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The Relationship of Delivery Mode and Antenatal Fear of Childbirth with Postpartum Depression, Post Traumatic Stress Disorder and Postpartum Fear of Childbirth in Nulliparous Women: A Prospective Longitudinal Study

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ABSTRACT

Background & aim: Diagnosis and treatment of fear of childbirth can influence both delivery mode and postpartum psychological symptoms. Therefore, the objective of this study was to evaluate postpartum depression, Post Traumatic Stress Disorder (PTSD), and fear of childbirth in nulliparous women based on their delivery mode and antenatal fear of childbirth.

Methods: For this prospective longitudinal study, 148 Iranian nulliparous women were selected using a convenient sampling method from January to September 2021 in the Mashhad, Iran. The Wijma Delivery Expectancy and Experience Questionnaire (W-DEQ) (A and B versions), the Beck Depression Inventory, and the Perinatal PTSD Questionnaire were administered to collect data. Fear of childbirth was assessed in the last month of pregnancy, followed by evaluation of delivery mode, postpartum depression, PTSD, and fear of childbirth 4–6 weeks after delivery. The data were analyzed using analysis of variance (ANOVA) and multivariate analysis of variance (MANOVA), with SPSS version 26.

Results: The women in the emergency cesarean group exhibited higher levels of depression and PTSD symptoms compared to those in the vaginal delivery ($P<0.0001$) and elective cesarean groups ($p=0.003$). Postpartum fear of childbirth was more prevalent among women with clinical antenatal fear of childbirth and vaginal delivery than in other women ($F(4, 139) = 2.86$, $P = 0.02$).

Conclusion: The diagnosis and treatment of clinical antenatal fear of childbirth is essential to prevent the worsening of postpartum fear of childbirth. A follow-up program for women with emergency cesarean can help to identify individuals at risk for postpartum depression, PTSD and fear of childbirth.

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Introduction

All women have some degree of fear of childbirth (FOC), because childbirth is so painful. Even though about 5% to 14% of women have extreme FOC, this percentage can change with the definition of fear, the assessment method of fear of childbirth , culture, and location (1). In Iran, severe and moderate FOC is expected to reach 1.6% and 19.1%, respectively (2).

FOC involves a broad range of concerns, such as worries about the physical health of both the mother and the baby, the fear of death, the apprehension of losing control during labor, the anxiety of enduring prolonged labor pains, and the fear of unexpected events (3). Several

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factors determine pregnant woman's FOC. There are three categories of factors: psychological, sociodemographic, and obstetric (4). Several sociodemographic research has revealed that FOC is connected with age, education level, income level, and employment status (5). Moreover, FOC has been associated with various factors, including gestational week, the intended nature of pregnancy, history of abortion, distrust in delivery service providers (6), and inadequate knowledge about delivery (7). High anxiety and depression, poor childbirth self-efficacy, and inadequate social support are psychological characteristics that can predict the likelihood of FOC (8).

Conversely, FOC carries various detrimental implications. In cases of severe FOC, women are more inclined to have either an elective cesarean or an emergency cesarean (9). The accuracy of FOC in predicting the mode of delivery remains uncertain, as there is conflicting evidence. However, Swedish research suggests a correlation between FOC in the last month of pregnancy and the likelihood of requiring an emergency cesarean section (10). A British study, however, revealed no link between FOC and having an emergency or scheduled cesarean (11). Cesarean delivery presents a fivefold increased risk of severe acute morbidity when compared to vaginal delivery (12) and a previous cesarean triples the likelihood of morbidity in a current pregnancy (13). Because caesareans have more negative effects than vaginal deliveries, all health-care systems strive to reduce the number of unnecessary elective caesareans performed. As per scientific literature, the typical rate of cesarean birth is as low as 13%, and the World Health Organization (WHO) guidelines recommend it to be as low as 15% (14). Iran's cesarean rate stands at 48 percent, surpassing the recommended rate set by the WHO (14).

