

The Relationship between Maternal-Fetal Attachment and Mother-Infant Attachment Behaviors in Primiparous Women Referring to Mashhad Health Care Centers

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ABSTRACT

Background & aim: Mother-infant bonding and interactions after childbirth are shaped by maternal-fetal attachment during pregnancy. Although many studies have shown the positive correlation between maternal-fetal attachment and mother-infant attachment behaviors, some controversial studies have shown otherwise. Therefore, this study aimed to evaluate the correlation between maternal-fetal attachment and mother-infant attachment behaviors in primiparous women.

Methods: This descriptive correlational study was conducted on 100 primiparous women, referring to the selected health care centers of Mashhad. Data were collected using Cranley's maternal-fetal attachment scale, Avant's mother-infant attachment tool, Edinburgh postnatal depression scale, and a demographic/obstetric questionnaire including demographic data, obstetric information, delivery outcomes, and postpartum data. Pregnant women with a gestational age of 35-41 weeks, who met the inclusion criteria, completed Cranley's questionnaire, as well as the demographic/obstetric questionnaire. Four and eight weeks after delivery, the subjects were asked to complete the Edinburgh questionnaire and postpartum information; then, they were asked to breastfeed their infants on a chair in a quiet place for 15 minutes. The researcher observed the mothers' behaviors toward their neonates. For data analysis, descriptive and analytical tests were performed, using SPSS version 16.

Results: There was a direct positive relationship between maternal-fetal attachment and mothers' emotional behaviors toward infants four and eight weeks after delivery. However, four and eight weeks after childbirth, no significant correlation was found between maternal-fetal attachment and mothers' caring behaviors.

Conclusion: According to the findings, maternal-fetal attachment is one of the most important factors for mother-infant attachment. These findings could be applied for enriching mother-infant attachment behaviors during pregnancy.

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Introduction

Infancy is one of the most important periods in an individual's life in terms of growth and development. Mental health of a neonate is as important as his/her physical health (1-3). Mothers show their emotional attachment to

their infants by behaviors such as smiling, calling their names, attentive responses to their movements, touching, hugging, direct eye contact, and kissing (4).

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Mother-infant attachment reflects the quality of mother's emotional feelings and behaviors toward her baby; this bonding emerges in behaviors which indicate the mother's attention and care. These behaviors include affectionate, proximity, and caring behaviors (5).

According to previous studies, women with stronger attachment to their children are most often sensitive to their children's needs. This sensitivity positively influences the infant's future psychosocial function and development of personality traits such as curiosity, sociability, self-confidence, independence, collaboration, and honesty, which are gradually formed (6).

On the other hand, children with insecure mother-infant bonding experience less emotional and mental development, poor social interactions, and stronger tendencies to escape from school; moreover, they are less able to form long-term relations and show more aggressive behaviors, compared to others (7, 8).

Several factors affect maternal-fetal attachment such as mother's personality disorders including psychiatric diseases, depression, bipolar disorders, and schizophrenia (9), marital satisfaction, instable family status (10), mother's early attachment experiences during childhood, and support provided by others during and after pregnancy (11, 12).

According to previous research, mother-infant attachment and interactive behaviors are formed during pregnancy by maternal-fetal attachment (13-15). Speckhard believes that maternal-fetal attachment is formed before the neonate's birth when the mother begins to form a mental image of the baby and imagines supporting her infant (16). Cranley also stated that changes in the quality of mother-infant relation starts before birth (13).

Maternal-fetal attachment refers to the relation between mother and fetus, which is related to the mother's mental image of the infant. This form of attachment is shaped during pregnancy, gradually improves in the third semester, and continues after delivery (17, 18). The emerging maternal-fetal attachment could be a predictor for the attitude and performance of mothers after delivery, as well as mother-infant interactions and attachment patterns after birth (19).

Mothers, who are sensitive about their maternal role during pregnancy, remain sensitive after childbirth (20). Pregnant women form an attachment to the fetus by talking to it, touching the abdomen, and paying attention to its movements. These mothers are ready to form a pleasant communication with their babies after delivery (21).

Moreover, increasing maternal-fetal attachment leads to healthy eating, alcohol withdrawal, positive attitudes towards the fetus, attention to fetal movements, and other interactive behaviors with the fetus. All these behaviors could lead to the acceptance of maternal role and promotion of physical and psychological health in mothers and infants (22).

As Reading et al. indicated (1982), strong maternal-fetal attachment is positively associated with healthy behaviors in mothers (23); these healthy behaviors lead to the promotion of maternal, fetal, and neonatal health (24). As Leifer (1986) (25), Fuller (1989) (26), and Muller (1996) (27) reported in different studies, emotional behaviors and maternal-fetal attachment during pregnancy could be predictors of mother-infant attachment behaviors.

