgery were breastfeeding, which was statistically significantly lower than the proportion of women who had not undergone surgery (89%) (Roberts et al., 2015).

In a cohort study that assessed the effect on breastfeeding of undergoing breast augmentation surgery, it was found that 99% of women who did not undergo surgery and 93% of those who did continued to breastfeed successfully. Although the breastfeeding success rate of women who had not undergone surgery was higher, the difference was not statistically significant (Filiciani et al., 2016).

While some studies suggest that breast implants have negative effects on breastfeeding rates (Ram et al., 2022; Roberts et al., 2015), other studies have reported that breastfeeding is possible without any difference for women without breast implants (Filiciani et al., 2016; Jewell et al., 2019). However, due to the limited number of studies on the topic of the effects of breast augmentation surgery on lactation, there is a need for larger-scale, evidence-based research.

Based on content analysis, it was determined that breastfeeding in women who had undergone breast augmentation surgery was affected by three factors: surgery type and placement of implant, implant material, and surgical complications. The studies included in the content analysis are summarized in Table 1.

Surgery Type and Placement of Implant

Anything that obstructs the normal development of a woman's breast or the production of milk can negatively affect the breastfeeding process. Women who have breast augmentation surgery may experience problems related to breastfeeding in connection with the type of surgical incision. It is stated in the literature that fewer problems may be met in breastfeeding with incisions below the armpit, whereas incisions around the areola may increase the risk of breastfeeding problems (Filiciani et al., 2016; Marcacine et al., 2018; Pillay & Davis, 2022). For successful breastfeeding, sensation

Table 1.
Studies Included in the Content Analysis by Year

Author/Year/Country	Sample	Study Design	Variables	Key Results
Strom et al., 1997 USA	497 cosmetic saline breast implant patients	Cohort study	Saline breast implants and Breastfeeding	It was stated that 71.4% of women with saline breast implants did not have any problems with breastfeeding.
Cheng et al., 2002 China	Twelve patients with various complications after breast augmentation with injected hydrophilic PAAG	Case report	Polyacrylamide hydrogel injection and complications of breast augmentation	The article suggests that injectable hydrophilic polyacrylamide gel is a contraindication for breast augmentation in any young woman who is unmarried or has no children, has a tendency to bleed, and has little breast tissue, as it poses a breastfeeding problem. Some considerations are discussed for preventing and managing these complications.
Semple, 2007 Canada	15 with bilateral silicone gel-filled implants and 34 with no implants	Experimental study	Contamination of human breast milk and silicone gel-filled breast implants, cow's milk, and infant formulas	Lactating women with silicone implants are similar to control women with respect to levels of silicon in their breast milk and blood. Silicon levels are 10 times higher in cow's milk and even higher in infant formulas.
Cruz & Korchin, 2010 Puerto Rico	107 women control group 105 women study group	Retrospective clinical study	Breastfeeding after augmentation mammaplasty, saline implants, periareolar and inframammary surgical technique	It was determined that the success of breastfeeding decreased by 25% in subpectoral saline implants; there was no significant difference between periareolar or inframammary approaches, and it did not affect breastfeeding success.
Kang & Ong, 2011 China	35-year-old patient who had undergone bilateral PAAG injection	Case report	Polyacrylamide hydrogel injection augmentation and unilateral breast autoinflation	The authors recommend against using PAAG injection for augmentation mammaplasty, especially in women intending to breastfeed. Physicians and patients must be aware of the complications associated with PAAG before gel administration.
Hammond, 2012 USA	48 women	Prospective cohort study	Contour profile gel implants and lactation problems after implantation	It was reported that 85.4% of 48 women who had breast augmentation surgery with Contour Profile Gel breast implants had enough milk to breastfeed. The probability of women with Contour Profile Gel breast implants having breastfeeding problems after implantation is low.
Wang et al., 2012 China	102 women with injected hydrophilic polyacrylamide gel	Retrospective study	Polyacrylamide hydrogel injection for augmentation mammaplasty and ability for breastfeeding	Assessing breastfeeding after breast augmentation by PAAG implant, infection was found in 56.8% of 102 women. For this reason, the use of the PAAG implant is not recommended for women who plan to breastfeed in the future.
Roth et al., 2012 USA	A 29-year-old Hispanic woman with a history of breast augmentation in the postpartum period	Case report	Breast implant and seroma	Late seroma formation is a rare finding associated with breast augmentation and is typically found in the context of trauma to the postoperative breast. Rarely, this condition can also be associated with the physiological changes found during pregnancy and the postpartum period. This also interrupts breastfeeding.
Meggiorini et al., 2013 Italy	A 39-year-old old woman with breast implants in the postpartum period	Case report	Breast implant and seroma	Even though the literature contains no articles about an association between textured prostheses, late seroma, pregnancy, and the use of breast pumps, this case report indicates that small repetitive traumas produced by the breast pump may have favored the seroma formation with both mechanical and inflammatory mechanisms. This also interrupts breastfeeding.

