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Influence of Birth Methods on Mother-Infant Bonding : A Comparative Study

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Abstract

Introduction: The process through which a woman and her child develop a close emotional attachment is known as woman-child bonding. This is essential to a child's early development and has been linked to a number of advantages for both mothers and children.This study aims to find out the relationship between a mother's postpartum bonding and the delivery method (csection or vaginal).

Methods: A descriptive comparative study was conducted among 240 postpartum womens at primary health care centers in Babylon city , Iraq. Participants aged 16-45 years in the 6 weeks after delivery . Data were collected using the validated (postpartum bondig questionnaire and analyzed with SPSS version 23.0. Descriptive and inferential statistics, including Kruskal-Wallis tests, Mann-Whitney U Test were employed to evaluate associations, with significance set at $p<0.05$.

Results: The study revealed using weighted scores categorized into three levels: low, moderate, and high. Among mothers who underwent normal delivery, 817% had high bonding scores (mean ± SD = 91.67 ± 18.14). Similarly, for mothers who delivered by C/S, 74.2% had high bonding scores (mean ± SD = 84.38 ± 21.166).

Conclusions: The findings from this study indicate that mothers who underwent normal delivery reported stronger positive bonding with their infants compared to those who had caesarean sections. While both groups exhibited high levels of bonding, the mothers with normal deliveries had significantly higher scores on positive bonding indicators.

Keywords: Type 2 diabetes mellitus, cardiac autonomic dysfunction, heart rate variability, glycemic control, SDNN, RMSSD, LF/HF ratio.

1. Introduction

Mother-to-infant bonding is the emotional connection that a mother forms with her newborn, usually during the first few weeks, months, or year of the child's life (Al-Juboori, 2022). One of the main goals of obstetric, neonatal, and pediatric nursing care has been the development of mother-to-infant bonding, or the mother's feelings and emotions for her child (Bieleninik et al., 2021). The transition of a woman into motherhood is one of the most important stages of human growth, This emotional bond between a mother and her child will assure that the child gets the care and protection they require, develop a strong mother-infant bond, and help the baby grow up to be healthy. In particular, greater maternal sensitivity and participation during interactions with their newborn have been linked to excellent bonding quality (Brockington et al., 2006). The process of bonding has significant effects on both the mother and the child, and a variety of circumstances influence the mother's emotional reaction to her baby. In the initial months following childbirth, some mothers may find the physiological, psychological, and social changes that accompany this process, as well as the need to adapt to the infant's numerous needs, to be difficult and overwhelming (Chen et al., 2024; Duran & Vural, 2023). A mother's emotional connection to her infant is known as maternal-infant bonding ,It is possible for the bonding process to start during pregnancy and continue to develop after the baby is born Research indicates that 6–41% of mother-child dyads exhibit disturbances in the maternal bonding process (Giang et al., 2024). Furthermore, the attachment and/or emotional bonds that are formed in the early postpartum phase may lay the groundwork for the relationship that mothers and their babies will have for the rest of their lives ,For this reason, it's critical to identify mother-infant bonding issues early on in order to promote healthy bonding during the postpartum phase (Hassan & Alawi, 2022).

2. Objective of the study:

١. To assess the mother-infant bonding among normal and caesarean section delivery.

2. To determine the variation in mother-infant bonding with regard to normal and caesarean section delivery.

3. To determine the differences in mother-infant bonding in both normal and caesarean section delivery with respect to their socio demographic characteristics.

3. Methodology

Study Design and Sitting

This study used a descriptive comparative design to assess the Influence of Birth Methods on Postpartum postpartum bonding . The comparative design was chosen to gather a picture of the relationship between mother and her newborn in the postpartum phase .

Study sample

The study was conducted at the primary health care centers , located in Babylon city , Iraq. The target population consisted of postpartum women's enrolled at the primary health care center . The sample included 240 women's (120 women deliver vaginally and 120 women deliver by cesarean section) who were selected through convenience sampling. The inclusion criteria All mothers within the first six weeks after delivery who attended the selected PH (Primary Health Care Center) the Exclusion Criteria women who declined to take part in the current study, Any

mother within the first six weeks after delivery, who have History of chronic disease , A recent history of psychological trauma . Study tools

The data series was conducted using the postpartum bonding questionnaire(PBQ) (Hulman et al., 2024)The PBQ has 24 statements, each followed by six alternative responses ranging from ‘always’ to ‘never’. Positive responses, such as ‘‘I enjoy playing with my baby’’, are scored from zero (‘always’) to 5 (‘never’). Negative responses, such as ‘‘I am afraid of my baby’’, are scored from 5 (‘always’) to zero (‘never’) Data collectin

Data were collected after acquiring an official agreement from the department of development and a training through using research instruments in the period from (20th semptemper 2024 to 10th janewary, 2025) .. Postpartum Women who participated in the study were interviewed face to face by the researcher, who provided instructions and answered any questions they had regarding the form and was present to react to any questions women could have if they required more .

