

Comparison of Maternal-Infant Attachment in Cesarean Delivery Based on Robson Classification: A Cross-Sectional Study

Abstract

Background: The Robson criteria allows for standardized comparisons of data and possible driving changes in Cesarean Section (C/S) rates and complications. The aimed to compare maternal-infant attachment in C/S based on Robson Classification. **Materials and Methods:** This cross-sectional prospective study was conducted on 369 women who had undergone C/S in Hazrate Zeinab Peace Be Upon Him (PBUH), Hafez, and Shoostari hospitals affiliated to Shiraz University of Medical Sciences, Iran from April 2018 to March 2019. The study data were collected using a demographic form, an obstetric form, and Avant Checklist (AC) at postpartum and pre-discharge stages. Each participant was placed in Robson classification and the attachment score was calculated in each Robson Classification, and a comparison was made among the 10 groups. The data were analyzed into the SPSS 16 software and using descriptive statistics and paired *t* test. **Results:** The total mean (SD) score of attachment was 38.73 (18.65) at 1–7 h postpartum and 90.52 (23.79) at pre-discharge. The highest total mean (SD) score of attachment was observed in group 6 (86.78 (8.70) at postpartum and 118.67 (4.47) at pre-discharge). The lowest total mean (SD) score of attachment was observed in group 10 (12.79 (2.37) at 1–7 h postpartum and 45.44 (7.99) at pre-discharge). **Conclusions:** Obstetric characteristics in Robson Classification, parity, previous C/S, gestational age, onset of labor, fetal presentation, and number of fetuses were effective in clarifying information. The use of this system is necessary to determine the causes of increased C/S cases in low-income and middle-income countries.

Keywords: Attachment, cesarean section, classification, delivery, infant

Introduction

Increasing rate of cesarean delivery around the world has been a source of concern, especially in developed countries.^[1] In a systematic review and meta-analysis on 197514 pregnant women, the prevalence of Cesarean Section (C/S) was estimated at 48% in Iran.^[2] The prevalence of cesarean delivery was found to be 31.3%, 31.6%, and 48.4% in Ireland, the USA, and Brazil, respectively.^[3,4] This rate was 58.6% and 72% in Shiraz and Tehran (Iran), respectively.^[5,6]

Cesarean classification indications were difficult in the past due to inappropriate definitions for most indications and led to undesirable and poor comparisons.^[7] Since 2001, the Robson Classification (also called the 10-group classification) has been used in many facilities and countries as a tool for monitoring the incidence of cesarean

delivery in their populations as well as for examining the impact of changes in clinical management that may change the rate of C/S.^[8-10] Robson Classification system divides women into ten groups based on the five parameters of parity, onset of labor, gestational age, fetal presentation, and number of fetuses [Table 1].^[11] Robson Classification has recently been used extensively due to the simplicity of its design, validity of its purpose, its ease of implementation, and directness of initial interpretation.^[12]

Cesarean delivery may affect mother–infant attachment due to such issues as the side effects of anesthesia and delivery location in the operating room.^[13] In cesarean deliveries, long-term separation of mothers and infants occurs due to such complications as pain, bleeding, and infection.^[14] Bowlby used the term attachment in relation to the mother–infant bonding for the first

Zohreh Rookesh¹,
Maasumeh Kaviani²,
Mahnaz Zarshenas³,
Marzieh
Akbarzadeh⁴

¹Department of Midwifery, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran, ²Department of Midwifery, Community Based Psychiatric Care Research Center, Department of Midwifery, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran, ³Community Based Psychiatric Care Research Center, Department of Midwifery, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran, ⁴Department of Midwifery, Maternal–Fetal Medicine Research Center, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran

Address for correspondence:

Mrs. Marzieh Akbarzadeh, Maternal–Fetal Medicine Research Center; Department of Midwifery, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran.
E-mail: akbarzadm@sums.ac.ir

Access this article online

Website: www.ijnmrjournal.net

DOI: 10.4103/ijnmr.IJNMR_230_19

Quick Response Code:



This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Rookesh Z, Kaviani M, Zarshenas M, Akbarzadeh M. Comparison of maternal-infant attachment in cesarean delivery Based on Robson Classification: A cross-sectional study. Iran J Nurs Midwifery Res 2021;26:500-7.

Submitted: 05-Nov-2019. **Revised:** 07-Dec-2019.

Accepted: 17-Jul-2021. **Published:** 22-Oct-2021.

Table 1: Robson's ten-group classification system

Number	Groups
1	Nulliparous, singleton, cephalic, ≥ 37 weeks of gestation, in spontaneous labor
2	Nulliparous, singleton, cephalic, ≥ 37 weeks of gestation, induced labor or cesarean section before labor
3	Multiparous (excluding previous cesarean section), singleton, cephalic, ≥ 37 weeks of gestation, in spontaneous labor
4	Multiparous without a previous uterine scar, singleton, cephalic pregnancy, ≥ 37 weeks of gestation, induced or cesarean section before labor
5	Previous cesarean section, singleton, cephalic, ≥ 37 weeks of gestation
6	All nulliparous with a single breech
7	All multiparous with a single breech (including previous cesarean section)
8	All multiple pregnancies (including previous cesarean section)
9	All women with a single pregnancy in transverse or oblique lie (including those with previous cesarean section)
10	All singleton, cephalic, < 37 weeks of gestation pregnancies (including previous cesarean section)

