Original Paper

The Relationship of Childbirth Experience With Mother-Infant Bonding and Child's Growth and Development

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ABSTRACT

Introduction: The negative experience of childbirth has many consequences for the mother and the baby.

Objective: This study analyzed the relationship of childbirth experience with mother-infant bonding and the child's growth and development.

Materials and Methods: In this cross-sectional study, the participants were 216 eligible women selected from all health centers in Zanjan City, Iran (36 health centers), using the census method. Data collection tools were as follows: childbirth experience questionnaire 2.0, postpartum bonding questionnaire, anthropometric indices checklist, and developmental age and stages questionnaire. The Pearson correlation test was used to determine the relationship of variables in univariate analysis, and a general linear model was used in the multivariate analysis.

Results: The Mean±SD of the participants was 29.0±5.7 years. Less than half of the studied women (40.3%) had a diploma, and most wanted pregnancy (94.9%). The Mean±SD scores of the childbirth experience and postpartum bondings were 2.6±0.5 (score range: 1-4) and 6.6±2.7 (score range: 0-125), respectively. Regarding child development, the highest mean score was in the domain of problem-solving (56.8±5.7), and the lowest was in the domain of communication (50.1±8.3). The results of the Pearson correlation test showed that the childbirth experience had a significant inverse correlation with the mother-infant bonding (r=-0.23, P=0.001) and a significant direct correlation with fine motions (r=0.18, P=0.007). The results of the general linear model after adjusting the socio-demographic and obstetrics characteristics showed that the postpartum bonding score was lower in women with a more positive childbirth experience, which was also an indication of a better bonding (B= -2.92, 95% CI; -4.85 to -0.98, P=0.003). Besides, the fine motor score was higher in women with a positive childbirth experience (B= 3.11, 95% CI: 0.733-5.487, P=0.011).

Conclusion: Considering the correlation between the variables of childbirth experience and mother-infant bonding and child development in the domain of fine motor, health providers must do their best to create positive childbirth experiences for the women to improve the mother-infant bonding and child development domains.

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Highlights

• The negative childbirth experience has many consequences for both the mother and the baby.

• The childbirth experience is a complex mental concept and is not only related to the consequences of childbirth.

• The women's childbirth experience is most correlated with the future mother-infant bonding.

• A traumatic childbirth experience leads to poor communication between the mother and the child and has a negative impact on the infant's cognitive development, and is associated with delayed emotional and cognitive development.

Plain Language Summary

Childbirth is a lifelong memory for women. Remembering negative memories for a long period often had harmful consequences for the mother and the baby. The present study was conducted to determine the relationship between childbirth experience and mother-infant bonding and the child's growth and development in women referring to Zanjan City health centers, Iran, in 2020. The present study showed that the postpartum bonding score was lower in women with a more positive childbirth experience, indicating a better relationship. Besides, the fine motor score was higher in women with a positive childbirth experience. Therefore, coherent planning is essential for improving the birth experience, the mother-infant bonding, and the child's development domains.

Introduction

Some women consider childbirth a positive process and a sign of their power [1]. Childbirth is a lifelong memory for women [2]. A cohort study in Japan reported that women remember their childbirth experience even five years later. Although they recalled negative experiences better than positive ones, remembering negative memories for a long time often had harmful consequences [3].

An ethnographic study of women's perceptions of a negative childbirth experience found no single definition of a negative childbirth experience, and the definition of childbirth trauma was intertwined with the negative childbirth experience [4]. The childbirth experience is a complex mental concept and is not limited to the consequences of childbirth [5]. So, if women felt cared for during the labor process, the overall experience of childbirth might be described as positive, despite the physical complications. The participants' mental experience was the most important predictor of post-traumatic stress symptoms [6].

One of the consequences of the negative childbirth experience is the delay in the infant's growth due to poor breastfeeding performance. Intervention during childbirth leads to psychological damage, which in turn is associated with the cessation of breastfeeding. Experiencing traumatic childbirth reduces the mothers' confidence and adds to their anxiety about their ability to breastfeed [7]. New World Health Organization (WHO) standards for child development state that all children worldwide should have the same opportunity and potential for growth and development. Also, it is proven that the differences in children's growth up to age 5 are more influenced by nutrition, environment, feeding practices, and health care than genetics or ethnicity. International organizations recommend breast milk as a good source of nutrition during infancy [8]. Since negative childbirth experiences are associated with poor breastfeeding performance, affecting the infant's growth [7].

