Factors associated with Maternal Attachment of Breastfeeding Mothers

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Purpose: This study aimed to identify factors associated with maternal attachment of breastfeeding mothers, with a focus on the mothers' breastfeeding characteristics. **Methods:** Data were collected from 217 mothers who breastfed their healthy baby for 1 month after childbirth and had no postpartum complications. The data were analyzed by hierarchical regression analysis. **Results:** The factors significantly associated with maternal attachment were an emotional exchange with one's baby (β=.41, $p<$.001), breastfeeding confidence (β=.20, p=.022), depression ('quite a bit or more', β=-.18, p=.005), and depression ('a little', β =-.14, p=.024). The model explained 38.4% of variance in maternal attachment. **Conclusion:** In order to improve attachment, nurses should be actively supported in helping mothers in the first month postpartum adapt to breastfeeding. Interventions to prevent postpartum depression should also be conducted.

Key words: Breast feeding; Mother-child relations; Object attachment; Psychological adaptation; Volition

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INTRODUCTION

The positive impact of breastfeeding on mothers' health and the health and development of newborn babies has long been well known. In particular, breastfeeding is known to enhance mothers' parenting behavior and bonding formation, as well as to improve attachment to the baby [1]. That is, maternal attachment builds up as a result of harmonious interactions during breastfeeding, which enables infants to receive visual, haptic, and auditory stimulation and mothers to learn the infants' patterns of behavior through direct sensory feedback.

As such, a number of authors have asserted that breastfeeding has positive effects on maternal attachment [2-4]. These opinions have encouraged mothers to choose breastfeeding over formula feeding for the purpose of maternal attachment development [5], although it has been found that mothers who bottle-fed their infants felt guilty [6]. However, claims of breastfeeding enhancing maternal attachment have been made with no concrete scientific and empirical evidence, and the universal assumption that breastfeeding exerts a positive influence on maternal attachment has been supported in some studies [4,7] and not supported in others [8,9]. The inconsistent results of previous studies underscore the necessity of scientifically confirming which characteristics of breastfeeding behavior affect attachment.

Women experience diverse aspects of the breastfeeding adaptation process immediately after childbirth. Breastfeeding adaptation involves four aspects: the physiological aspect, which

involves the ability of the mother to provide an ample amount of breast milk for the baby and engage in convenient feeding sessions, as well as infants' ability to feed and grow; the self-concept aspect, which involves improving confidence in breastfeeding; the role functioning aspect, which refers to skill development for breastfeeding; and the interdependence aspect, which describes how mothers become acquainted and exchange emotions with infants and receive social support for breastfeeding [10]. Breastfeeding adaptation is thought to be associated with attachment, but no definitive evidence for this yet exists.

Breastfeeding behavior is divided into exclusive, partial, and symbolic [11]. Exclusive breastfeeding is subdivided into two types: feeding with breast milk alone with no other liquids or solids, and breast milk occasionally supplemented with vitamins, minerals, water, or juice. Partial breastfeeding means that infants receive breast milk with complementary foods. Symbolic breastfeeding emphasizes the calm and comfort of infants over nutrition through the provision of occasional, irregular, and small amounts of breast milk [11]. Little research has investigated the influence of breastfeeding frequency on maternal attachment.

Mothers' willingness to breastfeed is also a critical element in breastfeeding [12,13]. Studies indicate that pregnant women are generally willing to breastfeed due to maternal-fetal attachment [14], though the relationship between maternal-fetal attachment and the willingness to breastfeed beyond the 12-month mark has not been reported.

Meanwhile, attachment develops over time, and secure attachment has been observed in the interactions between mothers and infants at 1 month of age [15]. Secure attachment is flexible and changeable depending on the family environment [16]. In addition, breastfeeding is a stable pattern in the first postnatal month [17]. Therefore, if attachment is confirmed at 1 month postpartum, attachment formation can be improved and attachment disorders can be prevented by early interventions. The study aimed at analyzing maternal attachment at 1 month postpartum and the characteristics of breastfeeding behavior that affected attachment.