time.^[15,16] Research showed that mother–infant attachment status directly affected infants' emotional, sentimental, and neonatal dimensions and behavioral problems.^[17-19] In addition, children with insecure parenting attachment had lower emotional and mental developmental characteristics, poor social relationships, school escape attempts, and aggression. Animal studies also indicated that the health, intelligence, and ability to learn throughout the life cycle were reduced in the infants who received the lowest level of contact care from their mothers.^[14] Mother–infant attachment and its impact on the development of the baby have been widely studied in the recent decades. Thus, the early postpartum period is a critical and sensitive period for the close relationship between the mother and her infant,^[20] which may be affected by their separation at birth^[21] and type of delivery.^[22] According to Lai *et al.*,^[23] women with induced caesarian delivery had higher postpartum fatigue scores compared to those with natural delivery. The higher postpartum fatigue score was associated with more problems in infant care. This in turn led to a weak mother–infant attachment during the first 3 days after delivery.

Based on what was mentioned above, the necessity to conduct this study can be expressed as follows: the average rate of cesarean delivery was 27% in four countries in South East Asia,^[24,25] whereas the latest statistics in Iran showed the rate to be 40.6%.^[26] Moreover, an increased risk of postpartum complications has been reported in planned cesarean delivery.^[27] A previous study demonstrated that maternal complications, such as hemorrhage and severe rupture of the cervix, vagina, or perineum, were related to the type of delivery.^[28] Complications of childbirth might in

turn have a negative effect on the mother–infant attachment due to their separation. It should be noted that the behavior domains that are measured in mother–infant attachment include emotional behaviors, proximity behaviors, close contact between mother and baby, and caring behaviors that have been described in details in the 'Materials and Methods' section. Up to now, limited studies have assessed the prevalence and mother–infant attachment scores based on Robson Classification. Hence, this study aims to compare mother–infant attachment in cesarean delivery based on Robson Classification in the selected hospitals of Shiraz University of Medical Sciences in 2019.

Materials and Methods

This cross-sectional, descriptive study was a part of a larger study conducted on women undergoing cesarean delivery in three teaching hospitals (with maternity wards and delivery rooms), namely Hazrate Zeinab Peace Be Upon Him (PBUH) ($n = 158$), Hafez ($n = 137$), and Shoostari ($n = 74$), affiliated to Shiraz University of Medical Sciences (Iran) from April 2018 to March 2019. Considering the prevalence of cesarean delivery as 60% (according to Dadipour *et al.*^[29]), power of 80%, constant z vale (1.96) equal to 95 percentiles, expected incidence (p) of 0.6, and accuracy of 5%, a 369-subject sample size was determined for the study. The participants were selected through convenience sampling according to the number of referrals for delivery. Sampling was completed within 3 months from April to June 2018. The inclusion criteria of the study were having undergone cesarean delivery by spinal anesthesia, having the ability to read and write in Persian, not smoking, lack of drug addiction, absence of spouse abuse, not having the current or recurrent history of health problems (hypertension, diabetes, postpartum hemorrhage, etc.) or mental illnesses (according to the mother's records and self-report), good midwifery history (no previous abortion, dead fetuses, or neonatal death), mother's full consciousness after childbirth (having the ability to breastfeed the infant), planned pregnancy, and lack of adverse events and marital problems. The exclusion criteria were Apgar score of less than 7 at 5 min, infant abnormalities, maternal bleeding, and hospitalization with midwifery indications for more than 48 h.

The data were collected using an interview form (including personal information and pregnancy and mental health data) and Avant's attachment behavior checklist for observing and measuring the level of mother–infant attachment. Avant's attachment behavior checklist included three groups of mother and infant attachment behaviors, including emotional behaviors (staring, caressing, kissing, talking, laughing, and rocking a cradle), proximity/contiguous behaviors (looping the arms firmly around the infant and sticking it to herself and close contact with infant's body), and caring behaviors (burping the infant and changing its

diapers and clothes). It should be noted that in the Iranian culture, caring behaviors are done with the cooperation of a first degree relative of the mother in the hospital and not doing them does not mean lack of attachment. In behavior assessment, these behaviors were observed for 15 min for each mother. In the first 30 s, the mother's behaviors were observed by the researcher and each behavior was recorded in the second 30 s. Every observed behavior was recorded only once in each minute. Therefore, each behavior could be observed 15 times in 15 min. As a total of 11 behaviors were observed for 15 min, the maximum score obtained for each unit was 165, which was quantitatively analyzed and the mean and standard deviation of each behavior were calculated. The content validity method approved by experts (10 Iranian professors) in a study by Khoramrody was used to determine the validity. In addition, the simultaneous observation test was used to determine the scientific reliability. The validity and reliability of Avant's checklist have been approved by Khoramrody in Iran. In that study, two individuals simultaneously recorded mothers' behaviors (in 10 women in the study population) in a checklist and reported the Cronbach's alpha of 0.98.^[30] This was also cited by Setoudeh and Ghodrati as well as by other researchers.^[31-35]

