

# Association Between Mode of Birth and Posttraumatic Stress Disorder Following Childbirth: A Prospective Cohort Study of Chinese Women

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## Research Article

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**Association between mode of birth and posttraumatic stress disorder following childbirth: a prospective cohort study of Chinese women**

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## **Abstract**

**Background** Previous studies on the association between mode of delivery and posttraumatic stress disorder have yielded inconsistent results. This study aimed to further investigate the association between mode of delivery and posttraumatic stress disorder in a cohort of Chinese women with a high rate of cesarean delivery.

**Methods** We conducted a prospective cohort study in Guangdong, China between October 2019 and August 2020. Women aged 20-45 years who visited Nanhai Hospital of Southern Medical University for prenatal care and planned to give birth at the same hospital during the study period were approached and were enrolled after a written consent was obtained. Posttraumatic stress disorder was assessed by the Posttraumatic Stress Disorder Checklist-Civilian Version. We first compared the sociodemographic and obstetric characteristics between cesarean delivery group and vaginal delivery group. We then examined the independent association between mode of birth and posttraumatic stress disorder by log binomial regression analysis.

**Results** A total of 630 women were included in the final analysis, with 385 (61%) who delivered vaginally and 245 (39%) who delivered by cesarean section. Fifty-six (8.9%) women developed posttraumatic stress disorder. Of them, 31 (12.7%) occurred in women with cesarean section, and 25 (6.5%) occurred in women with vaginal delivery. The risk of developing posttraumatic stress disorder in women with cesarean section was more than twice of that in women with vaginal delivery after adjusting for confounding variables (adjusted RR 1.91, 95% CI 1.08 to 3.36).

**Conclusion** Cesarean section is an independent risk factor of posttraumatic stress disorder in a cohort of Chinese women with a high cesarean section rate.

**Keywords:** Mode of birth, Posttraumatic stress disorder, Chinese women, Cohort study

## **Introduction**

Although childbirth is normally viewed as a pleasant life event, the rapid psychophysiological changes during childbirth may render it to be a stress-inducing experience. About 20%–45% women perceive their childbirth as a traumatic event, which may contribute to the development of posttraumatic stress disorder (PTSD) [1-3]. PTSD following childbirth was first described by Bydlowski and Raoul-Duval [4], with long ordeals during labor leading to ecophobia and recurrence of tension, nightmares, and flashbacks towards the end of the next pregnancy. Recently, PTSD following childbirth has gained growing attention. A systematic review of 59 studies originating from 23 countries with a total sample size of 24,267 women on all births including vaginal birth and cesarean section (CS) reported a mean prevalence of PTSD related to childbirth of 4.0% in community samples [3]. A number of studies [5-7] have shown that PTSD has a negative impact on women [5], women's relationship with their husbands and other family members, birth outcomes [6-7], as well as infant emotional and physical development [5-6].

Previous studies have demonstrated that various risk factors could contribute to the development of PTSD, including a history of psychologic issues [5-8], depression and anxiety [7], obstetric procedures [8], maternal and perinatal complications [7], negative experience with healthcare settings [5-7], perception of loss of control during birth [8], and lack of social support [6-8]. In addition, some studies [9-13] have reported that the mode of birth was associated with PTSD, however, of them, three studies [9-11] found that the prevalence of PTSD after vaginal delivery (VD) was

higher than that of CS, while other two studies [12-13] observed the opposite. While childbirth is a biological event, the pregnancy and birth experiences surrounding it are mostly social constructs, shaped by cultural perceptions and practices [14]. There are geographical and cultural variations in women's attitudes towards childbirth and perception of mental health issues [6-9,15]. In our previous systematic review that about the prevalence of PTSD after CS, we did not identify any study specific to Chinese women [16]. Women in China have more traditional beliefs and practices about childbirth, such as preferring for boys, choosing a certain time to give birth, refraining from consuming "cold" food, which make them be more likely to have psychological problems, including maternal PTSD [14, 17]. Besides, although the high CS rate in China has been declining recently after adopting the WHO recommendations, it continues to be higher than the recommended levels [18]. We have therefore undertaken an initiative to investigate the association between mode of birth and PTSD in a cohort of Chinese women with high CS rate.

