JOURNAL OF SCIENCE & DISEASES

Route of delivery and maternal outcome in severe preeclampsia: a retrospective cohort study in two referral hospitals in Yaoundé

Voie d'accouchement et issue maternelle de la pré-éclampsie : étude de cohorte rétrospective dans deux hôpitaux de référence à Yaoundé

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Original Article

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Key words: severe preeclampsia; caesarean section; maternal outcomes; mode of delivery; maternal complications.

Mots clés : prééclampsie sévère ; césarienne ; issue maternelle ; voie d'accouchement ; complications maternelles.

Date de soumission: 30/12/2025
Date d'acceptation: 20/03/2026

ABSTRACT

Background: The hallmark of preeclampsia (PE) treatment is delivery. This study aims to investigate the relationship between mode of delivery and maternal outcome in women diagnosed with severe preeclampsia.

Methodology: We employed a retrospective cohort method focused on women with severe PE who were delivered at the study two sites, from 1st June 2014 to 31st May 2024. Data were collected from medical records and exported into IBM's SPSS version 26 for statistical analyses. Bivariate and multivariate logistic regression analyses were done. The measure of association used was the relative risk with its 95% confidence interval. The significance level was set at p-value < 0.05.

Results: We recruited 349 cases of severe PE. In 42.9% of cases labour was induced, and in 16.9% of these cases, induction failed and caesarean section (CS) was indicated. The overall CS rate was 53.9%. After delivery, women who had CS were significantly more likely to have coma, eclampsia, HELLP syndrome, maternal death, acute pulmonary oedema and Intensive care unit admission than women who had VD. However, after multivariate logistic regression analyses, only acute pulmonary oedema (aRR = 1.31 [CI: 1.01 - 2.73]) and intensive care unit admission (aRR = 2.22 [CI: 1.98 - 3.45]) were independently associated with delivery by CS.

Conclusion: The success rate for induction of labour was high but caesarean section was the more common mode of delivery in patients with severe preeclampsia in our context.

RESUME

Introduction : Cette étude visait à examiner la relation entre le mode d'accouchement et l'issue maternelle chez les femmes admises pour la prééclampsie sévère (PE).

Méthodologie : Il s'agissait d'une étude de cohorte rétrospective. Etaient inclues des femmes atteintes de PE sévère ayant accouché dans les deux sites de l'étude, du 1er juin 2014 au 31 mai 2024. Les données étaient collectées à partir des dossiers médicaux et exportées dans la version 26 du logiciel SPSS d'IBM. La mesure d'association utilisée était le risque relatif avec son intervalle de confiance à 95 %. Le seuil de significativité a été fixé à une valeur p < 0,05.

Résultats : Au total, 349 patientes étaient recrutées. Le travail a été déclenché (42,9%). L'induction a échoué (16,9 %). Le taux de césarienne était de 53,9 %. Après l'accouchement, les femmes opérées pour une césarienne étaient plus susceptibles de présenter une complication maternelle et une admission en unité de soins intensifs que les femmes ayant accouché par voie basse. Cependant, seul l'œdème aigu du poumon (aRR = 1,31 [IC : 1,01 - 2,73]) et l'admission en unité de soins intensifs (aRR = 2,22 [IC : 1,98 - 3,45]) étaient associés à l'accouchement par césarienne.

Conclusion : Le taux de succès de l'induction du travail était élevé mais la césarienne était le mode d'accouchement le plus courant chez les patientes présentant une prééclampsie sévère.

DOI : https://doi.org/10.64294/jsd.v4i2.320

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Introduction

Preeclampsia is a multisystem disorder of unknown aetiology unique to pregnancy [1]. It has various complications which individually or in combination can lead to maternal and foetal morbidity and mortality [2, 3]. According to the American College of Obstetricians and Gynaecologists in 2019, preeclampsia is defined as the presence of new-onset high blood pressure, associated with proteinuria and/or signs of noble organ involvement (severe features) after 20 weeks of pregnancy [4].

According to the World Health Organization (WHO), preeclampsia is the third cause of maternal mortality after severe post-partum haemorrhage and puerperal infection, accounting for about 14% of deaths worldwide [5]. In Africa, nearly one tenth of all maternal deaths are associated with hypertensive disorders of pregnancy [6, 7]. In Cameroon, preeclampsia is reported to occurs in 4.9% to 7.7% of pregnancies [7]. In one of the major reference hospitals in Yaoundé, a study found preeclampsia and eclampsia to be the first cause of maternal death [7], while another in 2020 reported a prevalence of severe preeclampsia of 10.8% among women with hypertensive disease in pregnancy, in the North-West region [8].