After gaining the approval of the Ethics Committee, the researcher was introduced to all three hospitals and sampling was started. In doing so, the eligible pregnant women referring to the operating rooms of Hazrate Zeinab (PBUH), Hafez, and Shoostari hospitals for cesarean delivery were selected. At first, the mothers were informed about the study objectives and were reassured about the confidentiality of their data. Then, they were asked to sign written informed consent forms for taking part in the research and filled out the demographic information form. In the second stage and after delivery, attachment behaviors were assessed by the researcher within the first 1–7 h after delivery. The time frame was set by the research team, so that all mothers were evaluated in a relatively specific period. In the third stage, the attachment behaviors were assessed 2–3 h before discharge. The Avant checklist was completed by the researcher for all mothers in the two stages. To prevent bias during sampling and recording mother–infant relationships, the researcher referred to the mother only twice, and the mother's performance was recorded only once at each stage of the study. During sampling, each participant was classified into a group according to Robson Classification. As mentioned earlier, Robson Classification divides cesarean delivery into 10 groups. To determine the attachment score, a comparison was made among Robson's 10 groups.

The data were analyzed using descriptive statistics (mean and standard deviation) and paired *t* test was used to compare the mean score of mother–infant attachment in the two stages. SPSS 16 software (IBM Company Armonk, New York) was used for data analysis.

Ethical considerations

Ethical approval was obtained from the Research Ethics Committee of Shiraz University of Medical Sciences (project number: 97-01-08-17097, ethics code: IR.SUMS.REC.1397.404). In addition, permission was obtained from the units responsible for the research and full description of the study objectives was provided to the authorities. The authorities were also assured about the confidentiality of the data investigated in the study. Considering the evaluation of the attachment behaviors, the mothers were informed that their behaviors would be checked in one of their meetings with the researcher, but the exact meeting was not specified. The protocol was designed in accordance with the ethical principles of the Helsinki Declaration (World Medical Association, 2002) and Ethics Committee of Shiraz University of Medical Sciences.

Results

In this study, the mean (SD) age of the mothers was 27.39 (5.90) years. Most mothers were within the age range of 20–30 years. The most frequent education level was high school diploma (58.99%). Among infants, 185 (50.10%) were female and 295 (9.90%) weighed equal to or greater than 2500 grams. A total of 231 cases (62.60%) had an emergency C/S [Table 2].

The results of paired *t* test indicated that the total mean (SD) score of attachment was 38.73 (18.65) at 1–7 h after cesarean delivery and 90.52 (23.79) before discharge. Among mother–infant attachment behaviors, the highest mean score was related to proximity behaviors followed by emotional and caring behaviors. In addition, in all components and sub-components, the mean score of mother–infant attachment was higher before discharge compared to 1–7 h after C/S [Table 3]. Besides, the mean difference was statistically significant in both the score of attachment components and the total score of attachment. ($t_{368} = -64.61, p < 0.001$). The highest total

Table 2: The demographic characteristics of the study population

Variables	Group	n (%)
Maternal age (year)	<20	37 (10)
	20-30	231 (62.60)
	>30	101 (27.40)
Education level	<Diploma	123 (33.34)
	Diploma	214 (58.99)
	>Diploma	32 (8.67)
Neonate's sex	Female	185 (50.10)
	Male	184 (49.90)
Neonate's weight	<2500	74 (20.10)
	≥2500	295 (79.90)
Delivery mode	Emergency CS*	231 (62.60)
	Elective CS	138 (37.40)

*Cesarean section

Table 3: Comparison of the mean scores of mother-infant attachment and its variables during postpartum and pre-discharge stages

Attachment variables	Postpartum Mean (SD)	Pre-discharge Mean (SD)	t test	df	p
Looking	6.02 (3.19)	13.37 (3.09)	-38.42	368	0<0.001
Cuddling	0.89 (1.72)	6.33 (3.28)	-31.73	368	0<0.001
Kissing	0.13 (0.40)	1.26 (0.94)	-23.04	368	0<0.001
Speaking	0.96 (1.68)	6.94 (3.47)	-35.60	368	0<0.001
Laughing and rocking the cradle	1.64 (2.78)	10.14 (4.94)	-35.34	368	0<0.001
Emotional behaviors	9.63 (8.22)	38.5 (14.06)	-43.17	368	0<0.001
Hugging	5.77 (4.28)	12.53 (3.83)	-29.27	368	0<0.001
Close contact between mother and baby	10.42 (0.40)	14.09 (2.46)	-18.21	368	0<0.001
Looping the arms around the baby	7.58 (4.18)	13.58 (3.21)	-30.28	368	0<0.001
Proximity behaviors	23.77 (11.38)	40.20 (8.88)	-31.05	368	0<0.001
To kick the baby back for exit of stomach air	1.31 (1.63)	3.06 (1.83)	-20.67	368	0<0.001
Changing diapers and clothes	0.67 (1.34)	2.96 (1.44)	-28.24	368	0<0.001
Mother's attention to the baby	3.35 (2.43)	6.24 (1.94)	-20.95	368	0<0.001
Care behaviors	5.33 (4.20)	12.27 (3.79)	-42.69	368	0<0.001
Total attachment score	38.73 (18.65)	90.52 (23.79)	-64.61	368	0<0.001

attachment score was related to group 6 (nullipara women with breech presentation); 86.78 (8.70) at 1–7 h after C/S and 118.67 (4.47) before discharge ($t_8 = -9.87$, $p = 0.01$). The lowest score was related to group 10 (cephalic representation, preterm); 12.79 (2.37) at 1–7 h after C/S and 45.44 (7.99) before discharge ($t_{51} = -28.43$, $p = 0.01$). Moreover, mother–infant attachment in cesarean delivery increased over time ($t_{87} = -64.61$, $p = 0.01$) [Table 4].