Although most studies have shown a positive relationship between maternal-fetal attachment and mother-infant attachment behaviors, some controversial studies have reported otherwise. For instance, Davis (1989) reported no significant difference in the attachment behaviors of mothers with and without abdominal touching during the third semester of pregnancy (28). Similarly, Cranley (1981) found no relationship between maternal-fetal attachment and maternal feelings in the first three days after birth (29).

Considering the results of these controversial studies, personal/cultural differences, and the importance of the advisory, supportive, and administrative role of midwives during and after pregnancy, this study aimed to determine the relationship between maternal-fetal attachment and mother-infant attachment behaviors. By determining the influential factors, applying effective strategies, and preventing the infants' deprivation of maternal affection, the psychological health of mothers and infants can be promoted.

Materials and Methods

This descriptive correlational study was conducted on 100 primiparous women, who referred to the selected health care centers of Mashhad for pregnancy care. The sample size was calculated based on a pilot study on 20 primiparous women, using the following formula:

$$n = \left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{\omega} \right)^2 + 3$$

Considering CI=95%, $\alpha=5\%$, and power=80%, β was estimated at 20%. Among different sample sizes and different variables in previous studies, the maximum sample size was related to the variable of "exclusive feeding duration in 8 weeks", which was a dependent variable in the study ($n=33$) ($r=0.47$). This number was multiplied by three due to the nature of the study (cluster and stratified sampling).

Considering the 10% dropout, 110 participants were introduced to the study. However, 10 subjects were eliminated due to the mother's lack of consent to continue the study, two because of neonatal hospitalization, two due to depression, three for incomplete daily reports of neonatal nutrition, and one due to suffering from severe nipple fissure. Eventually, 100 participants were evaluated.

Sampling was conducted in 3 steps: stratified sampling, clustering, and simple non-probable sampling from August to January 2013. In the first step, five health care centers were stratified, and based on the patient coverage of each cluster, some clusters were randomly selected by drawing lots. According to the frequency of referrals for prenatal care, a quota was set for each cluster. Days of hospital visit were determined by drawing lots. On these days, based on the number of covered patients in each center, eligible participants were selected.

The inclusion criteria were as follows: 1) Iranian nationality; 2) residing in Mashhad; 3) 18-35 years of age; 4) literacy; 5) no prior history of medical diseases; 6) no prior history of drug addiction, hookah smoking, or cigarette smoking; 7) no history of infertility; 8) gestational age of 25-41 weeks; 9) primiparous singleton pregnancy; 10) low-risk pregnancy;

11) neonatal weight appropriate for gestational age (2500-4000 g); and 12) not studying medical sciences.

The exclusion criteria were as follows: 1) unwillingness to continue the study; 2) taking psychiatric medications; 3) major stress in the last 6 months; 4) postpartum complications; 5) neonatal hospitalization or separation of the neonate from the mother; 6) stressful events during the study period; 7) unavailability of the participants four and eight weeks after delivery (or two days after the set dates); and 8) depression after delivery.

Ethical considerations were observed throughout the study and an approval letter was obtained from the ethics committee of Mashhad University of Medical Sciences (MUMS). In addition, an introduction letter was obtained from the School of Nursing and Midwifery for presentation to the authorities of health care centers. Participants, who met the inclusion criteria, were referred for pregnancy care at the gestational age of 35-41 weeks.

Informed consents were obtained from the participants and questionnaires of demographic data, obstetric information, and maternal-fetal attachment were handed to them. They answered the questionnaires at the presence of the researcher and the researcher answered their questions. The participants and researcher exchanged their phone numbers so that they could contact each other about the time of delivery. The researcher contacted the participants before the delivery to ensure the exact time.

In the next step, the researcher, knowing the time of delivery, excluded the subjects in case they met the mentioned criteria; otherwise, the questionnaire of obstetric and neonatal data was completed via phone calls, and the participants were reminded to visit the hospital within four and eight weeks after delivery.

During mothers' visits after four and eight weeks, Edinburgh postnatal depression scale was completed. Then, they were asked to sit in a calm and quiet place to breastfeed their infants and play with them for 15 min. The researcher observed and recorded mothers' behaviors toward their infants. Each minute was divided to two 30 seconds; in the first 30

seconds, the behaviors were observed and during the second half, the behaviors were recorded.

Selection form: This form, completed via interview, consisted of the inclusion and exclusion criteria, which were based on the research objectives, latest published articles, and consultation with faculty members.

