

# Risk factors and maternal-fetal outcomes of pregnancies complicated by pre-eclampsia, following cesarean section after a trial vaginal birth

Xia Xu, Jian-Ying Yan, Li-Chun Chen

Department of Obstetrics and Gynecology, Fujian Maternity and Child Health Hospital, Affiliated Hospital of Fujian Medical University, Fuzhou, Fujian 350001, China.

*To the Editor:* Pre-eclampsia is a leading cause of maternal morbidity and mortality. Although the etiology and progression of pre-eclampsia are not fully understood, it has been demonstrated that delivery is the definitive treatment. The clinician is then faced with the decision of when, and how, to proceed with the delivery. According to the guidelines, pre-eclampsia is not an indication of cesarean section, as expected with some serious complications. This means that pregnant women with pre-eclampsia can have a vaginal trial. However, most pregnant women with pre-eclampsia select to have a direct cesarean section at present. Whether having a cesarean section after trialing a vaginal delivery affects the outcomes of mother and child, and its related risk factors, are still unclear. The purpose of this study was to investigate the risk factors and maternal-neonatal outcomes in severe pre-eclampsia patients who underwent a transfer-cesarean section during vaginal labor.

This study was approved by the Ethics Committee of Fujian Provincial Maternity and Child Hospital (FMCH2018-061). In this study, patients data were collected from January 1st, 2015 to July 31st, 2019. Patients with a single, cephalic pregnancy, that was complicated by pre-eclampsia, at between 34 and 41 weeks gestation were classified into three groups: patients with severe pre-eclampsia and had a cesarean section directly, patients with severe pre-eclampsia who had vaginal deliveries, and patients with severe pre-eclampsia who underwent a transfer cesarean section after the commencement of vaginal labor. The demographic variables and maternal-fetal outcomes were collected and analyzed.

Elective cesarean section was defined as women undergoing a planned operative termination of pregnancy before

labor, whereas an emergency cesarean section was defined as an urgent cesarean section prior to commencement of labor. A transfer-cesarean section was defined as a cesarean section carried out after labor had started. Severe pre-eclampsia was defined according to the criteria set by the National High Blood Pressure Education Program Working Group (2000), the presence of any one of the following signs or symptoms in women diagnosed of hypertension with proteinuria after 20 weeks of pregnancy: systolic blood pressure  $\geq 160$  mmHg or diastolic blood pressure  $\geq 110$  mmHg; proteinuria  $\geq 2.0$  g in 24 h (2+ or 3+ on qualitative examination); increased serum creatinine level ( $\geq 41.2$  mg/dL); thrombocytopenia-platelet count  $< 150,000/\mu\text{L}$ ; evidence of microangiopathic hemolytic anemia (with increased lactic acid dehydrogenase concentration), or both; elevated hepatic enzyme activities (either alanine aminotransferase, aspartate aminotransferase, or both); patient report of persistent headaches or other cerebral or visual disturbances; patient report of persistent epigastric pain.<sup>[1]</sup> Patients with twin or multiple pregnancies, or those with any evidence of previous medical or intrauterine fetal death were excluded from the study.

Categorical data were compared by  $\chi^2$  or Fisher exact test. One way analysis of variance or Kruskal-Wallis tests were used for comparison of continuous variables among the three groups. If statistical significance were observed among the three groups, multiple comparisons were adopted by Bonferroni methods. Risk factors for transfer-cesarean section were analyzed by univariate and multivariable logistic regression. Factors were included in multivariable regression if they were statistically significant in univariate analyses at a level of  $P < 0.2$ . In multivariate logistic regression, risk factors were fitted to a logistic regression model using backward stepwise regression

## Access this article online

Quick Response Code:



Website:  
www.cmj.org

DOI:  
10.1097/CM9.0000000000001452

**Correspondence to:** Jian-Ying Yan, Department of Obstetrics and Gynecology, Fujian Maternity and Child Health Hospital, Affiliated Hospital of Fujian Medical University, Fuzhou, Fujian 350001, China  
E-Mail: yanjy2004@126.com

Copyright © 2021 The Chinese Medical Association, produced by Wolters Kluwer, Inc. under the CC-BY-NC-ND license. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Chinese Medical Journal 2021;134(18)

Received: 23-09-2020 Edited by: Yan-Jie Yin and Xiu-Yuan Hao

analysis. All data were analyzed using SPSS version 19.0 (SPSS Inc., Chicago, IL, USA).  $P < 0.05$  was classified as a significant difference.