Discussion

In this research, the mean score of the behaviors was higher before discharge compared to 1–7 h after C/S, and the mothers showed more attachment behaviors during this period. Among the attachment behaviors, the highest mean score was related to proximity behaviors followed by emotional and caring behaviors. The results revealed a significant difference between the two time periods in terms of emotional, proximity, and caring behaviors.

In a previous study, 52 mothers and infants were divided into two groups of Normal Vaginal Delivery (NVD) and C/S. The infants born through NVD were placed next to their mothers immediately after birth, whereas those born via C/S had an average separation of 2.8 (1.0) days. The mother–infant interaction was assessed by direct observation of mothers' behaviors during feeding, (b) observation of mothers' behaviors during assessment of infants' behaviors based on the Neonatal Behavioral Assessment Scale (NBAS), and (c) mothers' interview using attachment questions. The results demonstrated that the mothers in the NVD group were more affectionate compared to those in the C/S group and were more involved in caring for their infants, indicating that mothers and infants were more attached in the vaginal delivery.^[36] In another study, 5-year (2011 to 2015) data were analyzed and the results indicated that the ratio of infants transferred

to the Neonatal Intensive Care Unit (NICU) for examination after skin-to-skin contact immediately after C/S was significantly different from the group with no mother–infant contact. These results supported immediate, uninterrupted skin-to-skin contact for all mothers regardless of birth mode.^[37] However, two studies showed that skin-to-skin contact between the mother and her infant during the first hour after delivery did not affect the mother's attachment behaviors 36 h and 3 months after delivery.^[38,39] The studies that examined emotional, proximity-seeking, and caring behaviors after C/S in one or two steps were not comparable. A study examining emotional, proximity-seeking, and caring behaviors at 1 h and 2 months postpartum showed that only proximity-seeking behaviors were significantly different at 2 months postpartum.^[40] These results were similar to those of this study and the only difference was in the type of delivery. The mean score of proximity behaviors in another study was also consistent with that reported in the current investigation.^[41] In contrast, Eslaminia *et al.*^[42] evaluated attachment among women with unwanted pregnancies in two stages and came to the conclusion that the two study groups were significantly different with regard to emotional and caring behaviors in the first hours after delivery, but proximity-seeking behaviors were the same in both groups. Given the importance of mother–infant attachment and its impact on the mother's sense of adequacy as well as its pleasant experience for mothers, the need for initial contact should be taken into account. Training healthcare workers, especially nurses and midwives, as well as parents about these behaviors before infant's birth can be a major step in promoting parent-infant relationships. If these behaviors are established in all mothers, one can hope that people will have a better mental health status in future.

In the current study, the highest total attachment score was observed in group 6 of Robson Classification at 1–7 h after C/S and pre-discharge. Scarce information

Table 4: The correlations between the mean scores of mother-infant attachment and its variables based on Robeson Classification