1. Objectives

The purpose of this study was to investigate the associations of factors related to mothers' breastfeeding with maternal attachment. The specific objectives of this study were as follows:
- To investigate the degree of mothers' attachment with their infants, breastfeeding adaptation, and willingness to breastfeed.
- To investigate differences in maternal attachment in accordance with the general characteristics of mothers' breastfeeding behavior.
- To investigate the correlations of mothers' attachment with their infant, with breastfeeding adaptation and willingness to breastfeed.
- To investigate factors associated with attachment between infants and breastfeeding mothers.

METHODS

1. Research Design

The research employed cross-sectional and descriptive analyses to investigate the factors associated with the attachment of infants and breastfeeding mothers.

2. Research Subjects

The research subjects were mothers who had been breastfeeding a healthy infant since birth and had no maternal complications. The size of the sample was calculated using G*Power 3.1.9.2. For multiple regression analysis with a medium effect size of .15, a significance level of .05, a power of .95 and 17 predictors (eight demographic and breastfeeding characteristics, eight subcategories of breastfeeding adaptation, and willingness to breastfeed), the minimum number of subjects calculated was 208. Considering about 15% dropout rate, the targeted number of subjects was 240. The study analyzed materials from 217 of 219 survey respondents, excluding two dropouts.

3. Research Instrument

1) Maternal attachment
Maternal attachment is a term used to describe the degree of infant attachment as evaluated by the mother. In this study, maternal attachment was measured by the Korean version [18] of the Maternal Attachment Inventory developed by Müller [19] after assessment of its reliability and validity. It is a mother-centered tool that directly measures maternal attachment and is composed of 26 questions that are scored on a Likert scale from 1 ('almost never') to 4 ('almost always'). The total score ranges from 26 to 104, with a higher score indicating a greater degree of maternal attachment. In a reliability test of examinations performed at 4 weeks after delivery, the Cronbach's α coefficient was .85 when the scale was developed [19], and it was .91 in this study.

2) Breastfeeding adaptation
Breastfeeding adaptation was measured using the tool de-

veloped by Kim [10]. This tool included 27 questions divided into eight subcategories: four items for an emotional exchange with one's baby, five for breastfeeding confidence, three for sufficient breast milk, four for the baby's feeding capability and growth, four for being familiar with one's baby, three for discomfort in breastfeeding, two for maintenance of breast milk volume, and two for getting support. Each question is evaluated on a Likert scale from 1 ('disagree') to 5 ('absolutely agree'). The total score ranges between 27 and 135, with higher scores indicating better adaptation to breastfeeding. Its reliability was confirmed through a Cronbach's α level of .82 in Kim's [10] study on the occasion of its development and a score of .88 in this study.

3) Willingness to breastfeed

Willingness to breastfeed was measured using the tool developed by Kim and Nam [12] to evaluate willingness to breastfeed during the postpartum period, which Kim [20] extended from 6 weeks to more than 12 months to reflect the recommendations of the American Academy of Pediatrics. The total number of questions is four, and they are evaluated using a Likert scale that ranges from 1 ('not at all') to 7 ('extremely likely'). The range of the total score is between 4 and 28, and higher scores are associated with stronger willingness to breastfeed. The Cronbach's α was .97 when the tool was developed [12] and .98 in this study.

4) Demographic and breastfeeding characteristics

Subjects were asked to report their demographic characteristics, including age, education, current working status, marital satisfaction, number of children, and depression. The depression item was one question asking "How depressed are you now?" that was rated with a 4-point Likert scale (1=not at all, 2=a little, 3=quite a bit, 4=very much). Further items relating to subjects' breastfeeding characteristics included the planned duration of breastfeeding and current breastfeeding type.

4. Data Collection Process

To recruit subjects, the directors of five postpartum care centers in Seoul metropolitan city and three other metropolitan cities were asked for support. The researcher visited the directors and explained the purpose of the research and how to collect the data, and delivered a publicity poster for recruiting volunteers. The data collection period was June 25 to September 21, 2018. With the aid of supporters from the organizations, brochures describing the study were given to mothers who were breastfeeding. Postpartum care nurses were employed as research assistants who explained the study to

breastfeeding subjects and directly received their contact information to send a link to an online survey. The contact information of the subjects included their cellphone number or e-mail address. The researcher sent a guide letter and the link to 240 mothers who were in their fourth or fifth week after birth, with one or two more reminders, using SNS messages or e-mail. Only subjects who were breastfeeding at the time of the survey were eligible to participate in the online survey. A total of 219 subjects responded to the survey, two of whom did not complete the survey.