Besides, a traumatic childbirth experience leads to poor communication between the mother and the child and has a negative impact on the infant's cognitive development. It is also associated with delayed emotional and cognitive development [9]. The mothers' psychological childbirth experience may indirectly impact their infant's behavior [10]. Various elements of the childbirth experience, including the physical process, social support, and the postpartum environment, can affect the infant's behavior. Such impacts may occur due to physiological influences on the infant, as well as maternal interactions influenced by the mental perception of the childbirth experience. In general, childbirth has a

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complex impact on the mother and the infant and their interaction [11]. If a woman positively perceives her childbirth, she can easily communicate with her child. Therefore, the women's childbirth experience is most correlated with the future mother-infant bonding [12]. A study in Italy showed that postpartum stress symptoms due to a traumatic childbirth experience negatively affect the development of maternal attachment to the newborn [13]. Secure attachment plays a significant role in the development of the right hemisphere of the baby's brain. The right hemisphere is not only involved in the processing of socio-emotional information but also the control of vital functions. The initial mother-infant bonding can have either a positive or a negative effect on the infant's mental development [14].

Evidence shows that a negative childbirth experience can affect maternal mood and maternal mood affect the maternal attachment to the child [13, 15] and the child's development [16]. Nonetheless, research that directly explores the association between maternal childbirth experience and mother-infant bonding and growth and child development is sparse. Therefore, considering the importance of mother-infant bonding, infant growth and development, and the effect of the stress of the negative experience of childbirth on them, this preliminary study aimed to investigate a possible association between childbirth experience and mother-infant bonding and the growth and development of the infant. If such a relationship exists, the appropriate interventions should be used to potentially influence the childbirth experience.

Materials and Methods

This cross-sectional analytical study was performed on women referring to health centers in Zanjan City, Iran, in 2020. The samples were selected by convenience sampling method.

The inclusion criteria were as follows: having a 4-month-old baby, living in Zanjan, having a vaginal delivery, having a minimum gestational age of 37 weeks, lacking mental disabilities, having a stable life with a spouse, not taking antidepressants and lacking stressful events such as divorce, death, and illness for the immediate family members for the past three months. The exclusion criteria included multiple pregnancies and a history of depression or postpartum depression.

Based on the study of Ghanbari-Homayi et al. [17] regarding the childbirth experience variable (Mean±SD 2.71±0.7), considering d=0.05 around the mean, α=0.05, and power of 90%, the sample size of this study was calculated 208. Finally, 216 people were selected as the research sample considering the attrition rate of about 5%.

Data collection tools included the socio-demographic and obstetrics profile questionnaire, Childbirth Experience Questionnaire 2.0 (CEQ 2.0), postpartum bonding questionnaire (PBQ), anthropometric indices checklist, and developmental Age and Stages Questionnaire (ASQ).

The socio-demographic and obstetrics profile questionnaire contained questions about the age of the participants, the age of their spouses, their income, education, body mass index, and obstetrics specifications, such as gestational age, number of pregnancies, intentional or unintentional pregnancies, location of delivery, cause of delivery, and skin-to-skin contact. The validity of this questionnaire was confirmed by assessing the content and face validity.

CEQ was designed by Dencker et al. [16]. The first version of this questionnaire contains 22 questions, and the revised version contains 23. This instrument measures a woman's childbirth experience. The questionnaire includes the following dimensions: personal capacity, professional support, perceived peace of mind, and participation. The 20 statements of the questionnaire are completed by selecting 1 of 4 options, and the other 3 statements are completed based on the visual analog scale (VAS). The answers consist of strongly agree (score 4), often agree (score 3), often disagree (score 2), and strongly disagree (score 1). Certain quantities from 1 to 4 are assigned to the questions answered on a VAS as follows: 0-40 (score 1), 41-60 (score 2), 61-80 (score 3), and 81-100 (score 4). Sentences with negative connotations (experiencing severe pain, feeling tired, scared, and having bad memories) are scored negatively. Higher average scores mean a more positive experience of childbirth. The validity and reliability of this tool have also been confirmed by Ghanbari-Homayi et al. study in Iran [18].

Brockington et al. developed the PBQ [19]. This questionnaire consists of 25 items that measure the feelings and attitudes of the mothers toward their babies. Participants express their emotions based on a 6-point scale (0-5). Lower scores indicate a good relationship. PBQ has 4 subscales: subscale 1 reflects relationship disorders (12 items, score 0-60), subscale 2 reflects rejection and anger (7 items, score 0-35), subscale 3 reflects anxiety about caring for the baby (4 items, score 0-20) and subscale 4 reflects the risk of child abuse (2 items, score 0-10). The suggested cut-off points for diagnosing

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problematic relationships are 12, 17, 10, and 3 for subscales 1, 2, 3, and 4, respectively. The cut-off point of the whole scale is 38.