Statistical analysis

A combination of descriptive and inferential data were used to analyze the accumulated statistics. The demographics of the participants and the prevalence of postpartum depression were summarized using descriptive data, such as frequencies, percentages, modes, and standard deviations. Statistical differences were identified using inferential data, which included the Mann-Whitney U Test and Kruskal-Wallis analysis. At $p<0.05$, statistical significance was established. SPSS software was used to analyze all of the data (model 23.0).

4. The results

Table (1). Distribution of Study Sample by their Socio-demographic Variables (SDVs)

SDVs	Classification	Normal Delivery		C/s Delivery	
		No.	%	No.	%
Age/ years	<20	5	4.2	5	4.2
	20-29	69	57.5	67	55.8
	30-39	39	32.5	44	36.7
	≥40	7	5.8	4	3.3
	M ± *SD*	28.14±5.775		28.44±5.447	
Education level	Illiterate	14	11.7	17	14.2
	Read and write	13	10.8	17	14.2
	Primary school	13	10.8	19	15.8
	Preparatory school	12	10.0	6	5.0
	Secondary school	16	13.3	17	14.2

	Institute	21	17.5	17	14.2
	University	31	25.8	27	22.5
Occupation	Employed	55	45.8	48	40.0
	Unemployed	58	48.3	69	57.5
	Student	7	5.8	3	2.5
Residents	Urban	65	54.2	66	55.0
	Rural	55	45.8	54	45.0
Current marital status	Marriage	115	95.8	115	95.8
	Divorce	4	3.3	5	4.2
	Widow	1	.8	0	0.0
Economic level	Enough	53	44.2	47	39.2
	Some extent enough	58	48.3	56	46.7
	Not enough	9	7.5	17	14.2
Child feeding	Breastfeeding	58	48.3	38	31.7
	Artificial feeding	40	33.3	52	43.3
	Mix methods feeding	22	18.3	30	25.0
Child sex	Male	71	59.2	62	51.7
	Female	49	40.8	58	48.3

No. Number; %= Percentage; M= Mean; SD= standard deviation

The table summarizes the distribution of study participants based on socio-demographic variables, comparing those who had normal deliveries to those who underwent caesarean sections (C/S). The majority of participants in both groups were aged 20–29 years (57.5% for normal deliveries, 55.8% for C/S) with similar mean ages around 28 years. Education levels varied, with university graduates comprising the largest subgroup for both delivery types (25.8% and 22.5%, respectively). Most participants were either employed or unemployed, with a higher proportion of unemployed women in the C/S group (57.5%). Urban and rural residency were nearly equally distributed in both groups. Marriage was the predominant marital status, while economic levels were primarily "somewhat sufficient." Breastfeeding was more common in the normal delivery group (48.3%), whereas artificial feeding was higher in the C/S group (43.3%). Lastly, male children slightly outnumbered females in normal deliveries (59.2%), while the sex ratio was more balanced in the C/S group.

Table(2). Distribution of Study Sample by Obstetric History

Factors	Normal Delivery	C/s Delivery

	Min-Max	*Mean± SD*	*Min-Max*	*Mean ±SD*
No. delivery	1–2	1.66 ± 0.473	1–2	1.68 ± 0.470
Number of living children	1–9	2.47 ±1.571	1–8	2.50±1.571
Gestational age (weeks)	35–40	37.59±1.331	33–40	37.25±1.411

Max= Maximum; Min= Minimum; M= Mean; SD= standard deviation

The distribution of the study sample according to obstetric history is shown in the table, which compares the variables of caesarean section (C/S) and normal deliveries. Both groups experienced one to two deliveries, with comparable averages (1.66 ± 0.473 for normal delivery and 1.68 ± 0.470 for C/S). With virtually equal averages (2.47 ± 1.571 and 2.50 ± 1.571, respectively), the number of alive children ranged more considerably, ranging from 1 to 9 in normal delivery and 1 to 8 inside C/S. With matching mean gestational ages of 37.25 ± 1.411 and 37.59 ± 1.331 weeks, the range of gestational ages for C/S deliveries (33–40 weeks) was somewhat wider than that of normal deliveries (35–40 weeks).