In addition to the cesarean, FOC has other negative consequences. For instance, it can be a predictor of postnatal post-traumatic stress disorder (PTSD) (15). The process of childbirth itself can be a stressful event, which may result in PTSD. However, if a woman experiences significant anxiety, helplessness, or terror during delivery, the probability of developing postnatal PTSD becomes higher. Therefore, the FOC during pregnancy is a predictor of the development of PTSD symptoms after delivery (16). Women with severe phobias of labor were more likely to report feeling absent in the delivery room, not receiving adequate assistance from midwives, and lacking confidence in their capacity to give birth (17). Hormones released in response to fear and anxiety, such as catecholamines, cortisol, epinephrine, and beta-endorphins, can interfere with the development of cervical dilatation as well as affect the smooth muscles of the uterus, reducing uterine contractility and efficiency during labor. As a result, labor is prolonged, pain increases, and this in turn leads to more fear and anxiety (18). In this situation, women are more likely to have emergency caesarean sections or have their fetuses delivered with the help of a vacuum (19). As a result, traumatic childbirth may result in PTSD in mothers (20). Furthermore, evidence suggests that negative birth experiences can contribute to a fear of childbirth in the future (21). The prevalence of PTSD symptoms after delivery varies considerably between studies; nevertheless, a recent study found that the prevalence of PTSD symptoms after delivery was 4.9 percent in community samples, whereas the prevalence of PTSD diagnosis was 1.6 percent (19).

Postpartum depression is more likely to occur in women who have undergone a cesarean delivery or have a history of FOC (22-23). Postpartum depression is a mood disorder that can occur during the initial year following childbirth. It typically occurs between 4 to 6 weeks after giving birth (24). According to a review of research, the pooled prevalence of depression in the first three months following birth was 14% (25). Postpartum depression reduces a woman's emotional well-being and, in certain situations, can lead to suicidal behavior (26). Postpartum depression may prevent a mother from establishing healthy relationships with her partner and child, which can have severe consequences on the child's development (27). Therefore, identifying risk factors for the postpartum period is critical to allowing for immediate intervention.

In 2018, the World Health Organization (WHO) called for a decrease in the application of non-urgent obstetric interventions, such as

unnecessary cesarean deliveries, during childbirth (28). Hence, due to the significant number of cesarean sections performed in Iran, the Ministry of Health has prohibited all non-medically necessary cesarean sections. In 2013, they initiated a comprehensive healthcare reform plan aimed at enhancing the well-being of both mothers and newborns, including strategies such as optimizing and expanding facilities for vaginal deliveries, providing free vaginal delivery services in public hospitals, and deducting the accreditation status of hospitals with excessive cesarean section rates (29). In contrast, despite the adverse effects of FOC, it appears in Iran, FOC is not given enough attention in clinical settings and is frequently disregarded and left untreated. Consequently, women who experience a fear of childbirth may find themselves compelled to undergo a vaginal delivery. Furthermore, as previously stated, FOC can result in the need for an urgent cesarean section. This is because fear and anxiety can trigger contractions in the uterus and hinder the progress of delivery To what extent does the mode of delivery (elective cesarean, emergency cesarean, vaginal delivery) impact postpartum depression, postpartum fear of childbirth (FOC), and postpartum post-traumatic stress disorder (PTSD) among women with varying levels of fear of childbirth (low, medium, high, clinical)? This inquiry was addressed by examining postpartum depression, PTSD, and FOC in nulliparous women, considering both the mode of delivery and antenatal FOC.

Materials and Methods

A longitudinal study was conducted on 160 pregnant Iranian women from January to September 2021. The study was carried out in Mashhad, Iran. Participants were selected from the private clinics of obstetricians and midwives in Mashhad using a convenient sampling method. The number of participants was determined using Cochran's formula:

$$N \geq \frac{\left(z\frac{\alpha}{2}\right)^2 p\,(1-p)}{d^2}$$

Considering an estimated prevalence of 10% for fear of childbirth, a 5% margin of error, and a confidence level of 95%, it was determined that a minimum of 136 participants would be necessary. However, to account for the potential loss of participants, the final number was adjusted to 160. To be eligible for inclusion, pregnant women must meet the following criteria: be over the age of 18 and in their eighth month of pregnancy, have no previous childbirth experience, have no complications with their pregnancy, have a normal body mass index (BMI) (18.6–25 kg/m2), and have no history of mental disorders.