Squires et al. designed the 25-question ASQ to assess the child's development [20]. This questionnaire is a developmental screening tool prepared for children between 4 and 60 months old in the form of 19 scales. There are 30 questions for each age group, including 6 questions for each of the five development areas, i.e., communication, gross motor, fine motor, problem-solving, and personal-social skills. The sum of the scores of the five studied domains is compared with the standard scores (cut-off point). If in each of the five domains, the child cannot get the relevant cut-off point, the child has a problem in that specific area. This outcome indicates that the necessary specialized follow-up should be done for the child to ensure their health or diagnose the existing disorder. ASQ has been used in many studies, and its validity and reliability have been proven, and it has been recognized as a valid tool at a global level. The validity and reliability of this questionnaire were confirmed in the study of Vameghi et al. for Iranian children, showing that it was a standard tool [21].

The anthropometric indices checklist, including height, weight, and head circumference, was used to assess the infant's growth.

In this study, the content and face validity were used to determine the validity of the socio-demographic and obstetrics profile questionnaire. Also, the Cronbach alpha coefficient was calculated to determine the reliability of this questionnaire. According to the results, the Cronbach alpha coefficients of 0.89 and 0.83 were computed for the variables of childbirth experience and mother-infant bonding, respectively.

Sampling was conducted in all health centers of Zanjan (36 health centers). The researcher visited all health centers and received a list of all women who gave birth in the past 4 months and their contact information. The researcher contacted women and, during the telephone call, briefly explained the research objectives and reviewed them to see if they were eligible to participate in the study. In case of eligibility and interest in participating in the study, the vaccination days of their children were set as the day for a face-to-face meeting. On the set date, the research objectives were explained to them in detail, and in case they were interested in participating in the study, they were reassured that their information would remain confidential and was asked to sign a consent form. Afterward, the researcher completed the questionnaires through interviews with the participants. Sampling took three months.

After collecting information from all participants, the data were analyzed using the SPSS v. 24 software. Descriptive statistics, including frequency (percentage) and mean standard deviation, were used to describe the socio-demographic and obstetrics characteristics of the participants. Skewness and kurtosis were used to determine the normality of the quantitative data. Based on the findings, rejection and anger and the risk of abuse subscales of the mother-infant bonding lacked a normal distribution, but all other variables had a normal distribution. The Pearson correlation test was used to determine the correlation between the childbirth experience and the mother-infant bonding, areas of development, and anthropometric indices with normal distribution. On the other hand, the Spearman correlation test was used for the variables with abnormal distributions. To determine the relationship between the childbirth experience and the total score of the mother-infant bonding and the score of fine motion, first, the relationship between the socio-demographic and obstetrics specifications and postpartum bonding and the fine motor were assessed using the Pearson correlation test, independent t test, and 1-way ANOVA. Then, the variables with a statistically significant relationship with the variables of mother-infant bonding or fine motor (P<0.2) were entered into the general linear model. In this model, the childbirth experience as the independent research variable and the postpartum bonding and fine motor as the dependent variables were entered into the model.

Results

According to the study's findings on 216 women, the Mean±SD ages of women and their husbands were 29.0±5.7 and 33.7±4.9 years, respectively. About two-thirds of women (65.7%) had an average economic status, according to their statements. Furthermore, less than half of the studied women (40.3%) had a diploma, and about half of their husbands (44.9%) had high school and lower education. Their Mean±SD body mass index was 25.0±3.8 kg/m2. The Mean±SD gestational age at the delivery time was 39.2±1.1 weeks. Most women wanted pregnancy (94.9%) and gave birth in a public hospital (81%). The birth attendant in three-quarters of women (77.3%) was a midwife. Skin-to-skin contact was performed in most of the participants (99.1%) after the delivery (Table 1).

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Table 1. Socio-demographic and obstetrics characteristics among postpartum women (n=216)

Variables		No. (%)
Economic status	High	25(11.6)
	Moderate	142(65.7)
	Low	49(22.7)
Education	High school and lower	84(38.9)
	Diploma	87(40.3)
	Bachelor	36(16.7)
	Masters	9(4.2)
Husband's education	High school and lower	97(44.9)
	Diploma	80(37)
	Bachelor	24(11.1)
	Masters	15(6.9)
Unwanted pregnancy	Yes	11(5.1)
	No	205(94.9)
Skin-to-skin contact	Yes	199(91.9)
	No	17(7.9)
Childbirth place	Public hospital	175(81)
	Private hospital	19(8.8)
	Teaching hospital	22(10.2)
Birth attendant	Midwife	167(77.3)
	Doctor	49(22.7)