Number	Group	Attachment	Postpartum Mean(SD)	Pre-discharge Mean(SD)	t test	df	p
1	Nulliparous, singleton, cephalic, ≥37 weeks of gestation, in spontaneous labor	Emotional	14.00 (8.60)	51.17 (2.99)	-8.52	5	<0.001
		Proximity	40.67 (6.59)	44.33 (1.63)	-1.77	5	0.138
		Careful	14.00 (3.03)	15.33 (1.96)	-1.26	5	0.262
		Total score	68.67 (3.39)	110.83 (5.81)	-14.94	5	<0.001
2	Nulliparous, singleton, cephalic, ≥37 weeks of gestation, induced labor or cesarean section before labor	Emotional	17.48 (8.77)	48.21 (2.92)	-29.13	72	<0.001
		Proximity	36.00 (11.42)	44.36 (3.08)	-5.72	72	<0.001
		Careful	10.56 (2.59)	16.39 (1.14)	-21.37	72	<0.001
3	Multiparous (excluding previous cesarean section), singleton, cephalic, ≥37 weeks of gestation, in spontaneous labor	Total score	64.04 (3.64)	108.96 (4.66)	-74.72	72	<0.001
		Emotional	4.00 (0.86)	11.33 (1.03)	-11.00	5	<0.001
		Proximity	18.67 (1.86)	46.17 (2.86)	-23.97	5	<0.001
4	Multiparous without a previous uterine scar, with singleton, cephalic pregnancy, ≥37 weeks of gestation, induced or cesarean section before labor	Careful	2.00 (1.55)	8.66 (1.51)	-7.91	5	<0.001
		Total Score	24.67 (1.37)	66.17 (2.14)	-38.15	5	<0.001
		Emotional	4.29 (1.42)	18.57 (10.45)	-6.24	20	<0.001
5	Previous cesarean section, singleton, cephalic, ≥37 weeks of gestation	Proximity	18.71 (2.39)	35.24 (11.95)	-6.29	20	<0.001
		Careful	2.14 (1.90)	9.14 (2.48)	-9.85	20	<0.001
		Total Score	25.14 (1.80)	62.95 (2.80)	-56.63	20	<0.001
6	All nulliparous with a single breech	Emotional	8.02 (5.82)	44.79 (3.56)	-75.21	170	<0.001
		Proximity	22.36 (5.49)	44.11 (1.93)	-46.56	170	<0.001
		Careful	4.71 (2.10)	12.44 (1.76)	-37.05	170	<0.001
7	All multiparous with a single breech (including previous cesarean section)	Total Score	35.10 (3.26)	101.35 (4.97)	-152.41	170	<0.001
		Emotional	27.89 (8.52)	54.78 (3.87)	-9.83	8	<0.001
		Proximity	45.00 (0.001)	45.00 (0.001)	0	8	1
8	All multiple pregnancies (including previous cesarean section)	Careful	13.89 (3.92)	18.89 (1.05)	-3.46	8	<0.001
		Total Score	86.78 (8.70)	118.67 (4.47)	-9.87	8	<0.001
		Emotional	13.56 (7.20)	30.11 (8.94)	-4.76	8	<0.001
9	All women with a single pregnancy in transverse or oblique lie (including those with previous cesarean section)	Proximity	25.78 (8.90)	40.78 (8.57)	-4.96	8	<0.001
		Careful	4.11 (2.62)	11.44 (4.22)	-6.42	8	<0.001
		Total Score	43.44 (13.42)	82.33 (16.45)	-11.60	8	<0.001
10	All multiple pregnancies (including previous cesarean section)	Emotional	5.88 (3.65)	18.88 (9.58)	-4.70	15	<0.001
		Proximity	17.94 (11.35)	36.13 (10.62)	-7.28	15	<0.001
		Careful	1.44 (2.13)	9.75 (2.98)	-9.95	15	<0.001
9	All women with a single pregnancy in transverse or oblique lie (including those with previous cesarean section)	Total Score	25.25 (13.69)	64.75 (16.74)	-14.39	15	<0.001
		Emotional	14.50 (6.02)	35.00 (12.76)	-3.65	5	<0.001
		Proximity	29.00 (9.03)	41.83 (7.76)	-5.29	5	<0.001
10	All women with a single pregnancy in transverse or oblique lie (including those with previous cesarean section)	Careful	3.83 (3.25)	10.83 (1.17)	-5.53	5	<0.001
		Total Score	47.33 (15.08)	87.67 (17.17)	-7.95	5	<0.001
		Emotional	2.96 (1.55)	15.81 (5.32)	-17.93	51	<0.001
Total	All singleton, cephalic, <37 weeks of gestation pregnancies (including previous cesarean section)	Proximity	9.06 (1.39)	22.46 (3.58)	-25.82	51	<0.001
		Careful	0.77 (0.85)	7.17 (3.69)	-12.10	51	<0.001
		Total Score	12.79 (2.37)	45.44 (7.99)	-28.43	51	<0.001
Total	All women with a single pregnancy in transverse or oblique lie (including those with previous cesarean section)	Emotional	9.63 (8.22)	38.05 (14.60)	-43.17	87	<0.001
		Proximity	23.77 (11.38)	40.20 (8.88)	-31.05	87	<0.001
		Careful	5.33 (4.20)	12.27 (3.76)	-42.69	78	<0.001
Total	All women with a single pregnancy in transverse or oblique lie (including those with previous cesarean section)	Total Score	38.73 (18.65)	90.52 (23.79)	-64.61	87	<0.001

is available regarding the consequences of long-term delivery with breech presentation. However, evidence has suggested that cesarean delivery is safer than vaginal delivery in case of breech presentation.^[43-45] Hence, cesarean delivery is preferred in breech pregnancies to reduce the complications of the prenatal period. Studies have indicated a significant relationship between attachment and pregnancy complications. The mean score

of attachment was also lower in the mothers with high complications. A study demonstrated that an atmosphere full of stress and discomfort in high-risk pregnancies might reduce maternal attachment behaviors. Adaptation to changes in pregnancy in normal conditions was considered a crisis, as well. In case of a health risk for the mother or the infant, conditions would be more difficult, requiring more flexibility and patience.^[46] In

this study, the mean score of attachment was higher in group 6, because nullipara women were more attached to their first infants. In case of emergency C/S also, they had lower stress levels compared to the other mothers in the emergency C/S and other groups, because they had planned C/S if there was abnormal breech presentation. Thus, unplanned pregnancy increases maternal stress, makes the mother more susceptible to depression, and has a negative effect on her response and, consequently, her attachment to the infant. As mothers with too complicated pregnancies have lower attachment behaviors, care interventions to improve their quality of life as well as their support for stress reduction appear to be necessary. Therefore, mother–infant attachment is expected to increase with planned cesarean delivery in case of abnormal breech presentation (group 6). Furthermore, increased participation of mothers by using proximity behaviors enhanced the interaction between the mother and her infant. Studies on preterm infants (group 10) showed that premature birth caused problems in mother–infant attachment.^[47,48] A study indicated that the mothers who experienced preterm delivery felt guilty and believed that they were responsible for the preterm labor. This feeling of guilt was mixed up with anxiety and affected the mother–infant relationship.^[49] Generally, preterm labor is one of the factors affecting the mother, her infant, and the relationship between them. Preterm birth imposes many problems on the mother’s soul and mind as well as on the family in addition to the pain and suffering associated with childbirth.^[50] On the contrary, parents of premature children may be less sensitive and receptive to the care of their children. Thus, these infants are less likely to be hugged, touched, or less kindly talked to in comparison to those that have well gone through the development stages.^[51] A prior study also suggested that mothers with preterm delivery or difficult delivery had a more negative attitude towards their infants and classified them as infants with difficult and problematic temperaments. These mothers had a negative view of an infant’s routine activities and did not use appropriate methods against crying and hunger. On the contrary, the mother’s disregard for the needs of the child and her inability to perform her maternal role caused the child to feel more stressed and to show negative and maladaptive behaviors.^[50] According to what was mentioned above, attachment and maternal health are among the key concepts in the mother–infant relationship. Given the deep impact of labor conditions on maternal psychology and mother–child relationships, the presence of experts who are familiar with support concepts is necessary. Meanwhile, midwives, as individuals who are present alongside mothers during childbirth, can prepare the mother for delivery to reduce the negative effects of high-risk conditions of delivery on mothers and the mother–infant relationship.^[52]