Tools for collecting data included a sociodemographicquestionnaire, which contained data about maternal age and educationand the Wijma Delivery Expectancy and Experience Questionnaire, (W-DEQ -A). This questionnaire was designed to assess FOC and encompasses 33 items assessed on a six-point Likert scale. The FOC scores range from 0 to 165, with higher scores indicating higher levels of FOC. The scale includes specific cutoff points: low FOC (< 37), medium FOC (38 to 65), high FOC (66 to 84), and clinical FOC (> 85). W-DEQ-A demonstrates a split-half reliability of 0.87 in nulliparous women and 0.96 in multiparous women (30). The questionnaire has also been deemed appropriate in terms of convergent validity (30). In the research conducted by Ghazaei et al. (2016), nulliparous women indicated an internal consistency of 0.81 and a split-half reliability of 0.85 when using the W-DEQ. According to their research findings, the questionnaire's convergent validity has been deemed appropriate (30). This was also observed in the current study (α =0.88).

The Wijma Delivery Expectancy/Experience Questionnaire (W-DEQ-B)**:** Utilizing a 6-point Likert scale, the W-DEQ-B is a questionnaire consisting of 33 items. Its primary objective is to assess the fear, emotions, and thoughts of women after giving birth. Total scores range from zero to 165, with higher values indicating a more intense fear of childbirth in the postnatal period. The W-DEQ-B demonstrates high internal consistency and split-half reliability, exceeding 0.87, for both nulliparous and multiparous women (30). The convergent validity of the questionnaire has been evaluated as appropriate (30). An Iranian study demonstrated that the Persian version of the WDEQ-B is a reliable and accurate questionnaire among Iranian women (32). This was also discovered in the current study (α=0.85).

The Beck Depression Inventory (BDI) Developed by Beck et al. in 1961, which is a self-reporting questionnaire with 21 items. It is widely used to evaluate the severity of depression in normal and psychiatric populations. The foundation of depression was based on the concept of negative cognitive distortions. It consists of 21 items, rated on a scale from 0 (no symptoms) to 3 (severe symptoms). Scoring is achieved by adding the highest ratings for all 21 items. The minimum score is 0, and the maximum score is 63. Higher scores indicate greater symptom severity. In non-clinical populations, scores above 20 indicate depression (33). The DBI indicates high concurrent validity with other depression measures, including the Minnesota Multiphasic Personality Inventory-D ($r = 0.77$ and $\alpha = 0.91$) (34). Different studies conducted in Iran have confirmed the reliability and validity of this questionnaire. One Iranian study, for instance, demonstrated high internal consistency (Cronbach's alpha = 0.87) and acceptable consistency over time ($r = 0.73$) among Iranian university students. Moreover, positive correlations with different measures (GHQ-28, DASS-21) further supported the concurrent validity of the BDI-II (35).

The Perinatal PTSD Questionnaire (PPQ), is a self-reported questionnaire (36), which is utilized to assess symptoms of postpartum posttraumatic stress specific to childbirth. Scores can range from 0 to 14, however, if the questions were asked in a diagnostic interview, a score higher than 6 would meet the criteria for a PTSD diagnosis. The internal consistency is high, with a value of 0.83. Moreover, the test-retest reliability is excellent, with a correlation coefficient of 0.92. PPQ scores have shown significant correlations with validated measures of PTSD and the utilization of psychotherapy (36). An Iranian study demonstrated that the Persian version of the PPQ is a valid and accurate questionnaire for use among Iranian women (37). It is shown that PPQ's internal consistency and split-half reliability are 0.82 and 0.9, respectively (37). The internal consistency for the current study was 0.78.

Data collection included two time periods for assessment: the last month of pregnancy (Time 1) and 4 to 6 weeks following birth (Time 2). At Time 1, women completed the Wijma Delivery Expectancy Questionnaire-WDEQ (A) and provided socio-demographic information. The researchers collected data for the initial part of the study in the private clinics of obstetricians and midwives. The data collection period lasted about 10-15 minutes. During Time 2, women answered to one question about the mode of delivery (emergency cesarean, elective cesarean, vaginal delivery), and completed the Wijma delivery Experience Questionnaire-WDEQ (B), the Beck Depression Inventory, and the Perinatal PTSD Questionnaire via an electronic link. At time 2, the researcher contacted the participants and coordinated with them to complete the electronic questionnaires. Delivery mode was ascertained through participant self-report. Twelve individuals were disqualified from the research as they failed to complete the questionnaires within the 4 to 6-week period after delivery or did not respond to the researcher's call. Hence, 148 participants completed the questionnaires within time 2.