5. Ethical Considerations

Institutional review board approval was obtained before initiating the research (No. CUIRB-2018-0011, from the Bioethics Committee of the institution). The survey participants voluntarily clicked the link to the survey, where they were able to read a description of the research that presented its purpose and methods and explained confidentiality and anonymity, revocability, and the benefits and disadvantages of participating. Once participants voluntarily agreed to participate, they were allowed to begin the survey. Upon completing the survey, an online thanks card and a small monetary token of appreciation (3,000 won) were sent using a mobile payment service. The data were stored in a safe, locked environment only accessible to the author. All files will be destroyed within 3 years of completing the analysis.

6. Data Analysis

The collected data were analyzed using IBM SPSS Statistics 25.0 in terms of frequency, percentage, mean and standard deviation for factors relating to the subjects' general background. For maternal attachment, breastfeeding adaptation, and willingness to breastfeed, mean and standard deviation were used. The normality of the data was analyzed using the Shapiro-Wilk test. The demographic and breastfeeding variables did not have a normal distribution. Thus, the Kruskal-Wallis test followed by the Mann-Whitney U test with the Bonferroni correction were used to analyze differences in maternal attachment according to demographic and breastfeeding variables. Correlations among maternal attachment, breastfeeding adaptation, and willingness to breastfeed were analyzed by Pearson correlation coefficients, and hierarchical multiple regression analysis was used to determine the factors that affected maternal attachment. In step 1, unique associations of demographic and breastfeeding characteristics with maternal attachment were tested. The subcategories of breastfeeding adaptation and willingness to breastfeed were added in step 2, testing unique associations of the subcategories of

breastfeeding adaptation and willingness to breastfeed with maternal attachment beyond the effects of demographic and breastfeeding characteristics.

RESULTS

1. Demographic and Breastfeeding Characteristics

The average age of the subjects was 32.34±4.06 years, with the majority of subjects in their 30s. The vast majority (80.6%) was college or university graduates and 48.8% were unemployed. Marital satisfaction received an average score of 4.31 ±0.63 points on average, and most subjects (67.7%) had one child. The score for depression was 1.59±0.62 points, and

47.9% and 46.1% of the subjects suffered from no depression and slight depression, respectively. The average planned duration of breastfeeding was 8.46±3.91 months, and most replies indicated that the planned duration was within 12 months. Furthermore, 59.9% of the subjects used partial breastfeeding (Table 1).

2. Degree of Maternal Attachment, Breastfeeding Adaptation, and Willingness to Breastfeed

The scores for maternal attachment and breastfeeding adaptation were 3.66±0.29 points and 3.71±0.44 points, respectively. The scores for the subcategories of breastfeeding adaptation were 4.23±0.67 for an emotional exchange with

Table 1. Maternal Attachment according to Demographic and Breastfeeding Characteristics   (N=217)

Variables	Categories	n (%) or M±SD	M±SD	H	p
Age* (year)	≤29	53 (24.7)	3.62±0.34	0.95	.622
	30~39	154 (71.6)	3.67±0.28		
	≥40	8 (3.7)	3.75±0.24		
	Total subjects	32.34±4.06			
Education	≤High school	16 (7.4)	3.74±0.34	3.87	.145
	College or university	175 (80.6)	3.66±0.28		
	Graduate school	26 (12.0)	3.62±0.31		
Current working status	Unemployed[a]	106 (48.8)	3.70±0.24	6.24	.044 (a>b>c)[†]
	Maternity leave[b]	105 (48.4)	3.63±0.32		
	Working[c]	6 (2.8)	3.40±0.35		
Marital satisfaction*	Very dissatisfied	0 (0.0)	-	12.19	.002 (c>b>a)[†]
	Dissatisfied	0 (0.0)	-		
	Moderate[a]	16 (7.4)	3.53±0.30		
	Satisfied[b]	113 (52.6)	3.64±0.28		
	Very satisfied[c]	86 (40.0)	3.72±0.28		
	Total subjects	4.31±0.63			
Number of children	1	147 (67.7)	3.65±0.30	3.49	.175
	2	56 (25.8)	3.66±0.27		
	≥3	14 (6.5)	3.79±0.20		
	Total subjects	1.40±0.64			
Depression	Not at all[a]	104 (47.9)	3.75±0.21	26.50	<.001 (a>b>c)[†]
	A little[b]	100 (46.1)	3.61±0.30		
	Quite a bit or more[c†]	13 (6.0)	3.32±0.43		
	Total subjects	1.59±0.62			
Period planned for breastfeeding* (month)	≤6	105 (48.6)	3.65±0.32	0.34	.843
	7~12	99 (45.8)	3.68±0.26		
	≥13	12 (5.6)	3.66±0.23		
	Total subjects	8.46±3.91			
Current breastfeeding type	Exclusive	61 (28.1)	3.68±0.28	1.80	.406
	Partial	130 (59.9)	3.67±0.27		
	Symbolic	26 (12.0)	3.55±0.40		