In the current study, the mother–infant attachment scores were lower in groups 3 and 4 of Robson Classification. Although these women had at least one normal vaginal delivery experience and hoped for the next natural delivery, their mother–infant attachment decreased due to the *traumatic* event during labor and emergency cesarean delivery. The results of the previous studies indicated that aggressive actions, such as emergency C/S, appeared to be traumatic.^[53] Moreover, Smith *et al.*^[54] indicated that emergency cesarean delivery due to maternal (failure in labor progression or cephalopelvic disproportion) or fetal (fetal distress) causes were important stressors for women, and these stressful events were anticipated to increase the risk of change in the mother–infant attachment. Another study suggested that childbirth stress was classified as severe in the psychosocial stress tables. In this period, it is possible to experience neuroticism, depression, and anxiety. Moreover, mothers who experience traumatic births or a problem with themselves or their infants during delivery may review the fear and anxiety of delivery in their minds over the next few years and experience cognitive, physical, and emotional symptoms of anxiety.^[55]

One of the strengths of this study was that it was the first study in Iran and other countries to compare mother–infant attachment in cesarean delivery based on Robson Classification. However, one of the limitations of the study was the mothers’ reluctance to participate in the study and the need for a suitable place to submit and complete the questionnaires. Another study limitation was the probable observer bias. Nevertheless, completion of all checklists by one person helped control and reduce the bias.

As natural infant development depends partly on the exchange of a series of emotional responses between the infant and its parents that make them closer to each other physiologically and psychologically, midwives and nurses in charge of taking care of mothers and newborns are recommended to provide the ground for establishment of long-term interactions at early moments after cesarean delivery and allow mothers to have skin-to-skin contact with their infants and build long-term initial interactions. Furthermore, it is necessary to conduct further studies on mother–infant attachment in cesarean delivery based on Robson Classification to find a better level of attachment in the study groups.

Conclusion

This study showed that mother–infant attachment in cesarean delivery increased over time. Thus, the mean score of attachment behaviors before discharge was higher compared to 1–7 h after C/S. Moreover, the mean score of neonatal attachment in the two stages was highest in group 6, lowest in group 10, and decreased in groups 3 and 4. The mother–infant attachment can be increased by controlling the labor more efficiently (groups 3 and 4) and planning for cesarean deliveries in case of abnormal presentations (group 6) and preterm deliveries (group 10).

Acknowledgements

This article is a part of thesis (project number: 97-01-08-17097), which was approved and sponsored by Shiraz University of Medical Sciences. The authors would like to thank Ms. A. Keivanshekouh at the Research Improvement Center of Shiraz University of Medical Sciences for improving the use of English in the manuscript.

Financial support and sponsorship

Shiraz University of Medical Sciences

Conflicts of interest

Nothing to declare.