During the study period, 1626 pregnancies were complicated by severe pre-eclampsia (2.5%). In total 796 of the 1626 women had a elective cesarean section, 277 accepted an emergency cesarean section, and the remaining 553 (34%) patients had an induced or natural labor. Of those with an induced or natural labor, 337 (61%) delivered vaginally and the other 216 (39%) had to undergo a transfer-cesarean section to deliver. In the patients receiving either a elective or emergency cesarean section, the most frequently charted indications were by patient request and non-reassuring, non-stress test of the fetus. For those who delivered by transfer-cesarean section after an induced or natural labor, cephalopelvic disproportion (59%) and fetal distress (32%) were the most common indications.

There were no statistical differences in the basic demographic characteristics on maternal age, gestational age, gravidity, parity, body mass index, and blood pressure at admission within each group ( $P < 0.05$ ). There was a greater incidence of postpartum hemorrhage, need for blood transfusion, hospitalization of 7 days or more, in patients who had a direct cesarean section, in comparison to those with vaginal deliveries [Table 1]. Apgar scores at 5 min  $< 7$  score, and admission of neonates into the neonatal intensive care unit (NICU), were significantly higher in the emergency cesarean section group [Table 1].

To compare the results of neonates more in depth, the neonatal outcomes at  $\geq 37$  weeks were compared. The neonates were similar weights and ages in each of the groups overall. The Apgar scores at 1 min  $< 7$  points (10.2% vs. 11.6% vs. 12.8%) and admission to NICU rates (26.0% vs. 18.4% vs. 21.8%) were significantly more common in the neonates delivered by transfer-cesarean section ( $P < 0.05$ ).

When multiple logistic regression analysis was performed, the variables that remained significantly associated with transfer cesarean section were cephalopelvic disproportion (odds ratio [OR]: 2.13; 95% confidence interval [CI]: 1.43–8.13) and fetal distress (OR: 2.42; 95% CI: 1.76–6.65).

Termination of pregnancy is the only cure for pre-eclampsia. Cesarean sections have been associated with increased maternal morbidity, raised risks of hemorrhage and infectious complications and the rates of postpartum hypertensive crises, and prolonged hospitalization.<sup>[2]</sup> Thus, for pregnancies affected by severe pre-eclampsia, guidelines and medical literature support vaginal delivery if there are no other indications for cesarean sections. However, the decision regarding the mode of delivery is not easy, obstetricians and pregnant women often worry that the maternal and fetal clinical conditions will worsen during vaginal delivery. Therefore, many patients and doctors choose cesarean sections directly in clinical practice. In the present study, a high direct cesarean section rate of almost 66% was found in patients with severe pre-eclampsia.

An increased risk of various postpartum complications was found in the patients allocated directly to having a cesarean section. Their estimated blood loss was almost three times higher in comparison to patients who had a vaginal delivery, but similar to those who had a transfer cesarean section. There was also a greater incidence of postpartum hemorrhage (7.7% vs. 4.5%), need for blood transfusion (2.4% vs. 0.6%), and increased numbers needing more than 7 days of hospitalization (10.4% vs. 0.6%) among patients who received direct cesarean section compared to those delivered vaginally. The Apgar score at 5 min  $< 7$  score, and NICU admission rates (7.5% vs. 2.7%; 26.0% vs. 18.4%) in the neonates were significantly higher in the direct cesarean section group compared with vaginal delivery, but there was no statistical difference

**Table 1: Comparison of maternal and neonatal complications in each group.**

Variables	Direct cesarean section (n = 1073)	Vaginal delivery (n = 337)	Transfer-cesarean section (n = 216)
Estimated blood loss (mL)	724.0 ± 112.5	208.0 ± 32.7	708 ± 95.1
Postpartum hemorrhage	83 (7.7)	15 (4.5)	16 (7.2)
Blood transfusion	26 (2.4)	2 (0.6)	4 (1.9)
Eclampsia	1 (0.1)	0	0
Hypertensive crisis	15 (1.4)	2 (0.6)	4 (1.9)
HELLP syndrome	6 (0.6)	1 (0.3)	2 (0.9)
Placenta abruption	31 (2.9)	7 (2.1)	8 (3.6)
Thromboembolic disease	2 (0.2)	0	1 (0.5)
Any puerperal infection	3 (0.3)	0	2 (0.9)
>7 days of hospitalization	112 (10.4)	2 (0.6)	26 (12.0)
Apgar score at 1 min $< 7$ points	109 (10.2)	39 (11.6)	28 (12.8)
Apgar score at 5 min $< 7$ points	81 (7.5)	9 (2.7)	11 (5.1)
NICU	279 (26.0)	62 (18.4)	45 (21.8)
Mortality	1 (0.1)	0	0

Data were shown as mean ± standard deviation or n (%). HELLP: Hemolysis, elevated liver enzymes, low platelets; NICU: Neonatal intensive care unit.

between direct cesarean section group and transfer cesarean section groups.