Demographic and obstetric questionnaire: This questionnaire consisted of 2 sections. The first part included 9 demographic questions which were completed at the beginning of the study. The second section included 12 questions related to the current pregnancy status of mothers; ten items were answered via interview and two items were completed using examination or mothers' medical records.

Cranley's maternal-fetal attachment questionnaire: This questionnaire consisted of 24 statements, graded by 5-point Likert scale: strongly agree (5), agree (4), not sure (3), disagree (2), and strongly disagree (1). Question No. 22 was reverse scored. The minimum and maximum scores were 24 and 120, respectively, and higher scores indicated stronger attachment.

Delivery and neonatal questionnaire: This questionnaire included two sections. The first part had three questions related to the time of delivery, maternal satisfaction, and childbirth experience and was completed via phone calls. The second part consisted of 10 questions related to neonatal gender and weight and parental satisfaction with the baby's gender.

Avant's questionnaire of mother-infant attachment behaviors: This questionnaire included three groups of behaviors: emotional behaviors, proximity behaviors, and caring behaviors, observed for 15 min. In the first 30 seconds of each minute, the behaviors were observed and during the second half, these behaviors were recorded; each observed behavior was recorded once per minute.

In total, the observation took 15 min; therefore, each behavior was observed for a maximum of 15 times in 15 minutes. In total, 11 behaviors could be observed in 15 min and each observed behavior in one minute was allocated one score (total score=165). The sum of scores presented mother-infant attachment and higher scores indicated stronger attachment.

Edinburgh postnatal depression scale: This questionnaire consisted of 10 short phrases. Each answer was given a score of 0 to 3, based on the severity of the symptoms. Questions No. 1, 2, and 4 were scored from 0 to 3 and the rest were scored from 3 to 0. The total score was calculated by summing the scores. A total score of ≥ 10 indicated depression and a total score of < 10 showed the absence of depression. This questionnaire was completed 4 and 8 weeks after delivery by the mothers.

In order to confirm the validity of demographic and obstetric questionnaire, as well as the delivery and neonatal questionnaire, content validity was applied. At first, the questionnaires were prepared, based on the latest published papers, and then, 10 faculty members were asked to comment on the questionnaires. The questionnaires were revised based on the given comments and the final version was prepared for the study.

The validity of Avant's questionnaire was first determined by Avant (30). This questionnaire was translated to Farsi and by applying some changes in the questionnaire, its validity was confirmed. The validity of this questionnaire was also approved by Tousi et al. (2011) (32). The reliability of this scale was also confirmed via inter-rater reliability by Vakilian et al. (1998) (31).

Cranley's maternal-fetal attachment questionnaire was first applied by Cranley (1980) and its validity was confirmed (33). This scale was translated to Farsi by Khorramrudi (2001) in Iran and its validity was confirmed using content validity (34). Abbasi et al. also confirmed the validity of the Farsi version using content validity (2010) (35).

In addition, the reliability of this questionnaire was first approved by Cranley (1981) (33). The reliability of the Farsi version was confirmed by Khorramrudi (2001) via test-retest ($r=0.85$) (34) and by Abbasi et al. (2010) by calculating Cronbach's alpha ($\alpha=0.8$) (35). In the present study, Cronbach's alpha was calculated to be 0.08. Moreover, the reliability of Edinburgh depression scale has been confirmed in Iran in several studies such as those by Namazi (1994) ($r=0.9$) (36) and Montazeri et al. (2007) (37).

For data analysis, Chi-square, Mann-Whitney U test, and Spearman's correlation coefficient were performed, using SPSS version 16. Moreover, descriptive statistics, absolute and relative frequency, and mean and standard deviation were calculated.

Results

The subjects were within the age range of 18-35 years (26 ± 4.67 years) and gestational age of 36-41 weeks (37 ± 1.28) (Table 1). In total, 77 women (77%) were housewives and 43 (43%) had high school diploma (or higher) (Table 1). Mean body mass index (BMI) before pregnancy was 25.22 ± 1.85 kg/m². As the results showed, 56% of participants had normal delivery (Tables 1 & 2). Other demographic data are presented in Tables 1 & 2. Correlation of descriptive characteristics associated with total score of mother-infant attachment behaviors in 4 and 8 weeks after birth are presented in Tables 3 & 4 and results of mother-infant attachment behavior in the influential variables are presented in Table 5.