References

- Vogel JP, Betrán AP, Vindevoghel N, Souza JP, Torloni MR, Zhang J, *et al.* Use of the Robson classification to assess caesarean section trends in 21 countries: A secondary analysis of two WHO multicountry surveys. *Lancet Glob Health* 2015;3:e260-70.
- Rafiei M, Saei Ghare M, Akbari M, Kiani F, Sayehmiri F, Sayehmiri K, *et al.* Prevalence, causes, and complications of cesarean delivery in Iran: A systematic review and meta-analysis. *Int J Reprod Biomed (Yazd)* 2018;16:221-34.
- Hehir MP, Ananth CV, Siddiq Z, Flood K, Friedman AM, D'Alton ME. Cesarean delivery in the United States 2005 through 2014: A population-based analysis using the Robson 10-Group Classification System. *Am J Obstet Gynecol* 2018;219:105.e1-11.
- Bolognani CV, Reis LBdSM, Dias A, Calderon IdMP. Robson 10-groups classification system to access C-section in two public hospitals of the Federal District/Brazil. *PLoS One* 2018;13:e0192997.
- Rooeintan F, Borzabad PA, Yazdanpanah A. The impact of healthcare reform plan on the rate of vaginal delivery and cesarean section in Shiraz (Iran) in 2015. *Electron Physician* 2016;8:3076-80.
- Omani-Samani R, Mohammadi M, Almasi-Hashiani A, Maroufizadeh S. Cesarean section and socioeconomic status in Tehran, Iran. *J Res Health Sci* 2017;17:e00394.
- Torloni MR, Betran AP, Souza JP, Widmer M, Allen T, Gülmezoglu M, *et al.* Classifications for cesarean section: A systematic review. *PLoS One* 2011;6:e14566.
- Kazmi T, Sarva Saiseema V, Khan S. Analysis of cesarean section rate-according to Robson's 10-group classification. *Oman Med J* 2012;27:415-7.
- Kelly S, Sprague A, Fell DB, Murphy P, Aelicks N, Guo Y, *et al.* Examining caesarean section rates in Canada using the Robson classification system. *J Obstet Gynaecol Canada* 2013;35:206-14.
- Costa ML, Cecatti JG, Souza JP, Milanez HM, Gülmezoglu MA. Using a caesarean section classification system based on characteristics of the population as a way of monitoring obstetric practice. *Reproductive Health* 2010;7:13.
- Robson MS. Classification of caesarean sections. *Fetal Matern Med Rev* 2001;12:23-39.
- Betran AP, Vindevoghel N, Souza JP, Gülmezoglu AM, Torloni MR. A systematic review of the Robson classification for caesarean section: What works, doesn't work and how to improve it. *PLoS One* 2014;9:e97769.
- Boyd MM. Implementing skin-to-skin contact for cesarean birth. *AORN J* 2017;105:579-92.
- Moore ER, Anderson GC, Bergman N, Dowswell T. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database Syst Rev* 2012;5:CD003519.
- Bowlby J. Attachment and Loss, Vol. I: Attachment. London: Hogarth. New York: Basic Books; 1969.
- Akbarzadeh M, Moattari M, Abootalebi M. Effect of the basnef model on maternal-fetal attachment in the pregnant women referring to the prenatal clinics affiliated to Shiraz University of Medical Sciences. *Iran J Neonatol* 2017;8:31-7.
- Farrant BM, Maybery MT, Fletcher J. Maternal attachment status, mother-child emotion talk, emotion understanding, and child conduct problems. *Child Dev Res* 2013;2013. doi: 10.1155/2013/680428.
- Akbarzadeh M, Dokuhaki A, Joker A, Pishva N, Zare N. Teaching attachment behaviors to pregnant women: A randomized controlled trial of effects on infant mental health from birth to the age of three months. *Ann Saudi Med* 2016;36:175-83.
- Dokuhaki A, Akbarzadeh M, Pishava N, Zare N. A study of the effect of training pregnant women about attachment skills on infants' motor development indices at birth to four months. *Family Medicine & Primary Care Review*. 2017;19:114-22.
- Klaus M, Kennell J, Louis ST. *Maternal-Infant Bonding: The Impact of Early Separation or Loss on Family Development*; Mosby Co; 1976:62
- Giustardi A, Stablum M, De Martino A. Mother infant relationship and bonding myths and facts. *J Matern Fetal Neonatal Med* 2011;24(Suppl 1):59-60.
- Stevens J, Schmied V, Burns E, Dahlen H. Immediate or early skin-to-skin contact after a C cesarean section: A review of the literature. *Matern Child Nutr* 2014;10:456-73.
- Lai Y-L, Hung C-H, Stocker J, Chan T-F, Liu Y. Postpartum fatigue, baby-care activities, and maternal-infant attachment of vaginal and cesarean births following rooming-in. *Appl Nurs Res* 2015;28:116-20.
- The SEA-ORCHID Study Group, Laopaiboon M, Lumbiganon P, McDonald SJ, Henderson-Smart DJ, Green S, *et al.* Use of evidence-based practices in pregnancy and childbirth: South East Asia optimising reproductive and child health in developing countries project. *PLoS One* 2008;3:e2646.
- Festin MR, Laopaiboon M, Pattanittum P, Ewens MR, Henderson-Smart DJ, Crowther CA. Cesarean section in four South East Asian countries: reasons for, rates, associated care practices and health outcomes. *BMC Pregnancy Childbirth*. 2009;9:17. Published 2009 May 9. doi:10.1186/1471-2393-9-17
- Rajabi A, Maharlouei N, Rezaianzadeh A, Rajaeefard A, Gholami A. Risk factors for C-section delivery and population attributable risk for C-section risk factors in Southwest of Iran: A prospective cohort study. *Med J Islam Repub Iran* 2015;29:294.
- Kok N, Ruiter L, Hof M, Ravelli A, Mol BW, Pajkrt E, *et al.* Risk of maternal and neonatal complications in subsequent pregnancy after planned caesarean section in a first birth, compared with emergency caesarean section: A nationwide comparative cohort study. *BJOG* 2014;121:216-23.
- Benedetto C, Marozio L, Prandi G, Rocchia A, Blefari S, Fabris C. Short-term maternal and neonatal outcomes by mode of delivery. A case-controlled study. *Eur J Obstet Gynecol Reprod Biol* 2007;135:35-40.
- Dadipour S, Madani AH, Alvai A, Rozbeh N, Safari-Moradabadi A. Survey of the growing trend of cesarean section in Iran and the world. *Iran J Obstet Gynecol Infertil* 2016;19:8-17.
- Khoramrody R. [The Effect of Mothers Touch on Maternal Fetal