(*Continued*)

Table 1.
Studies Included in the Content Analysis by Year (Continued)

Author/Year/Country	Sample	Study Design	Variables	Key Results
Papa et al., 2015 Albania	20 women with ending pregnancy and mammary silicone gel prostheses and 20 women with ending pregnancy without breast implant	Prospective clinical study	Silicone gel mammary prostheses and breastfeeding	It was found that mothers' blood was higher than in a control group, but this difference was not statistically significant.
Grella et al., 2015 China	A 33-years old Asian woman with polyurethane implants	Case report	Breast augmentation with polyurethane implants and breastfeeding	Women who underwent breast injections with permanent biomaterials such as polyurethane implants or PAAG should avoid breastfeeding.
Lund et al., 2016 USA	9217 subjects inframammary incisions, and 610 subjects with periareolar incisions	Cohort study	Inframammary incisions, periareolar incisions, nipple sensitivity, and lactation issues after primary breast augmentation	It was found that while no change was seen in the nipple and skin sensation of the periareolar incision group ($n=610$), in the group with the incision below the breast ($n=9217$), a small change in sensation in the nipple was determined. The negative effect of surgery type on nipple or skin changes and breastfeeding problems is at a low level (evidence level: 3).
Filiciani et al., 2016 Argentina	200 patients (100 breast implants, 100 control)	Cohort study	Breast implants, breastfeeding	In a study assessing women who have undergone breast augmentation surgery according to surgical incision type, it was found that 47% of the women with an incision below the breast and 46% of those with an areolar incision continued to breastfeed, and the difference between them was found not to be statistically significant. There was no significant effect of the type of surgery on breastfeeding success (evidence level: 2).
Marcacine et al., 2018 Brazil	115 postpartum women with breast implants	Cohort study	Surgical technique (periareolar or below the breast), Implant location (prepectoral or retropectoral), and breastfeeding	Study with 115 women who had undergone breast augmentation surgery, no significant difference was found between techniques with regard to surgical technique (periareolar or below the breast) or implant location (prepectoral or retropectoral). However, it was found that women with an implant volume of 270 mL or more needed to use a galactogogue because of inadequate milk production.
Jin et al., 2018 China	287 breast augmentation patients who had PAAG injection	Retrospective study	Breast augmentation by polyacrylamide hydrogel injection, complications, and treatment strategy	With PAAG implant, breastfeeding may be stopped by abscesses, which may occur as a complication.
Bompy et al., 2019 France	1073 postpartum women with breast implants	Retrospective study	Operative indication, the surgical approach, the implant position, implant features, and breastfeeding	It was found that 7% of the women who had undergone breast surgery gave birth, and 68% of these—more than half—breastfed. It was found that women with retroglandular implants were able to breastfeed significantly less than those with retromuscular implants.
Jewell et al., 2019 USA	Silicone, 3695 births; Saline, 2041 births	Cohort study	Silicone implant, saline implant, and breastfeeding	After surgery, 80% of the women with silicone implants and 75.9% of those with saline implants were able to breastfeed their babies after birth. It was found that the commonest problem seen in the women who had breast augmentation surgery was inadequate production of milk, which was seen in 19.8% of those with saline implants and in 19.6% of those with silicone implants. In the results of the study, it was emphasized that most of the women were able to breastfeed without any complications being seen (evidence level: 2).

(*Continued*)

Table 1.
Studies Included in the Content Analysis by Year (Continued)