*Missing data were not included in the values; [†] The Kruskal-Wallis test was followed by the Mann-Whitney U test using the Bonferroni correction to adjust the probability; [‡] 'Very much' was included in 'quite a bit or more' because there was only one person who responded 'very much'.

one's baby, 3.59±0.62 for breastfeeding confidence, 3.53±0.85 for sufficient breast milk, 4.02±0.64 for the baby's feeding capability and growth, 3.56±0.57 for being familiar with one's baby, 3.30±0.80 for discomfort in breastfeeding, 3.63±0.76 for maintenance of the breast milk volume, and 3.56±0.84 for getting support. Willingness to breastfeed received a score of 3.33±1.91 points (Table 2).

3. Maternal Attachment according to Demographic and Breastfeeding Characteristics

Maternal attachment showed a significant relationship with subjects' current working status (H=6.24, p =.044), satisfaction (H=12.19, p =.002), and depression (H=26.50, p <.001) (Table 1).

4. Correlations among Maternal Attachment, Breast-feeding Adaptation, and Willingness to Breastfeed

Maternal attachment was positively related to breastfeeding adaptation (r=.45, p <.001) and the subcategories of breastfeeding adaptation, an emotional exchange with one's baby (r=.51, p <.001), breastfeeding confidence (r=.38, p <.001), sufficient breast milk (r=.13, p =.049), the baby's feeding capability and growth (r=.29, p <.001), being familiar with one's baby (r= .38, p <.001), discomfort in breastfeeding (r=.20, p =.004), maintenance of breast milk volume (r=.15, p =.033), and getting support (r=.14, p =.038). A positive correlation was also observed between maternal attachment and willingness to breastfeed (r=.15, p =.027)(Table 3).

Table 2. Degree of Maternal Attachment, Breastfeeding Adaptation, and Willingness to Breastfeed (*N*=217)

Variables	M±SD	Minimum	Maximum
Maternal attachment	3.66±0.29	2.46	4.00
Breastfeeding adaptation (total)	3.71±0.44	2.63	4.85
Emotional exchange with one's baby	4.23±0.67	1.25	5.00
Breastfeeding confidence	3.59±0.62	1.60	5.00
Sufficient breast milk	3.53±0.85	1.33	5.00
Baby's feeding capability and growth	4.02±0.64	2.50	5.00
Being familiar with one's baby	3.56±0.57	2.00	5.00
Discomfort in breastfeeding	3.30±0.80	1.00	5.00
Maintenance of breast milk volume	3.63±0.76	1.00	5.00
Getting support	3.56±0.84	1.50	5.00
Willingness to breastfeed	3.33±1.91	1.00	7.00

Table 3. Correlations of Maternal Attachment, Breastfeeding Adaptation, and Willingness to Breastfeed (*N*=217)

Variables	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11
	r	r	r	r	r	r	r	r	r	r
X1	.45**	.51**	.38**	.13*	.29**	.38**	.20*	.15*	.14*	.15*
X2	1	.57**	.78**	.67**	.75**	.78**	.43**	.59**	.44**	.45**
X3		1	.38**	.24**	.30**	.36**	.14*	.18*	.13	.32**
X4			1	.44**	.53**	.54**	.29**	.37**	.18*	.59**
X5				1	.49**	.53**	.06	.40**	.17*	.26**
X6					1	.59**	.19*	.35**	.29**	.18*
X7						1	.24**	.38**	.27**	.28**
X8							1	.14*	.06	.18*
X9								1	.49**	.26**
X10									1	.08
X11										1