Delivery is the cornerstone of the treatment of preeclampsia and caesarean delivery (CD), which is usually the faster mode, especially in the absence of spontaneous labour, and even more so, when the readiness of the cervix (Bishop score) is poor, is preferred in many settings for cases of preeclampsia with severe features [9, 10]. Studies have reported proportions of intended CD as high as 25% to 41% because of eclampsia alone [11, 12]. However, reports about the maternal and perinatal outcomes of this mode of delivery, relative to vaginal delivery (VD), in severe PE have been conflicting [11, 12, 13, 14].

A study in two referral hospitals in Yaoundé, Cameroon found that severe preeclampsia was associated with increased post-operative complications compared to women without preeclampsia [15]. But we did not find any studies on the relationship between the outcome of patients with severe preeclampsia and the route of delivery. However, there is need to assess this relationship, as well as factors that could influence it, to enable practitioners propose informed choices in relation to route of delivery for these women. This study, therefore, aimed to investigate the relationship between mode of delivery and maternal outcome in women with preeclampsia and severe features.

Materials and Methods

This was a hospital-based retrospective cohort study carried out from the 1st of June 2024 to the 15th of August 2024 at the Obstetrics and Gynaecology departments of two reference hospitals; the Gynaeco-Obstetric and Paediatric Hospital of Yaoundé (GOPHY) and the Central Hospital of Yaoundé (CHY), over a period of 10 years: 1st June 2014 through 31st May 2024. The target population comprised women with severe preeclampsia, and the source population cases managed for severe preeclampsia at the aforementioned hospitals during the period of study. We included all women diagnosed of severe preeclampsia and delivered at the two aforementioned hospitals. We excluded patients with multiple pregnancies. The sample size was calculated using the following formula: n= [(Zα/2+Zβ)2(p1(1−p1) +p2(1−p2))]/(p1−p2)2, where Zα was the confidence level (1.96 at 95%) and Zβ the power (1.28) at 90%. The proportion of complications in severe preeclampsia following caesarean section, p1, was 0.554 (55.4%). The proportion of complications in severe preeclampsia following vaginal delivery, p2, was 0.867. The required sample size for each group was approximately 39, giving a minimum total sample size of 78.

First, we obtained ethical clearance from the ethics committee of the Faculty of Medicine and Biomedical Sciences (FMBS) and administrative clearances from the management of each hospital. We then explored the registers of the Obstetrics and Gynaecology unit and the Intensive Care Unit (ICU) of both hospitals, and a list of patients managed for severe preeclampsia from June 2014 to May 2024 was established. Using this list, medical records were obtained at the archives of the units after a thorough search. We collected data on sociodemographic variables, history of pregnancy, obstetric history, past medical history, clinical presentation before delivery, peripartum details, paraclinical investigations, medical treatment received, mode of delivery, maternal outcomes, days of hospital stay and follow-up until day 2 (at least) postpartum from the files. We used a structured questionnaire containing all the required variables for data collection.

Data collected were entered into a data entry form designed on CS Pro version 7.7. The generated data base was cleaned and exported into IBM's statistical package for social sciences (SPSS) version 26 for statistical analyses. Descriptive statistics were done for quantitative variables using measures of central tendencies (means or medians) and measures of dispersion (standard deviations-SD or inter quartile ranges-IQR). Qualitative variables were summarised using frequencies and their percentages. Bivariate analyses were done to assess for associations between the route of delivery and each maternal outcome. The chi square test or a fisher's exact test was done, as appropriate, to estimate p-values with the level of statistical significance set at 5%. The measure of association between mode of delivery and maternal outcome after delivery in the pseudo-cohort design was the risk ratios (RR) and its 95

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% confidence interval. All statistically significant associations from bivariate analyses were included into a multivariate analysis (using multiple logistic regression) to estimate the adjusted RR and adjusted p-values, to eliminate the effect of confounders and identify independent associations.

Results

We found 947 women who were managed for severe preeclampsia at YGOPH and CHY from June 2014 to May 2024. For 609 cases the medical files were found, but 260 were excluded for incompleteness or because of comorbidity (scarred uterus, twin pregnancy). Thus, we recruited 349 cases for this study.