## **Methods**

### **Study setting**

This study was conducted in Nanhai Hospital of Southern Medical University, Foshan, Guangdong, China, between October 1, 2019 and August 31, 2020. Approval from Human Research Ethics Committee of Nanhai Hospital of Southern Medical University was obtained before the commencement of the study. All women enrolled into this study participated on a voluntary basis and gave their written informed consents.

## **Study population**

All women aged 20-45 years with a singleton pregnancy who visited Nanhai hospital for prenatal care and planned to give birth at the same hospital were invited to participate in this study. We excluded: 1) women with an existing or previous history of psychologic trauma or psychiatric disorder. 2) women with major physical comorbidity, including hypertension, cardiac disease, diabetes, immune diseases or hematologic disease. 3) women with the following major obstetric and pregnancy complication, severe preeclampsia, eclampsia, placenta previa, placental abruption, postpartum hemorrhage, amniotic fluid embolism, or major postpartum infection, or with serious neonatal problems such as major birth defects, premature infant, or birth weight <1500 g.

## **Outcome measure**

The main outcome for this study was occurrence of PTSD as defined according to the Posttraumatic Stress Disorder Checklist-Civilian Version (PCL-C). The PCL-C was developed by the U.S. National Center for PTSD and it is used at 42 days postpartum to assess for PTSD, with a cutoff point of  $\geq 38$  [19-20]. While PCL-C is generally used as a screening rather than diagnostic tool for PTSD, it has gained widespread use due to its ease and speed of administration [21-22]. PCL-C has 17 items, and each item has 5 Likert scales, with a total maximum score of 85 and minimum score of 17. The sensitivity (0.79) and specificity (0.79) of the Chinese version of the PCL-C are comparable with the original scale [19].

## **Statistical analysis**

Baseline characteristics were compared between VD women and CS women using descriptive statistics. The association between mode of birth and PTSD was analyzed using log binomial regression analysis to provide crude and adjusted estimations. The obstetrical factors included in the adjusted log binomial regression were parity, anxiety during pregnancy, depressed during pregnancy, and fear of birth. Relative risk (RR) and 95% confidence interval (CI) were used as effect measures. Two-sided test was applied in all statistical analyses, with  $P < 0.05$  being considered as statistically significant. SPSS version 20.0 was used for all analyses.

## **Results**

A total of 630 eligible women were included in the final analysis. Of them, 385 (61.1%) gave birth vaginally and 245 (38.9%) delivered by CS (including 206 elective and 39 emergency CS). The majority (66.0%) were between the ages of 25 and 34 years, and 55.3% women were unemployed, 91.3% women graduated from secondary school, 90.5% women were married. We found that 56 (8.9%) women developed PTSD, and the prevalence of PTSD was higher (12.7%) in CS women than those women who gave birth vaginally (6.5%) ( $p < 0.05$ ). The details of the distribution of baseline characteristics are shown in Table 1.

Table 2 shows the results of analysis of the association of PTSD with potential confounding factors considered in this study in with VD women. Nulliparous (adjusted RR 3.39, 95% CI 1.43 to 8.08) and fear of birth (adjusted RR 2.40, 95% CI 1.04 to 5.88) were independent risk factors for PTSD. Anxiety during pregnancy and

dispirited during pregnancy were associated with PTSD before adjusting for other potential confounding factors. After adjusting for potential confounding factors, the risk of PTSD for CS women as compared with VD women was increased (adjusted RR 1.91, 95% CI 1.08 to 3.36) (Table 3).