X1=Maternal attachment; X2=Breastfeeding adaptation (total); X3=Emotional exchange with one's baby; X4=Breastfeeding confidence; X5=Sufficient breast milk; X6=Baby's feeding capability and growth; X7=Being familiar with one's baby; X8=Discomfort in breastfeeding; X9=Maintenance of breast milk volume; X10=Getting support; X11=Willingness to breastfeed; *p < .050; **p <.001.

5. Factors associated with Maternal Attachment

Hierarchical regression analysis was carried out to investigate the relative effects of various factors on maternal attachment. First of all, after examining the Durbin-Watson statistic, the tolerance, variance inflation factor (VIF), and the unemployed status variable were entered into the hierarchical regression analysis. However, the maternity leave status variable was excluded because multicollinearity between unemployed status and maternity leave status was suspected. The Durbin-Watson statistic was then 1.99, which indicated no autocorrelation, as it was close to the reference value of 2. Its tolerance was .41 to .94, and the VIF ranged from 1.06 to 2.42. Therefore, there was no multicollinearity problem with the independent variables, and the regression model was confirmed to be appropriate.

When demographic and breastfeeding characteristics were applied as independent variables in the first step of the hierarchical regression analysis, depression ('quite a bit or more', β=-.31, $p<.001$) and depression ('a little', β=-.22, $p=.001$) were found to have affected attachment. Those variables explained 16.2% of the variance in maternal attachment (Table 4).

The effects of the subcategories of breastfeeding adaptation and willingness to breastfeed on maternal attachment in the second step of the hierarchical regression analysis were tested while adjusting for demographic and breastfeeding characteristics. Of the breastfeeding adaptation subcategories,

an emotional exchange with one's baby (β=.41, $p<.001$), breastfeeding confidence (β=.20, $p=.022$), depression ('quite a bit or more', β=-.18, $p=.005$), and depression ('a little', β=-.14, $p=.024$) were shown to have affected maternal attachment. The final model explained 38.4% of variance in maternal attachment. Two subcategories of breastfeeding adaptation explained an additional 22.2% variance in maternal attachment beyond the effects of demographic and breastfeeding characteristics (Table 4).

DISCUSSION

In this study, the influence of the subcategories of breastfeeding adaptation on maternal attachment was analyzed after controlling for demographic and breastfeeding characteristics (22.2%) using hierarchical regression analysis. Our findings suggest that women with high breastfeeding adaptation will be better at forming attachment, implying that encouraging breastfeeding will help build attachment. This study supports previous findings [4,7] that breastfeeding was associated with attachment. Breastfeeding promotes attachment because breastfed babies are more warm and cuddly, more cooperative, and less demanding and angry than non-breastfed babies [4]. However, previous studies have investigated the relationship between the initiation or duration of breastfeeding and maternal attachment, but have not revealed which characteristics of breastfeeding are related to attachment [4,7].

Table 4. Factors associated with Maternal Attachment

(*N*=217)