Table 3.Overall Evaluation of Mother-Infant Bonding among Normal and Caesarean Section Delivery

Weighted	Normal delivery			C/s delivery		
	No.	%	M ± SD	No.	%	M ± SD
Low	4	3.3	91.67 ± 18.137	10	8.3	84.38 ± 21.166
Moderate	18	15.0		21	17.5	
High	98	81.7		89	74.2	
Total	120	100.0		120	100.0	

M: Mean for total score, SD: Standard Deviation for total score

(Low= 0-40, Moderate= 40.1-80, High= 80.1-120)

The table show overall evaluation of mother-infant bonding between normal delivery and caesarean section (C/S) delivery using weighted scores categorized into three levels: low, moderate, and high. Among mothers who underwent normal delivery, 817% had high bonding scores (mean ± SD = 91.67 ± 18.14). Similarly, for mothers who delivered by C/S, 74.2% had high bonding scores (mean ± SD = 84.38 ± 21.166). Both groups had a total sample size of 120 mothers each. While the majority of mothers in both groups achieved high bonding scores, a slightly higher proportion of mothers with normal delivery reported high bonding compared to those with C/S delivery.

Table 4.Statistical Variations in Mother-infant bonding between Groups of Normal and Caesarean Section Delivery

Variable	Birth Methods	No.	Mean Rank	*cz* _	*Sig.*

Postpartum Bonding Questionnaire	Normal	120	130.73	5972.000	.022
	C/s	120	110.27		

[c]= Mann-Whitney Test; No.= number,; sig.= significant level at 0.05.

The Mann-Whitney U Test indicate that there were significant differences in postpartum bounding between those who are normal delivery and those who are caesarean section delivery (p=0.022).

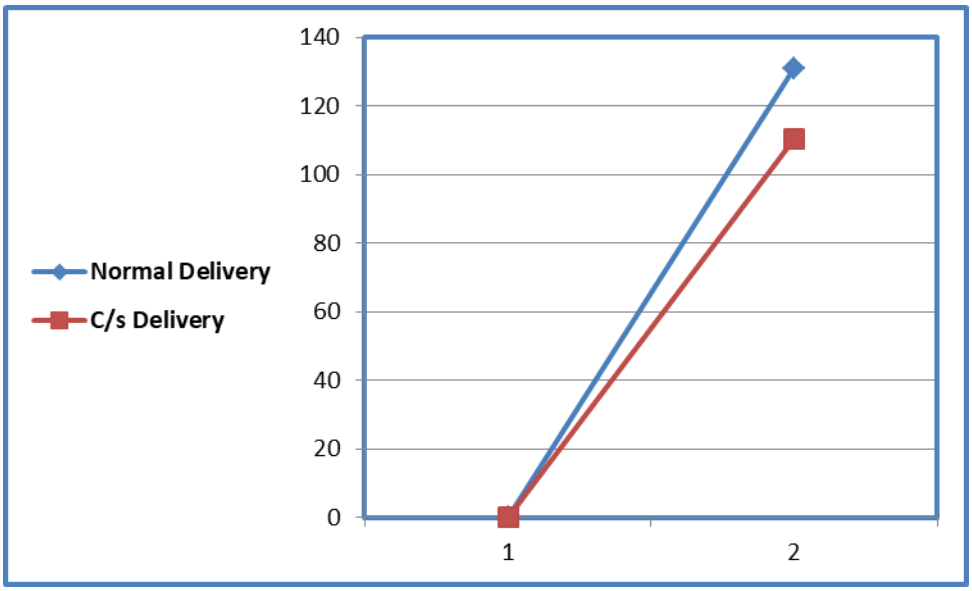

Fig. 1: Comparison of Mother-infant bonding between Groups of Normal and Caesarean Section Delivery

Table 5.Statistical Differences in Postpartum Bounding among Normal Deliveries Women between Groups Socio-demographic Characteristics

Variables	Ranks			[b]χ^2	Sig.
	Postpartum Bonding	No.	Mean Rank		
Age	<20	5	55.20	.206	.779
	20-29	69	61.41		
	30-39	39	59.41		
	≥40	7	61.43		
Education level	Illiterate	14	57.89	8.350	.214
	Read and write	13	59.08		
	Primary school	13	66.85		
	Preparatory school	12	53.75		
	Secondary school	16	73.78		