Table 1. Demographic characteristics of participants in the study

Sub-groups	N (%)
Maternal education	
Number (%)	
Minimum literacy (reading and writing)	10 (10.0)
Primary level education	20 (20.0)
Junior high education	27 (27.0)
High school diploma	30 (30.0)
Academic education	13 (13.0)
Total 100	
Husband's educational level	
Number (%)	
Minimum literacy (reading and writing)	4 (4.0)
Primary level education	27 (27.0)
Junior high education	27 (27.0)
High school diploma	33 (33.0)
Academic education	9 (9.0)
Total 100	
Maternal occupation	
Number (%)	
Housewife	77 (77.0)
Employed	13 (13.0)
Student	10 (10.0)
Total 100	
Husband's occupational status	

Sub-groups	N (%)
Number (%)	
Employed	15 (15.5)
Worker	82 (84.5)
Total 100	
Breastfeeding training after delivery	
Number (%)	
Yes	74 (74.0)
No	26 (26.0)
Total 100	
Mode of delivery	
Number (%)	
Normal vaginal delivery	56 (56.0)
Emergency cesarean section	38 (38.0)
Elective cesarean section	6 (6.0)
Total 100	
First lactation after delivery	
Number (%)	
Immediately after delivery	54 (54.0)
Less than 2 hours	41 (41.0)
More than 2 hours	5 (5.0)
Total 100	
First skin contact after delivery	
Number (%)	
Yes	63 (63.0)
No	37 (37.0)
Total 100	
Marital satisfaction	
Number (%)	
Not at all	0 (0.0)
Low	1 (1.0)
Relatively low	15 (15.0)
Relatively high	45 (45.0)
High	39 (39.0)
Very high	0 (0.0)
Total 100	
Interest in children	
Number (%)	
Not at all	75 (75.0)
Medium	9 (9.0)
High	16 (16.0)
Total 100	

Table 2. Demographic characteristics of participants in the study

Variables	SD±Mean
Maternal age	67.26±4
Gestational age	28.37±1
Neonatal weight	67.18±456.3524
BMI	85.22±1.25

Table 3. Correlation coefficients for descriptive characteristics associated with the total score of mother-infant attachment behaviors four and eight weeks after birth

Variables	Mother-infant attachment behaviors after 4 weeks		Mother-infant attachment behaviors after 8 weeks	
Maternal age	Spearman	P=0.106 r=0.336	Spearman	P=0.247 r=0.135
Maternal education	Spearman	P< 0.001	Spearman	P< 0.001
Husband's education	Spearman	P=0.474	Spearman	P=0.491
Marital satisfaction	Spearman	P< 0.001	Spearman	P< 0.001
Gestational age	Spearman	P=0.211 r=-0.170	Spearman	P=0.300 r=- 0.225
BMI	Spearman	P=0.478 r=- 0.322	Spearman	P=0.465 r=- 0.155
Mode of delivery	Chi square	P=0.438	Chi square	P=0.430
Neonatal weight	Spearman	P=0.170 r=0.178	Spearman	P=0.359 r=0.193
First lactation after delivery	Spearman	P< 0.001	Spearman	P< 0.001

Table 4. Correlation coefficients for descriptive characteristics associated with the total score of mother-infant attachment behaviors four and eight weeks after childbirth

Sub-groups	Mother-infant attachment behaviors 4 weeks after delivery (Mean±SD)		Mother-infant attachment behaviors 8 weeks after delivery (Mean±SD)	
Maternal occupational status				
Housewife	1.25±0.43		1.26± 0.44	
Employed	1.28±0.48		1.28±0.48	
Student	1.28± 0.48		1.14±0.37	
	F=0.267	P=0.066	F=0.027	P=0.212 Spearman Results
Husband's occupation				
Employed	1.26± 0.44		1.21±0.42	
Worker	1.29± 0.46		1.29±0.46	
	F=1.547	P=0.464	F=1.193	P=0.433 Chi-square Results
First skin contact after delivery				
Immediately after delivery	1.22±0.42		1.22±0.44	
One hour after delivery	1.25±0.43		1.25±0.43	
Two hours after delivery	1.55±0.52		1.33±0.50	
During the first 24 hours	1±0.00		1±0.00	
	F= 1.628	P< 0.001	F= 1.628	P< 0.001 Chi-square Results
Breastfeeding training after delivery				
Yes	1.25±0.43		1.30±0.46	
No	1.26±0.44		1.20±0.40	
	F= 1.524	P=0.506	F= 0.019	P=0.695 Chi-square Results
Interest in children				
Not at all	1± 0.00		1± 0.00	
Medium	1.15±0.37		1.26±0.45	
High	1.29±0.46		1.29±0.46	
	F= 0.213	P=0.004	F= 0.556	P=0.027 Chi-square Results

The results of Spearman's correlation coefficient showed a direct positive association between maternal-fetal attachment and emotional and proximity behaviors in mother-infant bonding four and eight weeks after delivery (P<0.001) (Table 6). In fact, stronger maternal-fetal

attachment was associated with more emotional and proximity behaviors. However, no significant relationship was found between maternal-fetal attachment and mother-infant caring behaviors at week 4) (Table 6).