Step	Variables	B	SE	β	t (*p*)	R²	Adjusted R²	F (*p*)
1	(Constant)	3.74	.04		100.02 (<.001)	.162	.142	8.08 (<.001)
	Current working status (unemployed)	0.06	.04	.11	1.75 (.082)			
	Marital satisfaction (moderate)*	-0.08	.08	-.07	-1.01 (.315)			
	Marital satisfaction (satisfied)†	-0.05	.04	-.09	-1.26 (.208)			
	Depression (quite a bit or more)†	-0.40	.09	-.31	-4.63 (<.001)			
	Depression (a little)§	-0.13	.04	-.22	-3.29 (.001)			
2	(Constant)	2.60	.17		15.01 (<.001)	.384	.341	8.91 (<.001)
	Current working status (unemployed)	0.06	.03	.11	1.89 (.061)			
	Marital satisfaction (moderate)*	-0.05	.07	-.05	-0.73 (.468)			
	Marital satisfaction (satisfied)†	-0.01	.04	-.02	-0.37 (.715)			
	Depression (quite a bit or more)†	-0.23	.08	-.18	-2.87 (.005)			
	Depression (a little)§	-0.08	.04	-.14	-2.28 (.024)			
	Emotional exchange with one's baby	0.17	.03	.41	6.51 (<.001)			
	Breastfeeding confidence	0.09	.04	.20	2.32 (.022)			
	Sufficient breast milk	-0.04	.02	-.12	-1.60 (.111)			
	Baby's feeding capability and growth	-0.02	.03	-.04	-0.48 (.633)			
	Being familiar with one's baby	0.08	.04	.15	1.90 (.059)			
	Discomfort in breastfeeding	0.01	.02	.03	0.57 (.568)			
	Maintenance of breast milk volume	0.00	.03	.01	0.15 (.879)			
	Getting support	0.00	.02	-.01	-0.17 (.865)			
	Willingness to breastfeeding	-0.03	.01	-.17	-2.42 (.061)			

*Dummy coded (1=moderate, 0=satisfied, 0=very satisfied); † Dummy coded (1=satisfied, 0=moderate, 0=very satisfied); † Dummy coded (1=quite a bit or more, 0=not at all, 0=a little); §Dummy coded (1=a little, 0=not at all, 0=quite a bit or more).

However, this study has filled that gap. In addition, this study investigated postpartum attachment at an earlier stage than previous studies. Therefore, based on the results of this study, it was found that it is important to facilitate early success in breastfeeding to promote attachment formation.

The quality of attachment of an infant is related to interactions and experiences with caregivers [21]. This study revealed that an emotional exchange with one's baby was the most significantly associated factor with maternal attachment among the breastfeeding adaptation subcategories. In other words, exchanging positive emotions with an infant during breastfeeding has a connection with attachment. The sensitivity of the primary caregiver exerts influence not only on early mother-infant interactions, but also on the quality of the infants' attachment [22]. Breastfeeding creates considerable opportunities for mothers to learn patterns of their infants' behavior through tactile and eye contact at an intimate distance. The growing frequency of interactive behaviors, including an emotional exchange with one's infant, caused by mothers' careful observation of infants' feelings and reactions during breastfeeding is thought to exert an influence on maternal attachment. This finding is similar to the report indicating [23] that kangaroo care, in which the baby is in direct contact with the mother's skin at close range, affects maternal attachment to premature babies. Therefore, it will be possible to improve attachment by continuously increasing opportunities for interaction after birth.

This study found that breastfeeding confidence was associated with maternal attachment, similarly to a report of a medium correlation between breastfeeding self-efficacy and maternal attachment [24]. Comprehensive knowledge of breastfeeding, the ability to get useful information, and the confidence to overcome difficulties in breastfeeding encourage the mother to feel that she is important to the infant and to enjoy the time that she spends with the infant, which is why breastfeeding confidence affected maternal attachment. As noted above, maternal attachment increases in women who adapt to breastfeeding well by engaging in emotional exchanges and developing breastfeeding confidence. Thus, it is essential to support and encourage mothers to adapt successfully to breastfeeding.

In this study, depression was found to be associated with maternal attachment, as in another study that reported that depression during the postpartum period was related with bonding disorder [25]. Similarly, other study reported that mothers experiencing subclinical depressive symptoms 6~8 months after birth had lower maternal attachment than healthy mothers [26]. Furthermore, it is critical to observe depression symptoms early and to prevent maternal attachment disorder because depression in postpartum women interferes

with the improvement of attachment to 6-month-old babies [25]. However, these results should be interpreted cautiously because only one item was used to evaluate maternal depression. Further research is required to confirm the relationship between depression in breastfeeding mothers and maternal attachment by applying a depression measurement tool with high levels of validity and reliability.