Our data do not support that direct cesarean delivery is more beneficial for mothers and neonates. In our study, multiple maternal and neonatal complications were increased in the direct cesarean section group. However, there was no difference between the direct and transfer-cesarean section groups. The finding more explicitly strengthens the recommendation to attempt vaginal delivery in pregnant women with severe pre-eclampsia since it is often successful and may reduce the risks of complications if delivery is vaginal but would not increase the incidence of complications for the mother and neonate, even if the cesarean section is carried out following an attempt at vaginal labor.

When multiple logistic regression analysis was performed, the present study showed that cephalopelvic disproportion and fetal distress remained significantly associated with transfer-cesarean sections, which is consistent with the risk factors of conversion to a cesarean section during vaginal delivery in pregnant women without pre-eclampsia. In addition, cesarean sections could potentially alleviate the anxiety of some obstetricians and pregnant women that the maternal and fetal pre-eclampsia conditions could worsen during the process of vaginal delivery to some extent.

Based on the present findings, together with other studies,<sup>[3-5]</sup> we would suggest that in addition to permitting labor progression when there are spontaneous contractions, labor can be induced in pregnant women with severe pre-eclampsia as an indication to safely terminating the pregnancy, as long as there are no contraindications for vaginal delivery. Attempting but failing vaginal delivery would not increase the complications of mothers or neonates, however, the results of this study showed that cephalopelvic disproportion and fetal distress were significantly associated with transfer cesarean sections. These results suggest that the fetal and pelvic size should be fully assessed before vaginal delivery. The condition of the fetus should also be closely monitored during labor. In addition, the position of fetus and the progress of each labor should be judged over time and the proportionality of cephalopelvic measurements should be evaluated accordingly.

We acknowledge that this is an observational, cohort study, and therefore the evidence level presented here is not as strong as that of a randomized clinical trial. However, the consistency of our epidemiological data, alongside evidence from other published larger studies is reassuring. We recommend a trial labor for all pregnant with severe

pre-eclampsia unless it is excluded for obstetric indications.

### **Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the article. The patient understands that his name and initials will not be published and due efforts will be made to conceal the identity of the patient, although anonymity cannot be guaranteed.

### **Acknowledgement**

The authors thank the statistical guidance and assistance of Dr. Ying-Ying Su from the School of Public Health, Xiamen University, China.

### **Funding**

This work was supported by grants from the Fujian Medical University (No: 2019QH1138), Fujian Science and Technology Project (No: 2018Y0005), and the Key Clinical Specialty Discipline Construction of Fujian ([2015] No. 593).

### **Conflicts of interest**

None.

### **References**

1. Report of the national high blood pressure education program working group on high blood pressure in pregnancy. *Am J Obstet Gynecol* 2000;183:S1-S22. doi: 10.1067/mob.2000.107928.
2. van Eerden L, Gaugler-Senden I, de Vries RJ, Zeeman GG, de Groot CJM, Bolte AC. Mode of delivery in severe preeclampsia before 28 weeks' gestation: a systematic review. *Obstet Gynecol Surv* 2018;73:469-474. doi: 10.1097/OGX.0000000000000589.
3. O'Brien L, Duong J, Winterton T, Haring A, Kuhlmann Z. Management of hypertension on the labor and delivery unit: delivering care in the era of protocols and algorithms. *Perm J* 2018;22:17-170. doi: 10.7812/TPP/17-170.
4. Cluver C, Novikova N, Koopmans CM, West HM. Planned early delivery versus expectant management for hypertensive disorders from 34 weeks gestation to term. *Cochrane Database Syst Rev* 2017;1:CD009273. doi: 10.1002/14651858.CD009273.pub2.
5. Værland IE, Vevatne K, Brinchmann BS. An integrative review of mothers' experiences of preeclampsia. *J Obstet Gynecol Neonatal Nurs* 2016;45:300-307. doi: 10.1016/j.jogn.2016.02.006.

**How to cite this article:** Xu X, Yan JY, Chen LC. Risk factors and maternal-fetal outcomes of pregnancies complicated by pre-eclampsia, following cesarean section after a trial vaginal birth. *Chin Med J* 2021;134:2249-2251. doi: 10.1097/CM9.0000000000001452