	Institute	21	70.05		
	University	31	48.90		
Occupation	Employed	55	60.03	3.291	.193
	Unemployed	58	58.19		
	Student	7	83.36		
Residents	Rural	65	62.66	.548	.459
	Urban	55	57.95		
Current marital status	Marriage	115	62.98	14.019	.001
	Divorce	4	73.63		
	Widow	1	3.00		
Economic level	Enough	53	63.92	2.439	.295
	Some extent enough	58	55.73		
	Not enough	9	71.11		
Child feeding	Breastfeeding	58	59.71	.661	.719
	Artificial feeding	40	58.70		
	Mix feeding	22	65.86		
Child sex	Male	71	58.82	.404	.525
	Female	49	62.93		

[b]*= Kruskal Wallis Test; n= number,; sig.= significant level at ≤0.05.*

The table presents the statistical differences in postpartum bonding among women with normal deliveries based on their socio-demographic characteristics, analyzed using the Kruskal-Wallis test. Age, education level, occupation, place of residence, economic level, child feeding method, and child sex did not show statistically significant differences in postpartum bonding (*p>0.05*). However, current marital status significantly affected postpartum bonding (χ^2 = *14.019, p = 0.001*), with divorced women scoring higher mean ranks compared to married or widowed women.

Table 6.Statistical Differences in Postpartum Bounding among C/s Deliveries Women between Groups Socio-demographic Characteristics

Variables	Ranks			[b]χ^2	Sig.
	Postpartum Bonding	No.	Mean Rank		
Age	<20	5	48.50	5.573	.134
	20-29	67	65.87		

	30-39	44	56.30		
	≥40	4	31.75		
Education level	Illiterate	17	65.29	4.050	.670
	Read and write	17	58.71		
	Primary school	19	52.13		
	Preparatory school	6	78.42		
	Secondary school	17	58.88		
	Institute	17	68.32		
	University	27	56.61		
Occupation	Employed	48	58.57	.332	.847
	Unemployed	69	62.04		
	Student	3	56.00		
Residents	Rural	66	59.62	.094	.760
	Urban	54	61.57		
Current marital status	Marriage	115	58.17	12.355	.001
	Divorce	5	114.00		
Economic level	Enough	47	65.56	3.090	.190
	Some extent enough	56	54.33		
	Not enough	17	66.82		
Child feeding	Breastfeeding	38	66.50	3.830	.147
	Artificial feeding	52	62.02		
	Mix feeding	30	50.27		
Child sex	Male	62	63.02	.558	.455
	Female	58	57.80		

[b]= *Kruskal Wallis Test; n= number,; sig.= significant level at ≤0.05.*

The table presents statistical differences in postpartum bonding among women who underwent caesarean deliveries, analyzed based on various socio-demographic characteristics. Postpartum bonding was assessed using the Kruskal-Wallis test. Most variables, including age, education level, occupation, residency, economic level, child feeding method, and child's sex, did not show statistically significant differences in bonding scores (*p>0.05*). However, current marital status revealed a significant difference (p=0.001), with divorced women demonstrating notably higher bonding scores (mean rank = 114.00) compared to married women (mean rank = 58.17).

5. Discussion

Evaluation of Mother-Infant Bonding among Normal and Caesarean Section Delivery

The results of this study highlight that a higher percentage of mothers who underwent normal delivery (81.7%) achieved high bonding scores, compared to 74.2% of mothers who delivered via caesarean section (C/S). Although both groups reported predominantly high bonding, the slight difference between them warrants further exploration of the factors contributing to maternal bonding post-delivery (Table ٣).

The connection between mother-infant bonding and the method of delivery has been the subject of numerous research. According to a study by (Lasheras et al., 2022), for example, mothers who delivered birth vaginally tended to have closer connections with their babies, especially during the crucial early postpartum period. The physiological effects of a typical vaginal delivery, which enable immediate skin-to-skin contact and stimulate hormone reactions that strengthen maternal attachment, could be the cause of this. During vaginal birth, larger amounts of oxytocin, sometimes referred to as the "bonding hormone," are released, which helps the mother and baby form emotional bonds (Murakami et al., 2021) . Additionally, a faster transition to early nursing is usually possible with vaginal delivery, which is another element that improves mother-infant connection (O'Dea et al., 2023) . However, because C/S births include an operation, they frequently delayed the onset of breastfeeding and skin-to-skin contact, despite their rising prevalence. According to research by (Pazzagli et al., 2023) , mothers who suffer a longer recovery period and are less likely to participate in early bonding activities like breastfeeding may have poorer first bonding ratings as a result of delayed interaction following C/S. These difficulties may be the reason for the decreased, but still significant, percentage of mothers in the C/S group who had strong bonding scores in this study. It is important to remember, however, that bonding quality can be influenced by the route of distribution. Bonding results can also be influenced by other factors, including the infant's health, support networks, and the mother's mental health. According to a study by (Pudasainee-Kapri et al., 2024) , mothers who experience higher levels of anxiety or depression are more likely to report having trouble connecting with their babies, regardless of the style of birth. Therefore, in order to understand bonding outcomes, it is important to take into account maternal psychological and environmental aspects in addition to the method of delivery. Overall, the findings of this study suggest that while the majority of mothers in both delivery groups exhibit high bonding scores, normal delivery may offer slight advantages in fostering a stronger bond due to immediate contact and hormonal responses.