In this study, subjects who had experienced breastfeeding for 1 month showed a slightly elevated willingness to breastfeed for more than 12 months, but willingness to breastfeed was not a major factor associated with maternal attachment. In this study, willingness to breastfeed referred to mothers' intent and efforts to breastfeed infants for more than 12 months, and the participants in this study were mothers who had breastfed exclusively, partially, or symbolically for only 1 month. Thus, maternal attachment at this time can be interpreted as being formed irrespective of the willingness to breastfeed for a long period of time. This is partly explained by findings that breastfeeding behavior is not influenced directly by the willingness to breastfeed for a long period because that willingness is influenced by several other factors [12]. It is difficult to contextualize our findings regarding prospective willingness to breastfeed and maternal attachment because few previous studies have investigated this issue. However, a previous retrospective study reported that the duration of breastfeeding contributed to secure attachment in 24-month-old babies [27], in contrast to this study. To summarize, this study revealed that there was no relationship between maternal attachment and willingness to breastfeed, and this relationship was not investigated in previous studies. Further research is needed to elucidate the association between willingness to breastfeed and maternal attachment depending on the postpartum time point.

This research showed no relationship between maternal attachment and exclusive, partial, or symbolic breastfeeding. This is similar to a previous finding that secure attachment had no relationship with exclusive or partial breastfeeding in addition to interactions with the infant [3]. Accordingly, maternal attachment has no relationship with breastfeeding frequency, but attachment has been found to show a relationship with the interactions between mothers and infants and mothers' sensitivity [22].

Interpretation and generalization of these findings require special caution because the research subjects were breastfeeding mothers from limited areas and the study did not include subjects who did not attend a postpartum care center. In addition, this study did not compare the maternal attachment of women who did not breastfeed because it focused on the association between breastfeeding and maternal attachment in breastfeeding women. Further research should compare ma-

ternal attachment between breastfeeding and non-breastfeeding women. Finally, the dropout rate of this study was lower than expected. The reason for this was that postpartum care nurses were employed as research assistants, who kindly requested participants to participate, had an intimate relationship with the postpartum mothers that continued after the mothers left the postpartum care center, and communicated through an easy and fast methods (one of the most used SNS in Korea) with one or two additional reminders within 1 week.

CONCLUSION

Enthusiastic support from professional nurses is necessary to promote breastfeeding adaptation in mothers, because an emotional exchange with infants and formation of breastfeeding confidence are the most important factors that contribute to maternal attachment in the first month of the postpartum period. Furthermore, in order to improve attachment, interventions for early postpartum depression are needed. Further research should be conducted using tools with high reliability and validity for the purpose of reinvestigating the correlation of postpartum depression with maternal attachment. This research suggests that it would be promising for further research to consider confounding variables that can affect the relationships among return to the workplace, marital satisfaction, and attachment.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

REFERENCES

1. Jansen J, de Weerth C, Riksen-Walraven JM. Breastfeeding and the mother-infant relationship-A review. Developmental Review. 2008; 28(4):503-521. https://doi.org/10.1016/j.dr.2008.07.001

2. Leung AK, Sauve RS. Breast is best for babies. Journal of the National Medical Association. 2005;97(7):1010-1019.

3. Britton JR, Britton HL, Gronwaldt V. Breastfeeding, sensitivity, and attachment. Pediatrics. 2006;118(5):e1436-e1443. https://doi.org/10.1542/peds.2005-2916

4. Gibbs BG, Forste R, Lybbert E. Breastfeeding, parenting, and infant attachment behaviors. Maternal and Child Health Journal. 2018; 22(4):579-588. https://doi.org/10.1007/s10995-018-2427-z

5. Gijsbers B, Mesters I, André Knottnerus J, Legtenberg AHG, van Schayck CP. Factors influencing breastfeeding practices and postponement of solid food to prevent allergic disease in high-risk children: Results from an explorative study. Patient Education and Counseling. 2005;57(1):15-21.