It is worth to mention that the emergency cesarean discussed in this study is a cesarean section that is performed in an emergency situation and without prior planning. This procedure is necessary when there is a lack of progress in natural childbirth and is undertaken to save the lives of both the mother and the baby. Furthermore, elective cesarean refers to any form of cesarean section conducted before the onset of the vaginal delivery process. This can be attributed to diverse reasons such as medical requirements, the mother's request, or the doctor's recommendation.

SPSS version 21 was utilized to analyze the data. Descriptive statistics were employed to present the frequency distributions, percentages, means, and standard deviations of the dependent, demographic, and obstetrical variables. Normality was assessed using skewness and kurtosis. Statistical significance was determined as $p < 0.05$. Women were divided into groups based on the manner of delivery (emergency cesarean, elective cesarean, vaginal delivery) and the severity of antenatal FOC (low FOC (LFOC), medium FOC (MFOC), high FOC (HFOC), and clinical FOC (CFOC). The interactive effect of the mode of delivery and antenatal FOC on dependent variables

(postpartum FOC, depression, and PTSD) was assessed using a two-way multivariate analysis of variance (MANOVA). The effect of each independent variable on the dependent variables (postpartum FOC, depression, and PSTD) was examined separately using a one-way multivariate analysis of variance (ANOVA).

Results

Table 1 shows demographic and obstetric variables including age, educational level, and mode of delivery distribution of WDEQ-A, WDEQ-B, DBI, and PPQ scores.

Table 1. Pregnant women's demographic and obstetric characteristics (N = 148)

Characteristics	Mean ± SD
Age	26.83 ± 5.2
Characteristics	**N (%)**
Educational level	
Primary school	1 (0.7)
Secondary school	8 (5.4)
High school	55 (37.2)
Associate degree	15 (10.1)
Bachelor	52 (35.1)
Master	15 (10.1)
PhD	2 (1.4)
Mode of delivery	
Vaginal delivery	48 (32.4)
Emergency cesarean	50 (33.8)
Elective cesarean	50 (33.8)
Score of WDEQ-A	
Low (<37)	0 (0)
Medium (38-65)	43 (29.1)
High (66-84)	75 (50.7)
Clinical (>85)	30 (20.3)
Mean 72.56 ± 11.52 (range: 51-121)	
Score of WDEQ-B	
Low (<37)	0 (0)
Medium (38-65)	33 (22.3)
High (66-84)	92 (62.2)
Clinical (>85)	23 (15.5)
Mean: 73.16 ± 9.6 (range: 52-102)	
Score of BDI	
Score > 20	0 (0)
Mean: 8.6 ± 3.45 (range: 0 – 17)	
Score of PPQ	
Score >6	9 (6.1)
Mean: 4.07 ± 1.7 (range: 0 -7)	
Mode of delivery and antenatal FOC	14 (9)
MFOC and vaginal delivery	17 (11.4)
MFOC and emergency cesarean	12 (8.1)
MFOC and elective cesarean	15 (10.1)
HFOC and vaginal delivery	31 (20.9)
HFOC and emergency cesarean	29 (19.5)
HFOC and elective cesarean	19 (12.8)
CFOC and vaginal delivery	2 (1.35)
CFOC and emergency cesarean	9 (6)
CFOC and elective cesarean	

CFOC: Clinical Fear of Childbirt, HFOC: High Fear of Childbirth, MFOC: Medium Fear of childbirth

Table 2 displays the mean and standard deviation of postpartum FOC, depression, and PTSD concerning the severity of antenatal FOC (medium, high, clinical) and mode of delivery (vaginal, emergency cesarean, elective cesarean).