- Attachment]. Tehran: Iran University of Medical Sciences; 2000. p. 30-45.
31. Setodeh S, Sharif F, Akbarzadeh M. The impact of paternal attachment training skills on the extent of maternal neonatal attachment in primiparous women: a clinical trial. *Family Medicine & Primary Care Review*. 2018;20(1):47-54. doi:10.5114/fmpcr.2018.73703.
 32. Ghodrati F, Setodeh S, Akbarzadeh M. A study of the effect of domestic violence on maternal-neonatal attachment in prim gravida women referred to hospitals affiliated to Shiraz University of Medical Sciences. *Biomed Res* 2017;28:3794-7.
 33. Moradi Z, Akbarzadeh M, Moradi P, Toosi M, Hadianfard MH. The effect of acupressure at GB-21 and SP-6 acupoints on anxiety level and maternal-fetal attachment in primiparous women: A randomized controlled clinical trial. *Nurs Midwifery Stud* 2014;3:e19948.
 34. Toosi M, Akbarzadeh M, Zare N, Sharif F. Effect of attachment training on anxiety and attachment behaviors of first-time mothers. *Hayat* 2011;17:69-79.
 35. Toosi M, Akbarzadeh M, Ghaemi Z. The effect of relaxation on mother's anxiety and maternale fetal attachment in primiparous IVF mothers. *J Natl Med Assoc* 2017;109:164-71.
 36. Gathwala G, Narayanan I. Influence of cesarean section on mother-baby interaction. *Indian Pediatr* 1991;28:45-50.
 37. Schneider LW, Crenshaw JT, Gilder RE. Influence of immediate skin-to-skin contact during cesarean surgery on rate of transfer of newborns to NICU for observation. *Nurs Womens Health* 2017;21:28-33.
 38. Curry MA. Maternal attachment behavior mothers self concept the effect of skin-to-skin contact. *Nurs Res* 1982;31:73-8.
 39. Messmer PR, Rodriguez S, Adams J, Well-Gentry J, Washburn K, Zabaleta I, *et al.* Effect of kangaroo care on sleep time for neonates. *Pediatric nursing*. 1997; 23(4):408-414.
 40. Adeli M, Aradmehr M. A comparative study of maternal-neonate abdominal and kangaroo (skin-to-skin) skin contact immediately after birth on maternal attachment behaviors up to 2 months. *J Educ Health Promot* 2018;7:42.
 41. Ahn HY, Lee J, Shin H-J. Kangaroo care on premature infant growth and maternal attachment and post-partum depression in South Korea. *J Trop Pediatr* 2010;56:342-4.
 42. Eslaminia T, Kaviani M, Akbarzadeh M. The effect of skin contact on maternal-infant attachment behaviors in emotional, proximity-seeking, and caretaking dimensions in planned and unplanned pregnancies in 2017, Iran: A research. *Current Women's Health Reviews* 2020;16:1-8. <https://doi.org/10.2174/157340481666200219102513>.
 43. Bin YS, Ford JB, Nicholl MC, Roberts CL. Long-term childhood outcomes of breech presentation by intended mode of delivery: A population record linkage study. *Acta Obstet Gynecol Scand* 2017;96:342-51.
 44. Högberg U, Claeson C, Krebs L, Svanberg AS, Kidanto H. Breech delivery at a University Hospital in Tanzania. *BMC Pregnancy Childbirth* 2016;16:342.
 45. Macharey G, Gissler M, Ulander V-M, Rahkonen L, Väisänen-Tommiska M, Nuutila M, *et al.* Risk factors associated with adverse perinatal outcome in planned vaginal breech labors at term: A retrospective population-based case-control study. *BMC Pregnancy Childbirth* 2017;17:93.
 46. Buist A, Morse CA, Durkin S. Men's adjustment to fatherhood: Implications for obstetric health care. *J Obstet Gynecol Neonatal Nurs* 2003;32:172-80.
 47. Evans T, Whittingham K, Boyd R. What helps the mother of a preterm infant become securely attached, responsive and well-adjusted? *Infant Behav Dev* 2012;35:1-11.
 48. Wolke D, Eryigit-Madzwamuse S, Gutbrod T. Very preterm/very low birthweight infants' attachment: Infant and maternal characteristics. *Arch Dis Child Fetal Neonatal Ed* 2014;99:F70-5.
 49. Staneva A, Bogossian F, Pritchard M, Wittkowski A. The effects of maternal depression, anxiety, and perceived stress during pregnancy on preterm birth: A systematic review. *Women Birth* 2015;28:179-93.
 50. Voegtline KM, Stifter CA, Investigators FLP. Late-preterm birth, maternal symptomatology, and infant negativity. *Infant Behav Dev* 2010;33:545-54.
 51. Pichler-Stachl E, Pichler G, Baik N, Urlesberger B, Alexander A, Urlesberger P, *et al.* Maternal stress after preterm birth: Impact of length of antepartum hospital stay. *Women Birth* 2016;29:e105-9.
 52. Surkan PJ, Patel SA, Rahman A. Preventing infant and child morbidity and mortality due to maternal depression. *Best Pract Res Clin Obstet Gynaecol* 2016;36:156-68.
 53. Beck CT, Driscoll J. *Postpartum Mood and Anxiety Disorders: A clinician's Guide*. Jones and Bartlett Learning; 2006.
 54. Smith J, Plaat F, Fisk NM. The natural caesarean: A woman-centred technique. *BJOG* 2008;115:1037-42.
 55. Quarini C, Pearson RM, Stein A, Ramchandani PG, Lewis G, Evans J. Are female children more vulnerable to the long-term effects of maternal depression during pregnancy? *J Affect Disord* 2016;189:329-35.