## **Discussion**

### **Implications**

Our study in a cohort of Chinese women with high CS rate revealed that the prevalence of PTSD in postpartum women was 8.89%. This figure was higher than that reported in a meta-analysis in 2017, which combined 15 studies of postpartum PTSD and globally indicated a prevalence of PTSD at postpartum 4–6 weeks as 5.77% [23]. We conducted a systematic review of 9 studies originating from 7 countries with a total of 1,134 women and found that the pooled prevalence of PTSD after CS was 10.7%, and pooled prevalence of PTSD after emergency CS was higher than that after elective CS [16]. Variations in test used to detect PTSD, time points at measurement of PTSD, geographical origin of study, risk profile of PTSD, and methodological quality may explain the differences in the reported PTSD prevalence rates.

This study showed that CS was a significantly risk factor of PTSD. Findings of this study suggest that the prevalence of PTSD was 12.65% in women delivered by CS, which was about two-times higher than that in women who delivered vaginally. On the other hand, a systematic review with a total of 24,267 women reported a

prevalence of PTSD related to childbirth of 4.0% in community samples [3], suggesting that CS may be an important traumatic event. A prospective cohort with 1824 women identified CS as a risk factor for PTSD symptoms [24]. The result is also consistent with one study carried out by Halperin et al. [25] and two systematic reviews [26-27], which concluded that mode of birth was a highly predisposing factor for PTSD.

An elective CS is defined as a planned, non-emergency delivery which occurs before initiation of labor [28]. Elective CS is usually performed when medical indications such as placenta previa and pre-eclampsia present, but elective CS might also be a traumatic event as it brings physical trauma to women. [15]. Previous studies have documented an increased risk following CS for severe maternal morbidities, complications in newborn medical health [29-30], and complications in psychologically derived factors such as maternal bonding [31]. Increased risk of PTSD following CS may in part reflect these negative impacts of CS.

On the other hand, emergency CS is defined as an unplanned CS delivery performed before or after onset of labor, which is typically urgent and is most often required due to fetal, maternal or placental conditions (e.g., fetal distress, eclampsia, placental/cord accidents, uterine rupture, and failed instrumental birth) [27]. Except for the same negative results as elective CS emergency CS women usually have an unpleasant birth experience. A large prospective cohort study in Sweden reported that birth experience was more negative among women with emergency CS relative to VD [32].

Emergency CS was associated with more adverse, unpleasant childbirth experiences

that may increase the risk for development of postpartum PTSD [33]. Furthermore, emergency CS increased a woman's vulnerability to suffering from clinically relevant psychiatric problems [31], which may be an explanation for the high prevalence of PTSD in emergency CS women. Our study also showed that PTSD in emergent CS women was 15.4%, higher than that in elective CS women (12.1%). However, because of limited sample size of emergent CS, we could not perform formal statistical analysis to emergency CS.

Our study also indicated that negative emotions during pregnancy are risk factors for developing PTSD, including fear of birth, anxiety and depressed during pregnancy. Fear of birth increased the risk of a negative subjective birth experience which in turn may lead to PTSD [34]. Taghizadeh et al. [35] demonstrated that fear of birth may result in fatigue and sleep deprivation during pregnancy, which may be another explanation for why women with fear of birth were more likely to suffer from PTSD. A study in Canada found that anxiety sensitivity during pregnancy can predict the development of PTSD [36]. A systematic review also showed that negative emotions, distress and a generally negative experience of labor were connected with the development of PTSD [37]. Therefore, paying attention to the psychological status of pregnant women and providing appropriate psychological intervention may contribute to reducing the prevalence of PTSD.

In addition, nulliparous women are more likely to suffer PTSD. Among primiparous women, the relative risk of developing a PTSD symptom profile after CS was 6.3 times higher compared to normal vaginal deliveries [31]. Nulliparous women have

more uncertainty about birth, which may increase their perceived birth pain [38]. A systematic review found that birth pain was considered a highly predisposing factor for developing PTSD [7].