Author/Year/Country	Sample	Study Design	Variables	Key Results
Woo & Park 2019 South Korea	A 30-year-old female with gel implants	Case report	Breast implant and silicone in breastmilk	In a case who had breast augmentation surgery with silicone gel, silicone was found in breast milk due to rupture of the extracapsular silicone implant.
Denizoglu et. al., 2019 Turkey	A 25-year-old female had a history of breast augmentation with prepectoral silicone implants in the postpartum period	Case report	Breast augmentation with prepectoral silicone implants and pregnancy-associated implant complications	Postpartum mastitis was assessed as a late complication of breast augmentation surgery
Lee et al., 2021 South Korea	A 34-year-old old woman with breast implants in the postpartum period	Case report	Postpartum galactocele, breast implant, and using breast pump	This case report indicates that peri-implant galactocele occurs in lactating women after using a breast pump. This also interrupts breastfeeding.
Kornfeld et al., 2021 USA	A 39-year-old woman with a history of bilateral retropectoral breast augmentation surgery	Case report	Breast implant with uninterrupted breastfeeding and galactocele	This case report indicates that peri-implant galactocele occurs in lactating women. The woman continued to breastfeed during treatment despite being told that she should not. This case is an example of the safe surgical removal of infected breast implants and the management of an infected galactocele without stopping breastfeeding.
Loesch et al., 2022 Turkey	A 33-year-old woman with a history of bilateral Aquafilling® injection augmentation mammoplasty	Case report	Aquafilling® injection and galactocele formation in a lactating woman	It is recommended that patients who have had breast enlargement by Aquafilling® injection should avoid breastfeeding.

Note: PAAG = polyacrylamide gel.

is necessary in the nipple. The baby suckling on the nipple stimulates the pituitary gland through nerve pathways, resulting in the release of prolactin and oxytocin for the production and release of milk. The lateral intercostal branch of T4, which passes through the route of the periareolar incision, sends a deep branch through the breast tissue to innervate the nipple. However, the incidence of lack of success at breastfeeding is found to be higher because of the higher probability of changes in sensation when this branch is damaged in the periareolar incision approach (Cheng, 2018; Hurst, 1996). In a study assessing changes in nipple and skin sensation in women who had undergone surgery and the effect of this on breastfeeding, Lund et al. (2016) assessed 9827 cases according to surgical incision types. It was found that while no change was seen in the nipple and skin sensation of the periareolar incision group ($n = 610$), in the group with the incision below the breast ($n = 9217$), a small change in sensation in the nipple was determined. The negative effect of surgery type on nipple or skin changes and breastfeeding problems is at a low level (evidence level: 3) (Lund et al., 2016). Despite the greater probability of seeing changes in nipple sensation in the periareolar group in the literature, the reason for obtaining the opposite result in the present study is thought to be because the groups were not homogeneous. From this, it can be concluded that, in terms of the impact on breastfeeding being affected by changes in nipple or skin sensation, there is no significant difference between the incisions made below the breast and the periareolar incision.

In a study assessing women who have undergone breast augmentation surgery according to surgical incision type, it was found that 47% of the women with an incision below the breast and 46% of those with an areolar incision continued to breastfeed, and the difference between them was not statistically significant. There was no significant effect of the type of surgery on breastfeeding success (evidence level: 2) (Filiciani et al., 2016). Similarly, in another study with 115 women who had undergone breast augmentation surgery, no significant difference was found between techniques with regard to surgical technique (periareolar or below the breast) or implant location (prepectoral or retropectoral). However, it was found that women with an implant volume of 270 ml or more needed to use a galactogogue because of inadequate milk production (Marcacine et al., 2018). On the other hand, in Cruz's study (2010), it was determined that the success of breastfeeding decreased by 25% in subpectoral saline implants, but there was no significant difference between periareolar or inframammary approaches, and it did not affect breastfeeding success (Cruz & Korchin, 2010).

In France, 1073 patients were included in a study performed retrospectively at three university hospitals to analyze the effect of breast implants on breastfeeding. It was found that 7% of the women who had undergone breast surgery gave birth, and 68% of these—more than half—breastfed. It was found that women with retroglandular implants were able to breastfeed significantly lower than those with retromuscular implants (Bompy et al., 2019).

Implant Material

There are studies in the literature showing that mechanical aspiration by a baby during breastfeeding can cause a change in the position of the material in the breast tissue, tearing of the capsule that surrounds it, leakage of the material, and infection (Jin et al., 2018; Loesch et al., 2022; Woo & Park, 2019). Asymptomatic patients who have had breast injections of long-lasting biomaterials are advised to avoid breastfeeding (Grella et al., 2015). From this, it can be said that in assessing breastfeeding in women who have undergone breast augmentation surgery, the material used is of importance.

In a study in the United States, it was reported that 85.4% of 48 women who had breast augmentation surgery with Contour Profile Gel breast implants had enough milk to breastfeed. The probability of women with Contour Profile Gel breast implants having breastfeeding problems after implantation is low (Hammond, 2012).