The age range of participants was 15 - 45 years, the majority (43%) were aged between 20 - 29 years, and the mean age was 28.3 years (±7.1 years). Most of our participants were single (72.2%), self-employed (45.8 %), and of secondary level of formal education (60.5 %). The majority were of the Christian faith (79.4 %) and from the Centre region (45.3 %) (table 1).

Table 1: Sociodemographic characteristics of participants (N=349)

Variable and categories	Number	Proportion (%)
Age		
< 20 years	51	14.6
20 – 29 years	153	43
30 – 39 years	124	35.5
40 – 49 years	22	6.3
Marital status		
Married	97	27.8
Single	252	72.2
Profession		
Housewife	47	13.5
Student	99	28.4
Public sector	17	4.9
Private formal	26	7.4
Self-employed	160	45.8
Educational level		
None	12	3.6
Primary	78	23.4
Secondary	202	60.5
Higher	42	12.6
Religion		
Christian	277	79.4
Muslim	58	16.6
Others	14	4.0

Considering obstetrical characteristics, close to half of the study population were primiparas (48.4 %) and were received at term (46 %). Of the 295 (84.5%) who had had antenatal contacts (ANC), 161 (48%) had less than 4 contacts, 206 (73 %) had their first ANC in the second trimester (table 2).

Table 2: Obstetric characteristics of participants

Variable	Number	Proportion (%)
Parity (N= 349)		
Nulliparas	10	2.9
Primiparas	169	48.4
Multiparas	115	32.9
Grand-multiparas	55	15.8
Gestational age at admission (N= 349)		
<28 weeks	15	4.3
[28 – 34[weeks	81	23.2
[34 – 37[weeks	92	26.4
≥37 weeks	161	46.1
Number of ANCs (N=349)		
None	54	15.5
1-3	141	40.4
4-7	134	38.4
≥8	20	5.7
GA at first ANC (N=295)		
<13 weeks	59	22.3
[14-27[weeks	193	72.8
≥28 weeks	13	4.9
PE Prophylaxis received (N= 295)		
Calcium	49	16.6
Aspirin (Low dose)	12	4.1

ANC = Antenatal Contact, GA=Gestational Age, PE=Pre-eclampsia

The more frequent mode of delivery for women with preeclampsia was Caesarean section, with 188 cases (53.9 %). The most common indication was a poor BISHOP score (149/188, 79.2 %), followed by a non-reassuring foetal status (9.1%), failed induction (5.9%), placenta abruption (3.2%) and cephalopelvic disproportion (2.6%). Of the 161 (46.1%) who delivered per vaginam, labour was spontaneous in 92 (57.1%) and induced in 69 (42.9%). Labour induction was unsuccessful in 15.9% (11/69) of cases.

The frequency of coma, Haemolysis Elevated Liver enzymes Low Platelet (HELLP) syndrome, acute kidney injury, acute pulmonary oedema, and severe hypertension appeared to be higher in the CD group, but these differences were not statistically significant. Eclampsia was the lone complication with a statistically significant higher prevalence in the CD group (33.5%) compared to 21.1% in the VD group, with p-value of 0.014 (table 4).

Overall, between pre-partum and postpartum, there was a drop in the prevalence eclampsia, coma (VD group), HELLP syndrome (VD group), disseminated intravascular coagulation, severe hypertension and haemorrhagic cerebrovascular accident (VD group). There was an increase in prevalence of acute kidney injury, acute pulmonary oedema, and intensive care unit admission (CD group) after delivery.

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Table 4: Peri-partum progress of complications in severe PE cases by mode of delivery.