Table 5. The results of regression model based on mother-infant attachment behaviors in the presence of effective variables

Effective variables	Attachment four weeks after delivery (P-value)	Attachment eight weeks after delivery (P-value)
Maternal education	0.001<	0.05>
Marital satisfaction	0.05>	0.005<
Interest in children	0.020	0.040

Table 6. Correlation of maternal-fetal attachment with emotional, caring, and proximity behaviors four and eight weeks after childbirth

Variables	Four weeks after delivery Rs (P)	Eight weeks after delivery Rs (P)
Emotional behaviors	0.752(< 0.001)	0.670(< 0.001)
Proximity behaviors	0.753(< 0.001)	0.626(< 0.001)
Caring behaviors	0.072(0.478)	0.120(0.233)

Discussion

Maternal-fetal attachment is an important part of pregnancy that facilitates future communication between the mother and neonate (38). More attached mothers are able to keep the fetus and neonate healthy, whereas less attached mothers experience various problems and are unable to maintain the health of their fetus or neonate (39).

The present study showed a significant direct relationship between maternal-fetal attachment and emotional and proximity behaviors; i.e., stronger maternal-fetal attachment was accompanied by more emotional and proximity behaviors in mother-infant relationship. In this regard, Abbasi et al. (2008) showed that increased maternal-fetal attachment leads to the improvement of mother's mental health and desirable communication between mother and neonate (35).

Nagata et al. (2003) also showed a significant correlation between intrauterine/postpartum attachment and attachment one year after delivery (40). In a study by Vakilian et al. (1386), emotional behaviors had the maximum score

among other attachment behaviors (31). Findings of the present study were in agreement with studies by Davachi (2000) (4), Carter (1981) (38) and Griss (43). In other words, mothers who paid more attention to their fetus showed more affection and care toward their babies after delivery; they smiled more often to their infants and hugged and kissed them more regularly.

Fuller in his study on maternal-fetal attachment stated that attachment before delivery is related to mother-infant attachment during the first days of birth (26). Griss concluded that attachment before delivery could predict attachment 4-6 weeks after delivery. Leifer (1986) (25) and Muller (1996) (27) in separate studies reported that maternal-fetal attachment during pregnancy could be considered a predictor for mother-infant attachment behaviors.

Although many studies have shown a positive relationship between maternal-fetal attachment and mother-infant attachment behaviors, some controversial results have been reported. For instance, Davis (1989) found no significant difference between attachment behaviors of mothers who touched their abdomen during the third semester of pregnancy and others (28).

Similarly, Cranley found no relationship between maternal-fetal attachment and maternal feelings within the first 3 days after birth (29). The reason behind this discrepancy could be the application of different instruments for observing mother-infant attachment behaviors and the short follow-up period, which was only 2-3 days after birth in these studies.

Mihara et al. (2005) studied attachment behaviors in Japanese and Brazilian populations and concluded that women's feelings are similar, although there are some differences in behaviors between these populations. For instance, Japanese mothers mostly looked at their babies without touching them, while Brazilian mothers looked at their babies less and spent more time on taking care of their neonates. These behaviors were related to cultural and socioeconomic differences between these countries (44).

According to the findings of the present study, no significant correlation was found between maternal-fetal attachment and mother-

infant caring behaviors. This result was in contrast with the findings by Brimnezhad et al. (2011) (45) and Vakilian et al. (2008) (31). In the mentioned studies, the minimum score was given to caring behaviors. According to the present research and other conducted studies, maternal-fetal attachment is one of the influential factors for mother-infant attachment behaviors. These findings could be applied for enriching mother-infant attachment behaviors during pregnancy.

Despite the researchers' effort to eliminate and control the confounding factors, some of them were out of control. First, the differences in participants' personalities and emotional status affected their answers to the questionnaires; this problem was relatively controlled by the random selection of health care centers.

Second, despite assuring participants about the confidentiality of the data and providing proper conditions for answering the questions, some participants might have answered the questions less precisely; this was also uncontrollable by the researcher. Finally, answering the questionnaires in a limited amount of time and breastfeeding out of the house at the presence of the researcher might have influenced the given answers.

Conclusion

The results could be applied for future health care planning and policy making. For instance, consultation and educational programs can be held for health care providers to focus on maternal-fetal attachment and mother-infant bonding.

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Conflicts of interest

Authors declared no conflicts of interest.

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