In a 5-year cohort study comparing breastfeeding results after breast augmentation surgery with silicone and saline implants (Jewell et al., 2019), 64.4% of the women had surgery with silicone implants and 35.6% with saline. After surgery, 80% of the women with silicone implants and 75.9% of those with saline implants were able to breastfeed their babies after birth. It was found that the most common problem seen in women who had breast augmentation surgery was inadequate production of milk, which was seen in 19.8% of those with saline implants and in 19.6% of those with silicone implants. In the results of the study, it was emphasized that most of the women were able to breastfeed without any complications being seen (evidence level: 2) (Jewell et al., 2019). In another study conducted with women using saline implants, it was stated that 71.4% of women did not have any problems with breastfeeding (Strom et al., 1997). In a study evaluating silicone gel implants and the levels of silicone that pass into breast milk, a result was obtained supporting this evidence, and the silicone levels in formula foods and cow's milk were found to be higher (Semple, 2007). In a case study from Korea, a woman who had undergone breast augmentation with silicone gel 5 years prior found a sticky gel-like material in her breast milk 2 months after giving birth. Following mammography and magnetic resonance imaging, a diagnosis was given of extracapsular silicone implant rupture relating to an intraductal silicone extension in her left breast. She stopped breastfeeding because of a leakage of silicone into her milk (Woo & Park, 2019). In another study with 20 women with and without silicone gel prostheses, it was found that the level of silicone in the mothers' blood was higher than in the control group, but this difference was not statistically significant (Papa et al., 2015). On the other hand, the American Society of Plastic Surgeons stated that the amount of silicone in breast milk is 10 times less than that in cow's milk or formula (Semple et al., 1998). In view of this, it must be kept in mind that breast augmentation surgery with saline or silicone implants can have a negative effect on milk production and that breastfeeding may be interrupted because of a leakage of implant material into the mother's milk.

Breast augmentation surgery using hydrogel fillers, such as polyacrylamide gel (PAAG) or Aquafilling®, is commonly used in some countries as an alternative to breast augmentation with saline or silicone implants (Jin et al., 2018; Loesch et al., 2022; Wang et al., 2012). In the case of a 33-year-old woman with a history of bilateral Aquafilling® injection enlargement mammoplasty, galactocele was found after hydrogel injection, negatively affecting breastfeeding success. From this case, it is recommended that patients who have had breast enlargement by Aquafilling® injection should avoid breastfeeding, and that women planning breastfeeding should not have breast augmentation surgery by Aquafilling® injection (Loesch et al., 2022). With PAAG implant, breastfeeding may be stopped by abscesses, which may occur as a complication (Jin et al., 2018). In another study assessing breastfeeding after breast augmentation by PAAG implant, infection was found in 56.8% of 102 women. Therefore, the use of PAAG implant is not recommended for women who plan to breastfeed in the future (Wang et al., 2012). In a case report, a 35-year-old patient had undergone bilateral PAAG injection augmentation mammaplasty in China. The authors of this case report recommend against using PAAG injection for augmentation mammaplasty, especially in women intending to breastfeed. Physicians and patients must be aware of the potential complications associated with PAAG before gel administration (Kang & Ong, 2011). Other cases of PAAG suggest that the injectable hydrophilic polyacrylamide gel is a contraindication for breast augmentation in any young, unmarried woman with no children, those with a tendency to hemorrhage, and those with little mammary tissue (Cheng et al., 2002). In another case, which was performed using a permanent material similar to PAAG, a woman remained asymptomatic after breast augmentation surgery until she began to breastfeed, but she was forced to stop breastfeeding when mastitis and galactocele developed during lactation (Grella et al., 2015). There are also studies that report breast malignancies in the area where PAAG implant surgery has been performed (Chen et al., 2016; Zhao et al., 2015). Therefore, the World Health Organization has included PAAG in its classification of suspected carcinogens (WHO, 2010).

Surgical Complications

The most frequently seen complications following breast augmentation surgery are hematoma formation and infection. Occasionally, periprosthetic serous fluid accumulation may occur in the early or late periods after the operation (Pineda et al., 2004). Infection of breast implants during breastfeeding can cause a rare but difficult clinical scenario of early cessation of breastfeeding and morbidity in the mother and baby (Kornfeld et al., 2021). In clinical practice, nurses may encounter various complications arising from breast augmentation surgery, including capsule contraction, calcification, mammography distortion, silicone or saline leakage, systemic illness, cancer, and breastfeeding problems (Hill et al., 2004).

In the literature, there are few reports of complications in the period following birth relating to breast augmentation surgery. In one published case, treatment began during the breastfeeding period for a woman who had had breast augmentation surgery and who had developed mastitis and abscesses in the second week postpartum in her left breast. This was assessed as a late complication of breast augmentation surgery (Denizoglu et. al., 2019). Similarly, in published case presentations, Meggiorini

et al. (2013) and Roth et al. (2012) reported a case of seroma arising from an implant seen during the breastfeeding period following birth (Meggiorini et al., 2013; Roth et al., 2012).