CS has become increasingly common in developed and developing countries. Our findings support recommendations of the American College of Obstetricians and Gynecologists (ACOG) to minimize any unnecessary obstetric intervention in birth [39]. The rate of CS with non-medical indication should be reduced. Furthermore, pregnant woman should be given more education about birth, such as advantages and disadvantages of VD and CS, the process of delivery and matters needing attention, which can enhance the confidence of pregnant women to give birth naturally. Various professional practices could be performed to improve women's childbirth experience and to reduce stressors during childbirth, such as reducing instrumental deliveries and CS, using adequate analgesia in painful procedures, encouraging skin-to-skin contact with the newborn, and increasing the involvement of women in the birth process by birth plans.

### **Strengths and limitations**

To the best of our knowledge, this is the first study that assessed the association between mode of birth and PTSD among women in Guangdong. . We carefully assessed potential confounders and performed appropriate methods to adjust for the effect of these confounders. The consistent results from different models in the adjustment suggest the robustness of the association between mode of birth and

PTSD. In addition, design and analysis of this study was guided by a systematic review that we conducted before.

There were several limitations for consideration in interpreting the results. First, while our analysis includes most of the important antepartum and intrapartum risk factors reported in the literature, some potential postpartum risk factors such as postpartum care provider and postpartum living environment, have not been taken into consideration in the regression analysis. Second, despite a large sample size of over six hundred women, our study did not separate emergency CS versus elective CS women due to the infrequency of emergency CS. Third, the study was conducted in a single institution. Whether the results could be generated to other Chinese women remains to be explored.

## **Conclusion**

This study with a cohort of Chinese women revealed that CS was a significant risk factor of PTSD. Pregnant woman should be given more education about birth, such as the advantages of VD, the process of natural delivery and matters needing attention, which can enhance the confidence of pregnant women to give birth naturally. Various professional practices, such as delivery position and Doula accompanied delivery, could be performed to improve women's childbirth experience and to reduce stressors during childbirth, which could help reduce the risk of PTSD.

## **Acknowledgement**

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## **Authors' Contributions**

RHX and YC conceptualized and designed the study. ML and WH made major contributions to the acquisition of the data, and YC, IC and SWW made major contributions to the analysis and interpretation of the data. YC drafted the paper; RHX, DK, IC and SWW critically reviewed and revised the paper, and all authors approved the final version of the manuscript. Each author certified that they had participated sufficiently in the work to believe in its overall validity and take public responsibility for appropriate portions of its content.

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## **Availability of data and materials**

The datasets analysed during the current study are not publicly available due

Chinese data safety restrictions, but are available from the corresponding author on reasonable request.

### **Ethics approval and consent to participate**

Approval from Human Research Ethics Committee of Nanhai Hospital of Southern Medical University was obtained.

### **Consent for publication**

Not applicable.

### **Competing interests**

The authors declare that they have no competing interests.

### **Statement**

Our study was within the relevant guidelines and regulations of Declaration of Helsinki. There was no harm to the participants. All women included in our study knew our research objective and procedure. All women enrolled into this study participated on a voluntary basis and gave their written informed consents.

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**Table 1. Comparison of baseline characteristics between vaginal delivery women and cesarean section women**