Table 2. Mean and SD of postpartum depression, FOC and PTSD

Mode of delivery	Mean	N
Postpartum depression		
Medium		
Vaginal Delivery	7.9 ± 2.4	14
Emergency Cesarean	10.3 ± 4.1	17
Elective Cesarean	8.8 ± 2.6	12
Total	9.1 ± 3.3	43
High		
Vaginal Delivery	7.8 ± 3.05	15
Emergency Cesarean	10.7 ± 3.3	31
Elective Cesarean	8.4 ± 2.8	29
Total	9.2±3.2	75
Clinical		
Vaginal Delivery	5.7±3.2	19
Emergency Cesarean	10.5±2.1	2
Elective Cesarean	7.5±2.8	9
Total	6.6±3.3	30
Total		
Vaginal Delivery	7.02±3.1	48
Emergency Cesarean	10.5±3.5	50
Elective Cesarean	8.4±2.7	50
Total	8.6±3.4	148
Postpartum FOC		
Medium		
Vaginal Delivery	63.78±7.02	14
Emergency Cesarean	69.7±10.4	17
Elective Cesarean	70±4.6	12
Total	67.8±8.4	43
High		
Vaginal Delivery	75.3±11.6	15
Emergency Cesarean	71.1±6.8	31
Elective Cesarean	72.5±8.3	29
Total	72.5±8.5	75
Clinical		
Vaginal Delivery	84.4±6.9	19
Emergency Cesarean	80.5±4.9	2
Elective Cesarean	78.1±6.1	9

Mode of delivery	Mean	N
Total	82.3±7.06	30
Total		
Vaginal Delivery	75.5±12	48
Emergency Cesarean	71.0±8.3	50
Elective Cesarean	72.9±7.6	50
Total	73.1±9.6	148
Postpartum PTSD		
Medium		
Vaginal Delivery	3.9±1.2	14
Emergency Cesarean	5.0±1.5	17
Elective Cesarean	4.5±1.5	12
Total	4.5±1.5	43
High		
Vaginal Delivery	3.4±1.7	15
Emergency Cesarean	4.5±1.7	31
Elective Cesarean	4.1±1.4	29
Total	4.1±1.6	75
Clinical		
Vaginal Delivery	3.2±2.09	19
Emergency Cesarean	5.0±2.8	2
Elective Cesarean	3.0±1.3	9
Total	3.2±1.9	30
Total		
Vaginal Delivery	3.4±1.7	48
Emergency Cesarean	4.7±1.7	50
Elective Cesarean	4.02±1.4	50
Total	4.07±1.7	148

A one-way analysis of variance (ANOVA) was conducted to compare the antenatal FOC by mode of delivery. The ANOVA was conducted after verifying and confirming the fundamental assumptions of this analysis, which included checking the normality of the dependent variable and ensuring homogeneity of variances among the study groups. The ANOVA results revealed no significant difference in prenatal FOC between vaginal birth, emergency cesarean, and elective cesarean groups ($F(39, 108) = 1.15$, $P = 0.27$).

A two-way multivariate analysis of variance (MANOVA) was used to compare postpartum FOC, PTSD, and depression concerning the severity of antenatal FOC and mode of delivery. Before performing the MANOVA, the essential assumptions of this analysis, such as the normality of dependent variables and the homogeneity of variances across study groups, were examined and confirmed. Two-way MANOVA revealed a significant interaction impact between the severity of prenatal FOC and manner of delivery on the dependent variables ($F(12, 362.75) = 3.63$, $P = 0.008$; Wilks' $\Lambda = 0.1$). To analyze the impact of the independent variables on each dependent variable, it is necessary to examine the Tests of Between-Subjects Effects. The Tests of Between-Subjects Effects revealed a significant interactive impact between the severity of antenatal FOC and the manner of delivery only in the variable of postpartum FOC ($F(4, 139) = 2.86$, $P = 0.02$). The interaction impact between the severity of prenatal FOC and the mode of delivery was not significant in postpartum PTSD ($F(4, 139) = 1.38$, $P = 0.5$) or postpartum depression ($F(4, 139) = 0.313$, $P = 0.8$). Hence, for postpartum FOC, a variable is created by merging the severity of antenatal FOC and the delivery method. Subsequently, a one-way ANOVA is employed to compare the postpartum fear of childbirth within this combined variable. Results of one-way ANOVA showed that there was a statistically significant difference between groups ($F(8,139) = 8.64$, $P = P<0.0001$). To address the uncertainty regarding the specific groups that exhibit this distinction, it is recommended to employ post hoc tests. Due to the unequal distribution of members across groups and the consistent variance between them, the most suitable post hoc test for this scenario is the Scheffe test.