6. Braimoh J, Davies L. When 'breast' is no longer 'best': Post-partum constructions of infant-feeding in the hospital. Social Science & Medicine. 2014;123:82-89. https://doi.org/10.1016/j.socscimed.2014.10.052

7. Scharfe E. Maternal attachment representations and initiation and duration of breastfeeding. Journal of Human Lactation. 2012;28 (2):218-225. https://doi.org/10.1177/0890334411429111

8. Jackson DB. The association between breastfeeding duration and attachment: A genetically informed analysis. Breastfeeding Medicine. 2016;11(6). https://doi.org/10.1089/bfm.2016.0036

9. Schulze PA, Carlisle SA. What research does and doesn't say about breastfeeding: A critical review. Early Child Development and Care. 2010;180(6):703-718. https://doi.org/10.1080/03004430802263870

10. Kim SH. Development of a breast feeding adaptation scale (BFAS). Journal of Korean Academy of Nursing. 2009;39(2):259-269. https://doi.org/10.4040/jkan.2009.39.2.259

11. Labbok M, Krasovec K. Toward consistency in breastfeeding definitions. Studies in Family Planning. 1990;21(4):226-230.

12. Kim HS, Nam ES. Prediction of breastfeeding intentions and behaviors: An application of the theory of planned behavior. Journal of Korean Academy of Nursing. 1997;27(4):796-806. https://doi.org/10.4040/jnas.1997.27.4.796

13. Yang HJ, Seo JM. A structural model for primiparas' breastfeeding behavior. Journal of Korean Academy of Nursing. 2013;43(3):399-408. https://doi.org/10.4040/jkan.2013.43.3.399

14. Huang HC, Wang SY, Chen CH. Body image, maternal-fetal attachment, and choice of infant feeding method: A study in Taiwan. Birth. 2004;31(3):183-188. https://doi.org/10.1111/j.0730-7659.2004.00303.x

15. Isabella RA, Belsky J. Interactional synchrony and the origins of infant-mother attachment: A replication study. Child Development. 1991;62(2):373-384.

16. Thompson RA, Raikes HA. Toward the next quarter-century: Conceptual and methodological challenges for attachment theory. Development and Psychopathology. 2003;15(3):691-718.

17. Huggins K, Ziedrich L. The nursing mother's guide to weaning. 2nd ed. Boston, MA: The Harvard Common Press; 2007. p. 26.

18. Shin H, Kim YH. Maternal attachment inventory: Psychometric evaluation of the Korean version. Journal of Advanced Nursing. 2007;59(3):299-307. https://doi.org/10.1111/j.1365-2648.2007.04322.x

19. Müller ME. A questionnaire to measure mother-to-infant attachment. Journal of Nursing Measurement. 1994;2(2):129-141.

20. Kim SH. Factors explaining mothers' breastfeeding satisfaction. Korean Journal of Women Health Nursing. 2009;15(4):270-279. https://doi.org/10.4069/kjwhn.2009.15.4.270

21. Cerezo MA, Pons-Salvador G, Trenado RM, Sierra P. Mother-infant verbal and nonverbal interaction as predictor of attachment:

Nonlinear dynamic analyses. Nonlinear Dynamics, Psychology, and Life Sciences. 2016;20(4):485-508.

22. De Wolff MS, van Ijzendoorn MH. Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. Child Development. 1997;68(4):571-591.

23. Cho ES, Kim SJ, Kwon MS, Cho H, Kim EH, Jun EM, et al. The effects of kangaroo care in the neonatal intensive care unit on the physiological functions of preterm infants, maternal-infant attachment, and maternal stress. Journal of Pediatric Nursing. 2016;31(4):430-438. https://doi.org/10.1016/j.pedn.2016.02.007

24. Cinar N, Köse D, Altinkaynak S. The relationship between maternal attachment, perceived social support and breast-feeding sufficiency. Journal of the College of Physicians and Surgeons Pakistan. 2015;25(4):271-275.

25. Kerstis B, Aarts C, Tillman C, Persson H, Engström G, Edlund B, et al. Association between parental depressive symptoms and impaired bonding with the infant. Archives of Women's Mental Health. 2016;19(1):87-94. https://doi.org/10.1007/s00737-015-0522-3

26. Behrendt HF, Konrad K, Goecke TW, Fakhrabadi R, Herpertz-Dahlmann B, Firk C. Postnatal mother-to-infant attachment in sub-clinically depressed mothers: Dyads at risk? Psychopathology. 2016;49(4):269-276. https://doi.org/10.1159/000447597

27. Weaver JM, Schofield TJ, Papp LM. Breastfeeding duration predicts greater maternal sensitivity over the next decade. Developmental Psychology. 2018;54(2):220-227. https://doi.org/10.1037/dev0000425