In one published case presentation, peri-implant fluid accumulation was found in the left breast of a woman aged 34 who had undergone breast augmentation surgery, who had been breastfeeding for 1 month, and who was diagnosed with galactocele after further investigation (Lee et al., 2021). Similarly, both peri-implant fluid and galactocele were found following advanced evaluation 1 week after birth in a 39-year-old woman with a history of bilateral retropectoral breast augmentation surgery. The woman continued to breastfeed during treatment despite being told that she should not, and 4 months later, her implant was taken out and the galactocele was drained (Kornfeld et al., 2021). This case is an example of the safe surgical removal of infected breast implants and the management of an infected galactocele without stopping breastfeeding.

The results of the articles included in the content analysis are summarized in Table 2.

Study Limitations

One of the limitations of this study was the difficulty of fully accessing up-to-date and reliable sources. However, the best and most reliable sources were selected and retrieved according to the situation and needs.

Table 2.
Factors Affecting Breastfeeding in Women Undergoing Breast Augmentation Surgery

Affecting Factors	Effects
Surgery type and placement of implant	It is reported that incisions in the armpit may cause fewer problems with breastfeeding, while periareolar may increase the risk of breastfeeding problems. However, the level of evidence for this is low (evidence level: 3). In summary, it could be said that the type of surgery did not have a significant effect on breastfeeding success.
Implant material	The probability of women with Contour Profile Gel breast implants having breastfeeding problems after implantation is low. Although breast augmentation surgery with silicone and saline implants usually does not cause any complications, milk production may be negatively affected or breastfeeding may be interrupted due to leakage of the implant material into breast milk. The breastfeeding process of patients who undergo breast augmentation surgery with Aquafilling® injections is negatively affected. The PAAG implant could be complicated by an abscess during breastfeeding. PAAG is also a suspected carcinogen.
Surgical complications	The most common complications during breastfeeding after breast augmentation surgery are hematoma, infection, and rarely periprosthetic serous fluid accumulation. These complications may interrupt breastfeeding.

Note: PAAG = polyacrylamide gel.

Conclusions and Recommendations

According to the results of the research, there is no conclusive evidence as to whether breast augmentation surgery should hinder breastfeeding. While some studies show that breast implants have a negative effect on breastfeeding rates, there are also studies indicating that breastfeeding is possible without any difference for women without breast implants.

The factors affecting the breastfeeding process in women with a history of breast augmentation surgery were grouped in this review under 3 headings: surgery type and placement of implant, implant material, and surgery complications.

According to the surgical incision type, neither the incision below the breast nor the areolar incision is superior with regard to breastfeeding success. However, with regard to the location of the implant, those with retroglandular implants were found to be less able to breastfeed than those with retromuscular implants, whereas no superiority was seen between prepectoral and retropectoral locations. In addition, it was seen that as the volume of the implant increased (270 ml or more), the need for the use of a galactogogue in connection with inadequate milk production also increased. Investigating surgical implant materials, it was found that while the use of hydrogel implant materials, such as of polyacrylamide gel (PAAG) and Aquafilling®, was not recommended, the likelihood of breastfeeding problems with Contour Profile Gel breast implants was low. It has been reported that saline implants are associated with inadequate milk production. Additionally, some studies have shown that after enlargement with silicone gel, the silicone has leaked into the mother's milk. In the literature, complications in the period after birth relating to breast augmentation surgery are limited, but in this survey, complications such as mastitis, abscess, hematoma, infection, seroma, and galactocele, were found (Cheng et al., 2018; Cruz & Korchin, 2010; FDA, 2011; Denizoglu et al., 2019).

When it is considered that breast augmentation surgery is most often performed at the reproductive age, nurses, as health professionals, have great responsibility. Nurses should inform women completely about the potential effects of this surgery and its potential effects on lactation. In addition, it is necessary to give women counseling on the possibility that breastfeeding may cease after surgery, and their written informed consent should be obtained. In providing this service, it is important that the nurse listens carefully to the woman during the interview, is supportive, and displays a non-judgmental attitude. Women who have chosen breast augmentation surgery should be closely monitored after discharge from the hospital for postpartum breastfeeding management. Identifying the women who have undergone this operation against the lower possibility of breastfeeding, supporting them, and encouraging them to breastfeed is of great importance for women's health in particular and for public health in general.

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