A Scheffe post hoc test revealed that postpartum FOC in the group of clinical FOC and vaginal delivery was significantly higher than in the group of medium FOC and vaginal delivery ($p < 0.0001$), the group of medium FOC and emergency cesarean ($P = 0.001$), the group of medium FOC and elective cesarean ($P = 0.001$), the group of high FOC and emergency cesarean group ($p < 0.0001$), the group of high FOC and elective cesarean ($P = 0.003$). There was no significant difference in postpartum FOC between the groups of clinical FOC and vaginal delivery, high FOC and vaginal delivery, clinical FOC and emergency cesarean, and clinical FOC and elective cesarean.

A one-way MANOVA analysis was utilized to examine postpartum depression and PTSD symptoms based on the severity of prenatal FOC. Confirmation of the basic assumptions, such as the normality of dependent variables and the homogeneity of variances in the study groups, was done before conducting the MANOVA. MANOVA revealed a significant

difference in postpartum PTSD and depression based on the severity of prenatal FOC (F (4, 288) = 4.41, P = 0.002; Wilks' Λ = 0.8). The analysis of Tests of Between-Subjects Effects is necessary for examining the influence of the independent variable on the dependent variables. Tests of Between-Subjects Effects results showed that the severity of antenatal FOC has a statically significant effect on both postpartum depression (F (2, 145) = 5, P = 0.008) and postpartum PTSD (F (2, 145) = 7.48, P = 0.001). Nevertheless, as it is uncertain which particular groups possess this distinction, post hoc tests become imperative. Considering the unequal number of members in each group and equal variance between groups, the Scheffe test (Table 3) is the appropriate post hoc test in this part.

Table 3. Multiple comparisons according to the severity of antenatal FOC

Independent Variable	Mean Difference	Sig
Postpartum depression		
Medium FOC with High FOC	-0.12	0.98
Medium FOC with clinical FOC	2.5	0.007
High FOC with clinical FOC	2.66	0.001
Postpartum PTSD		
Medium FOC with High FOC	0.36	0.52
Medium FOC with clinical FOC	1.24	0.009
High FOC with clinical FOC	0.88	0.04

In Table 3, a Scheffe post hoc test indicated that postpartum depression symptoms were significantly lower in the clinical FOC group compared to both the medium FOC group (P = 0.007) and the high FOC group (P = 0.0012). Furthermore, the postpartum PTSD symptoms in the clinical FOC group were significantly less than those observed in the medium FOC group (P = 0.009) and the high FOC group (P = 0.04). The comparison between the high FOC group and the medium FOC group revealed no significant difference in symptoms between postpartum depression and postpartum PTSD.

The mode of delivery was taken into account when conducting a MANOVA analysis to compare symptoms of postpartum depression and postpartum PTSD. The assumptions necessary for conducting the MANOVA were thoroughly examined and validated, which included checking the normality of dependent variables and the homogeneity of variances among the study groups. MANOVA revealed a significant difference in postpartum PTSD and depression symptoms by mode of delivery (F (4, 288) = 7.56, p < 0.0001; Wilks' Λ = 0.8). When evaluating the effects of the independent variable on each of the dependent variables, it is crucial to examine the Tests of Between-Subjects Effects. The results from the analysis of the effects between different groups revealed that the mode of delivery has a significant impact on postpartum depression symptoms (F (2, 145) = 15, p < 0.0001) as well as postpartum PTSD symptoms (F (2, 145) = 6.66, P = 0.002). To address the ambiguity regarding the groups that possess this difference, it is advisable to employ post hoc tests. Considering the unequal number of members in each group and the equal variance between them, the most appropriate post hoc test to use in this context is the Scheffe test (Table 4).

Table 4 showed that postpartum depression symptoms were significantly higher in the emergency cesarean group compared to both the vaginal delivery group (P<0.0001) and elective cesarean group (P = 0.003), as revealed by a Scheffe post hoc test. Additionally, the emergency cesarean group had significantly higher postpartum PTSD symptoms than the vaginal delivery group (P = 0.002).