The Mean±SD score of the childbirth experience was 2.6±0.5 (score range: 1 to 4). The highest and the lowest mean scores were obtained in the dimensions of personal capacity (2.7±0.6) and professional support (2.3±0.5), respectively. The Mean±SD postpartum bonding score was 6.6±2.7 (score range: 0 to 125). Regarding the child's development, the highest and the lowest mean scores were associated with problem-solving (56.8±5.7) and communication (50.1±8.3), respectively. The mean±SD anthropometric indices of the infants, including height, weight, and head circumference, were 64.3±2.5 cm, 7078.4±792.5 g, and 41.3±1.2 cm, respectively.

The results of the Pearson correlation test showed a statistically inverse relationship between the childbirth experience and the mother-infant bonding (r=-0.23, P=0.001), in such a way that a positive childbirth ex-

perience improved the mother-infant bonding. Also, there was a significant and direct relationship between childbirth experience and fine motor (r=0.18, P=0.007). However, there was no significant relationship between childbirth experience and other areas of development and the infant's anthropometric indices (Table 2).

The variables of income adequacy (P=0.107) and birth attendant (P=0.085) that had a relationship with postpartum bonding score with P<0.2 based on the results of bivariate tests along with the childbirth experience were included in the adjusted general linear model. Also, the variables of age (P=0.166), spouse's age (P=0.180), body mass index (P=0.065), gestational age (P=0.124), skin-to-skin contact (P=0.174) and spouse's education (P=0.001) that had a relationship with fine motor with P<0.2 based on the results of bivariate tests along with

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Table 2. Correlation between childbirth experience with the mother-infant bonding and child growth and development (n=216)

Variable	Mean±SD*	Achieved Score Range	Achievable Score Range	Correlation With Childbirth Experience, r (P)
Childbirth experience	2.60±0.52	1.28- 3.96	1- 4	-
Personal capacity	2.71±0.67	1- 4	1- 4	-
Participation	2.57±0.57	1- 4	1- 4	-
Perceived security	2.63±0.68	1- 3.83	1- 4	-
Professional support	2.38±0.59	1- 4	1- 4	-
Postpartum bonding	6.65±2.74	0- 51	0- 125	-0.23 (0.001)*
Relationship disorders	3.32±4.01	0- 23	0- 60	-0.20 (0.002)*
Rejection and anger	1.16±2.45	0- 17	0- 35	-0.11 (0.081)*
Care anxiety	2.12±2.50	0- 11	0- 20	-0.20 (0.003)*
Risk of abuse	0.02±0.21	0- 2	0- 10	0.03 (0.663)**
Communication	50.12±8.35	25- 60	0- 60	0.11 (0.101)*
Gross motor	53.93±8.74	25- 60	0- 60	0.11 (0.095)*
Fine motor	52.87±9.57	15- 60	0- 60	0.18 (0.007)*
Problem solving	56.71±5.74	30- 60	0- 60	0.05 (0.386)*
Personal- Social	55.69±6.17	30- 60	0- 60	0.05 (0.389)*
Height (cm)	64.30±2.54	57- 78	Girl 58- 62.2 Boy 60- 67.8	-0.002 (0.981)*
Weight (gr)	7078.43±792.59	5100- 9700	Girl 5100- 8100 Boy 5600- 8600	0.02 (0.722) *
Head circumference (cm)	41.38±1.26	37.5- 45	Girl 38.2- 43 Boy 39.4- 43.9	0.02 (0.676)*

*The Pearson correlation test; **The Spearman correlation test.

the childbirth experience were included in the adjusted general linear model. The results of the adjusted general linear model (table 3) showed that the postpartum bonding score was lower in women who had a more positive childbirth experience, which was also an indication of a better bonding (B= -2.92, 95% CI; -4.85 to -0.98, P=0.003). The adjusted general linear model also (Table 4) showed that the fine motor score was higher in women with a positive childbirth experience (B= 3.11, 95% CI; 0.733-5.487, P=0.011).

Discussion

The present study aimed to determine the relationship between the childbirth experience, mother-infant bonding, and the infant's growth and development four months after childbirth. Based on the research findings, a better childbirth experience led to a more desirable mother-infant bonding and improved the development of the infant in the domain of fine motor.

In this study, 38% of the women had a negative childbirth experience. In terms of the negative childbirth experience, the findings of this research were in line with the results of a study done in Tabriz, Iran [17], in which 37% of the studied women had a negative childbirth experience. In a systematic review, the prevalence of negative childbirth experiences has been reported as 6.8%-44% [22].