<b>Characteristic</b>	<b>VD women (n=385)</b>	<b>CS women (n=245)</b>	<b>p value<sup>a</sup></b>
<b>Age (y)</b>			0.07
18-24	101 (26.26)	53(21.67)	
25-34	255 (66.13)	161(65.62)	
35-45	59 (7.61)	31(12.71)	
<b>Employment</b>			0.30
Unemployed	219 (56.83)	129(52.66)	
Employed	166 (43.17)	116(47.34)	
<b>Education</b>			0.09
Primary school	9 (2.34)	2(0.82)	
Secondary school	355 (92.13)	221(90.13)	
Higher education	21 (5.53)	22(9.05)	
<b>Marital status</b>			0.10
Married	342 (88.84)	228(93.14)	
Unmarried cohabitation	18 (11.16)	17(6.86)	
<b>Annual family income (RMB)*</b>			0.88
<30000	94 (24.37)	57(23.32)	
30000-100000	133 (73.22)	181 (73.86)	
100000-200000	11 (2.31)	7(2.82)	
<b>History of medical abortion</b>			0.51
Yes	170 (44.28)	117(47.84)	
No	215 (55.28)	128(52.16)	
<b>Parity</b>			0.33
Nulliparous	148 (38.52)	103(42.00)	
Multiparous	237 (61.48)	142(58.00)	
<b>Anxiety during pregnancy</b>			0.70
Yes	203 (52.68)	112(45.63)	
No	182 (47.32)	133(54.37)	
<b>Depressed during pregnancy</b>			0.19
Yes	126 (32.68)	68(27.74)	
No	259 (67.32)	177(72.26)	
<b>Fear of birth</b>			0.04

Yes	299 (77.65)	172(70.23)	
No	86 (22.35)	73(29.77)	
<b>Gestational age at delivery</b>			<b>0.07</b>
Term	375 (97.41)	232(94.64)	
Preterm	10 (2.59)	13(5.36)	
<b>Sex of neonate</b>			<b>0.22</b>
Male	188 (48.76)	132(53.86)	
Female	197 (51.24)	113(46.14)	
<b>Birth weight (g)</b>			<b>0.56</b>
<2500	15 (3.92)	13(5.36)	
2500-4000	358 (93.00)	222(90.52)	
>4000	12 (3.08)	10(4.12)	
<b>Rooming-in</b>			<b>0.33</b>
Yes	314 (81.52)	192(78.48)	
No	71 (18.48)	53(21.52)	
<b>Family support</b>			<b>0.84</b>
High	250 (64.91)	155(63.22)	
Normal	129 (33.47)	39(35.56)	
Low	6 (1.62)	4(1.22)	
<b>PTSD</b>			<b>0.01</b>
Yes	25 (6.50)	31 (12.62)	
No	360 (93.50)	214 (87.38)	

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<sup>a</sup> *P* value based on  $\chi^2$  test.

**Table 2 Association of PTSD with potential confounding risk factors among vaginal delivery women**

Exposure	Total No.	PTSD, No. (%)	RR (95% CI)	
			Crude	Adjusted <sup>a</sup>
<b>Parity</b>				
Nulliparous	147	14 (9.52)	2.17 (1.25-4.92)	3.39(1.43-8.08)
Multiparous	238	11 (4.62)	1 [Reference]	1 [Reference]
<b>Anxiety during pregnancy</b>				
Yes	203	9 (4.43)	2.08 (1.18-4.83)	1.39 (0.49-3.92)
No	182	16 (8.79)	1 [Reference]	1 [Reference]
<b>Depressed during pregnancy</b>				
Yes	126	4 (3.17)	2.69 (1.04-8.01)	2.63 (0.86-10.13)
No	259	21 (8.11)	1 [Reference]	1 [Reference]
<b>Fear of birth</b>				
Yes	299	15 (5.02)	2.49 (1.07-5.77)	2.40 (1.04-5.88)
No	86	10 (11.63)	1 [Reference]	1 [Reference]

<sup>a</sup> Adjusted RRs and 95% CIs were generated from log binomial regression model adjusting for all independent variables listed in the table simultaneously.

**Table 3. Association between mode of delivery and PTSD after adjusting for confounding factors**

<b>Model</b>	<b>RR (95%CI)</b>	<b>P</b>
Model I	2.08 (1.19-3.62)	0.009
Model II	1.91 (1.08-3.36)	0.027

Model I: only mode of birth as the independent variable in the model (crude estimation).

Model II: mode of birth + parity, anxiety during pregnancy, depressed during pregnancy, and fear of birth.