Table 4. Multiple comparisons according to the mode of delivery

Independent Varibale	Mean Difference	Sig
Postpartum depression		
Vaginal delivery with Emergency Cesarean	-3.55	000
Vaginal delivery with elective Cesarean	-1.37	0.63
Emergency Cesarean with elective Cesarean	2.18	0.003
Postpartum PTSD		
Vaginal delivery with Emergency Cesarean	-1.22	0.002
Vaginal delivery with elective Cesarean	-0.54	0.27
Emergency Cesarean with elective Cesarean	0.68	0.12

Discussion

We aimed to investigate the impact of the mode of delivery and severity of antenatal fear of childbirth (FOC) on postpartum depression, PTSD and FOC in nulliparous women. Our objective was to determine how the mode of delivery influences these psychological variables at different levels of FOC (medium, high and clinical). The results showed that the women in the emergency cesarean group exhibited higher levels of depression and PTSD symptoms compared to those in the vaginal delivery and elective cesarean groups. Postpartum fear of childbirth was more prevalent among women with clinical antenatal fear of childbirth and vaginal delivery than in other women

Notably, the prevalence of high and clinical FOC in this study was generally higher compared to the Western world (1). The variance in time measurement, measuring tools, and birth circumstances may account for the disparity between the findings of this study and previous research. In the current research, a PPQ score higher than the cut-off point was attained by 6% of the participants. According to Mahmoodi et al. (2016), the prevalence of postpartum PTSD is 6.2% (38). None of the women attained scores that exceeded the cut-off points in the Beck Depression Inventory. According to a review study conducted in Iran, the prevalence of postpartum depression was recorded at 28.7% (39). The prevalence of postpartum depression can differ based on the time of tests, sample size, study design (prospective or retrospective), cut-off values, and even the type of test utilized.

The results of this study showed that there is no significant difference in antenatal FOC between vaginal birth, emergency cesarean, and elective cesarean.Similarly, Johnson and Slade (2002) found that there is no aassociation between emergency cesarean section and FOC or anxiety scores and emergency cesarean section is linked to the factors like previous cesarean section, parity, age, and a medical risk score (11).

Based on the results, it was observed that the interaction between the mode of delivery and antenatal FOC is specifically evident in the postpartum FOC variable. To elaborate, nulliparous women with antenatal clinical FOC and vaginal delivery experienced greater postpartum FOC compared to all women with medium antenatal FOC and those with high antenatal FOC who underwent elective or emergency cesarean delivery. Women who experienced antenatal clinical FOC, as well as emergency or elective cesarean section, exhibite no variations from the other categories. Antenatal expectation emerged as a crucial factor in determining postpartum experience, as revealed by the study findings in both nulliparous and multiparous groups, notably when accounting for other psychological variables (general depression and anxiety) and birth outcomes (labor duration, emergency cesarean, vacuum, and stimulated delivery) (40). Moreover, Alehagen, Wijma, and Wijma (2009) found that pregnant women with a fear of childbirth are at a higher risk of encountering fear during both the delivery process and the postpartum phase (41). The findings of another studyrevealed that women who have FOC throughout pregnancy have an increased risk of developing FOC one year after birth (42). Women who are fearful of delivery may overestimate nociceptive signals and delivery pain (43). Indeed, prenatal fears may exacerbate and prolong delivery (42) by increasing the intensity of labor pain (44), and leading to unpleasant birth experiences and postpartum FOC.

The severity of antenatal FOC was found to have a significant impact on postpartum PTSD and postpartum depression, as indicated by the results of the one-way MANOVA analysis. The results of a Scheffe post hoc test indicated a significant decrease in postpartum depression among the antenatal clinical FOC group compared to both the antenatal medium FOC group and the antenatal high FOC group. Furthermore, the antenatal clinical FOC group exhibited significantly lower levels of postpartum PTSD compared to both the antenatal medium FOC group and the antenatal high FOC group, as revealed by a Scheffe post hoc test. In contrast with the current study's findings, other research has revealed that women who had no history of depression were more prone to developing postpartum depression if they experienced adverse events during pregnancy, specifically if they had FOC (45). Another study discovered a substantial positive relationship between the degree of FOC and PTSD (46). Antenatal FOC refers to negative emotions associated with childbirth (30), Antenatal FOC refers to negative emotions linked with childbirth; nevertheless, depression comprises unpleasant feelings associated with not only delivery but also with other negative life situations, such as minor pregnancy difficulties and conflict with family members (40). Furthermore, the findings of the current investigation indicate that irrespective of the level of fear towards childbirth, an unplanned cesarean delivery can serve as an indicator for both postpartum depression and postpartum PTSD. The occurrence of emergency cesarean sections is more common among women with high and medium fear of childbirth. In the group receiving antenatal clinical FOC, only two cases required emergency cesarean sections, potentially leading to lower rates of postpartum depression and postpartum PTSD compared to the other two groups (antenatal medium FOC with 17 emergency cesareans; antenatal high FOC with 31 emergency cesareans). As previously stated, the severity of the prenatal FOC was unaffected by the style of delivery, but other unknown factors influenced it.