The statistical analysis using the Mann-Whitney U Test reveals a significant difference in postpartum bonding between mothers who underwent normal delivery and those who delivered via caesarean section (C/S), with a p-value of 0.022. This indicates that the mode of delivery has a statistically significant impact on the bonding process in the postpartum period. The results show that mothers who had a normal delivery had a higher mean rank (130.73) compared to those who delivered via C/S (mean rank = 110.27), suggesting that the bonding experience may be more positively perceived among the former group (Table 4).

The Mann-Whitney U Test is a non-parametric test commonly used to assess differences between two independent groups when the data is not normally distributed, which is often the case in healthcare and psychological research (Damian Riina et al., 2023) .In this case, the significant p-value (0.022) suggests that the null hypothesis, which assumes no difference

between the two groups, can be rejected. This supports the conclusion that the mode of delivery influences postpartum bonding, with mothers who have normal deliveries reporting stronger bonding compared to those who undergo C/S.Numerous studies have supported similar results, demonstrating that vaginal delivery may promote a stronger attachment between mother and child due to the advantages of direct skin-to-skin contact and hormonal reactions (such as enhanced oxytocin release). For instance, a study by (Uvnäs-Moberg, 2024) showed that better bonding scores as determined by several postpartum bonding questionnaires are associated with immediate attachment, which is easier to encourage following a vaginal delivery. Conversely, C/S deliveries, especially those with problems or long recovery periods, can interfere with the bonding relationships that occur right away, which can sometimes result in poorer bonding scores (Vagos et al., 2025; Yoshida et al., 2020) .Although the statistical difference is significant, it is crucial to understand that not all mothers will experience clinically meaningful consequences as a result of this difference. Regardless of the method of birth, other elements like the infant's health, support networks, and the mother's psychological state can have a significant impact on bonding (Alzeyadi et al., 2024) . Consequently, a comprehensive approach to postpartum care that takes into account both medical and psychosocial factors is crucial to improving mother-infant bonding for all moms, regardless of delivery mode, even though the statistical variation observed in this study is significant.

The statistical analysis of postpartum bonding among women with normal deliveries based on socio-demographic characteristics reveals significant and non-significant differences across various factors, as evaluated using the Kruskal-Wallis test. Among the variables examined, current marital status was the only factor that showed a statistically significant difference in postpartum bonding ($\chi^2 = 14.019$, $p = 0.001$). Divorced women had higher mean ranks in postpartum bonding compared to married or widowed women (Table ٥). According to some research, single or divorced mothers frequently adjust to their circumstances by developing closer relationships with their children in order to lessen stressors related to social isolation or financial difficulties. This finding may be a reflection of the particular psychological or social dynamics of divorced women, who may show a heightened focus on their maternal role due to fewer spousal responsibilities or increased reliance on their bond with the child for emotional support (Kyung-Sook et al., 2018) .

The analysis of postpartum bonding among women who underwent cesarean deliveries provides insightful findings about the influence of socio-demographic characteristics. Using the Kruskal-Wallis test, significant differences were observed only for marital status, while other variables showed no statistical significance. The analysis revealed that marital status significantly impacts postpartum bonding ($\chi^2 = 12.355$, $p = 0.001$). Compared to married women (mean rank = 58.17), divorced women scored significantly higher on bonding (mean rank = 114.00). This result is consistent with earlier research, including that conducted by (20,21), which indicates that mothers who are divorced or single may develop closer emotional bonds with their babies as a result of their heightened attention to the children as the main source of emotional support. Furthermore, the lack of a partner may increase the mother's sense of responsibility and trust on the child, deepening their relationship.

6. Conclusion:

According to the results of this study, women who had a normal delivery reported a better bond with their babies than mothers who had a cesarean section. Postpartum bonding was

significantly impacted by sociodemographic factors, including marital status. Relationship status may have an impact on how mothers attach with their newborns after delivery, as divorced women showed higher mean ranks for postpartum bonding than married or widowed women.

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8. Conflicts of interest

There are no conflicts of interest.

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