In the present study, a significant relationship was found between the childbirth experience and the mother-infant bonding. Based on the findings of this study, the stress caused by negative childbirth disturbed the mother-infant bonding. Dekel et al. studied the relationship between post-traumatic stress caused by childbirth and mother-infant attachment. They studied 685 women who

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Table 3. Relationship between childbirth experience with the mother-infant bonding based on general linear model (n=216)

Variables		B	SE	t	P	95% CI	
						Lower	Upper
Intercept		15.762	2.818	5.593	0.001	10.206	21.318
Childbirth experience		-2.921	0.983	-2.973	0.003	-4.858	-0.984
Economic status	High	-2.539	1.855	-1.368	0.173	-6.196	1.119
	Moderate	0.712	1.245	0.572	0.568	-1.742	3.167
	Low	0*					
Birth attendant	Midwife	-2.177	1.227	-1.775	0.077	-4.596	0.241
	Physician	0*					

*Indicates reference category.

had undergone vaginal delivery in the past six months. Their findings showed that the mother's traumatic stress resulting from childbirth could adversely affect the early mother-infant bonding instead of the objective complications of childbirth (such as labor complications, etc.) [23]. The results of Ponti et al. in Italy also showed that postpartum distress symptoms had significant adverse effects on postpartum bonding [13]. Bennington et al. examined the relationship between spirituality and childbirth experience on the mother-infant bonding. They studied 402 women through various birth websites. Their findings also showed that the leading causes of negative childbirth experiences were lack of control, care, and communication. The measures taken by the midwives and their support increased the women's sense of control, improved their self-esteem, prevented the negative experi-

Table 4. Relationship between childbirth experience and the development of the child in the domain of fine motor based on general linear model (n=216)

Variable		B	SE	t	P	95% CI	
						Lower	Upper
Intercept		-3.648	23.639	-0.154	0.878	-50.253	42.957
Childbirth experience		3.110	1.206	2.580	0.011	0.733	5.487
Skin-to-skin contact	Yes	3.503	2.353	1.489	0.138	-1.136	8.142
	No	0*					
Husband's education	High school and lower	10.532	2.586	4.073	0.001	5.434	15.629
	Diploma	10.398	2.602	3.996	0.001	5.269	15.528
	Bachelor	9.845	2.998	3.284	0.001	3.934	15.756
	Masters	0*					
Age		0.108	0.177	0.608	0.544	-0.241	0.456
Husband's age		0.030	0.201	0.149	0.881	-0.367	0.427
Body mass index		0.281	0.167	1.687	0.093	-0.048	0.610
Gestational age		0.621	0.581	1.070	0.286	-0.524	1.767

*Indicates reference category.

ence of childbirth, and changed mothers' views of their childbirth. It was also concluded that a positive childbirth experience could affect not only a woman's self-esteem but also influence her initial interactions with her children. Furthermore, the perceived childbirth experience had the highest correlation with the mother-infant bonding [12], and the present study's findings were consistent with their findings.

In this study, there was a significant positive relationship between the childbirth experience and the infant's development in the domain of fine motor. The negative experience of childbirth was associated with a lower score in the area of the baby's fine motor. Power et al. conducted a qualitative study to explore the service providers' perceptions of how mothers' childbirth experiences could affect the newborn's mood and behavior. This study was performed on 18 maternity care providers using semi-structured interviews in the UK. According to their findings, physical and psychological stress during childbirth was associated with challenging infant behaviors such as crying and restlessness. They concluded that the pain and stress during childbirth directly affected the infant's behavior. Also, they found that the women's mental and psychological experience of childbirth indirectly affected the infant's behavior by influencing the mother and, consequently, her interactions with her child [11]. Our findings were consistent with their results of them.

Given the cross-sectional nature of this study, the relationship between childbirth experience and infant's development in the domain of fine motor as well as mother-infant bonding fails to accurately indicate a causal relationship which is one of the limitations of this study. One of the strengths of this study was the fact that the participants were selected from all health centers, which increased the generalizability of the findings. Using valid and standard tools to collect the research data was another strength of this study.

Health providers should consider the correlation between the childbirth experience and mother-infant bonding and the behavioral and psychological development of the child and do their best to create positive childbirth experiences for the women to improve the mother-infant bonding and child development domains.

Ethical Considerations

Compliance with ethical guidelines

This research has been approved by the Ethics Committee of the Tabriz University of Medical Sciences, Tabriz, Iran (Code: IR.TBZMED.REC.1399.614). All participants were ensured about the matter of confidentiality and signed the informed written consent form.

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