The one-way MANOVA results indicated a significant difference in postpartum PTSD and postpartum depression depending on the mode of delivery. Further analysis using a Scheffe post hoc test revealed that postpartum depression was significantly higher in the emergency cesarean group compared to both the vaginal delivery group and elective cesarean group. Boyce and Todd (1992) discovered an increased incidence of postpartum depression three months following an emergency cesarean (47). Another study discovered a correlation between emergency cesarean section and an increased risk of postpartum depression six weeks following delivery (48). The occurrence of maternal complications, like delays in progress or cephalopelvic disproportion, or fetal complications, such as fetal distress, often leads to emergency cesarean sections. Such emergency and stressful circumstances can significantly raise the likelihood of women experiencing postpartum depression (49). Furthermore, the surgical procedure can lead to inflammation, resulting in pain and increased anxiety, which may contribute to a higher risk of depression among women (48).

Furthermore, the vaginal delivery group had lower levels of postpartum PTSD symptoms compared to the emergency cesarean group. However, there were no significant differences in PTSD symptoms between the elective cesarean group and both the vaginal delivery group and emergency cesarean group. A study revealed that women who had an emergency cesarean had more severe postpartum PTSD than those who had an elective cesarean (50). A statistically significant correlation was also discovered between emergency cesarean and instrumental vaginal birth and postpartum symptoms of PTSD (51). Emergency cesarean is associated with worse postpartum and delivery experiences than elective cesarean sections and normal childbirth (52). Furthermore, women undergoing emergency cesarean sections may have experienced a diminished sense of control and a lack of comprehensive understanding regarding the delivery procedure (19).

This study is among the initial ones to examine the relationship between delivery method and antenatal fear of childbirth (FOC) on postpartum FOC, postpartum depression, and postpartum PTSD. Nonetheless, it is essential to address the limitations that exist within this longitudinal study. In the present study, the impact of

variables such as the duration of labor was not considered. The study also did not identify cesarean sections performed for medical reasons, such as delivery of a fetus weighing more than 4 kg or a breech baby. Additionally, instrumental vaginal delivery was not identified in the study.

Conclusion

Women with clinical antenatal fear of childbirth (FOC) experience higher postpartum FOC if they opt for a vaginal delivery. Hence, it is crucial to identify and acknowledge clinical antenatal FOC. Women who experience intense fear of childbirth necessitate extra care before and after delivery to ensure more positive childbirth experience. It is significant to address their fear by providing appropriate treatment. Childbirth preparation classes are essential for these women, with a focus on addressing their fear of childbirth. Irrespective of the level of antenatal fear of childbirth (FOC), women who underwent emergency cesarean delivery experienced higher levels of postpartum depression and postpartum PTSD symptoms. Consequently, it is essential to include strategies to prioritize safe and convenient delivery in programs designed to lower the incidence of emergency cesarean. Additionally, it is crucial to provide post-operative care and conduct screenings for depression and PTSD among women who undergo emergency cesarean.

Declarations

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The current study is based on a Master's thesis in general psychology authorized by the Research Committee of Shandiz Institute of Higher Education. We also thank anyone who participated in the study.

Conflicts of interest

Authors declared no conflicts of interest.

Ethical considerations

Informed consent was obtained from all individual participants included in the study. Verbal and written information regarding the study was provided to the women, ensuring they were well-informed. Furthermore, all the women who agreed to be part of the study signed a written informed consent form, which included their contact details.

Code of Ethics

The research committee at the Shandiz Institute of Higher Education approved the research proposal**.**

Use of Artificial Intelligence (AI)

We have not used any AI tools or technologies to prepare this manuscript**.**

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Authors' contribution

MGH contributed substantially in the conception and design of the study. MCH carried out the data collection. MGH analysed and interpreted the data and drafted the manuscript. MGH reviewed the manuscript critically for important intellectual content. All authors read and approved the final manuscript and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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