Complication	Before/ After Delivery	CS (N=188) n(%)	VD (N=161) n(%)	Total N=349 n(%)	p-value
Eclampsia	Before	63(33.5)	34(21.1)	97(27.8)	0.014
	After	24(12.8)	10(6.2)	34(9.7)	0.040
Coma	Before	49(26.1)	28(17.4)	77(22.1)	0.051
	After	48(25.5)	17(10.6)	65(18.6)	<0.001
HELLP syndrome	Before	38(20.2)	20(12.4)	58(16.6)	0.071
	After	37(19.7)	12(7.5)	49(14.0)	0.001
Acute kidney injury	Before	15(8.0)	8(5.0)	23(6.6)	0.259
	After	22(11.7)	11(6.8)	33(9.5)	0.121
DIC	Before	4(2.1)	4(2.5)	8(2.3)	0.824
	After	11(5.9)	8(5.0)	19(5.4)	0.717
Acute pulmonary oedema	Before	5(2.7)	0(0.0)	5(1.4)	0.103
	After	15(8.0)	2(1.2)	17(4.9)	0.004
ICU Admission	Before	5(2.7)	5(3.1)	10(2.9)	0.803
	After	128(68.1)	32(19.9)	160(45.8)	<0.001
Haemorrhagic CVA	Before	0(0.0)	2(1.2)	2(0.6)	0.125
	After	3(1.6)	0(0.0)	3(0.9)	0.107
Hypertensive crisis	Before	129(68.6)	102(63.4)	231(66.2)	0.300
	After	14(7.4)	8(5.0)	22(6.3)	0.342

CS=caesarean section VD=vaginal delivery HELLP=Haemolysis Elevated Liver enzymes Low Platelet, CVA=Cerebrovascular accident, DIC=Disseminated intravascular coagulation, ICU=Intensive Care Unit

Between the CD and VD groups, the prevalence of coma, eclampsia, HELLP syndrome, acute pulmonary oedema, and intensive care unit admission after delivery were significantly higher in women who had CD compared to VD. There was no significant difference in the prevalence of hypertensive crisis (systolic BP ≥160 and/or diastolic BP ≥110 mmHg), acute kidney injury, disseminated intravascular coagulation, and haemorrhagic cerebrovascular accident, as shown in table 4.

Women who delivered by Caesarean Section were significantly more likely to experience eclampsia (RR = 1.36; 1.07-1.73], p = 0.034), coma (RR = 1.50 [CI; 1.24-1.81], p < 0.001), HELLP Syndrome (RR = 1.50 [CI; 1.23-1.82], p = 0.001), acute pulmonary oedema (RR = 1.58 [CI; 1.20-2.07], p = 0.022), admission to intensive care unit (RR = 2.5 [CI; 2.03-3.11], p <0.001), hospitalization for >7 days (RR = 1.76 [CI; 1.47-2.10], p <0.001), and maternal death (RR = 1.48 [CI; 1.22-1.79], p = 0.001).

After multivariate logistic regression analyses, however, only acute pulmonary oedema (aRR = 1.31 [CI: 1.01-2.73], p = 0.048), and admission to intensive care unit (aRR = 2.22 [CI: 1.98-3.45], p < 0.001), were shown to be independently associated with mode of delivery.

Discussion

This study was a retrospective cohort study and had as aim to compare maternal outcome in women with severe preeclampsia delivered by caesarean section or by vaginal route at two referral hospitals in Yaoundé, Cameroon. We recruited 349 cases, 188 (53.9%) delivered by caesarean and 161 (46.1%) delivered vaginally. Our findings showed a high success rate (84.1%) for induction of labour in women having severe PE and suggest a higher frequency of adverse maternal outcome after CS.

Maternal complications of severe preeclampsia before delivery by mode of delivery

We observed several maternal complications amongst our study participants, which was similar to observations from other studies done in our setting [3, 16]. However, none of these studies compared maternal complications before delivery by route of delivery. In our study, but for eclampsia, none of the complications had a statistically significant difference in frequency between the groups before delivery. Eclampsia, however, was more common in the CS group, with p-value <0.05. This is probably because convulsions readily move the medical team to want to act fast and deliver the baby to avoid complications and expect resolution of PE. When faced with a poor Bishop score, teams readily opt for CS. In our context, common practice aims to deliver the baby within 24 hours for severe PE and within 12 hours when there is eclampsia.

Progress of complications of severe preeclampsia overall and by mode of delivery

The major complications of PE witnessed a decrease in frequency of most complications between the prepartum and postpartum periods, regardless of route of delivery. In contrast, there were variable increases in frequency of acute kidney injury, disseminated intravascular coagulation, acute pulmonary oedema, and intensive care unit admission, most marked with the latter, and this could be influenced by the routine clinical practice of admission to intensive care unit after major surgery, like CS.

Maternal complications postpartum by mode of delivery

There was a statistically significant higher risk of various maternal postpartum complications in patients subjected to CS following bivariate analysis. These include eclampsia (RR 1.32), coma (RR 1.50), HELLP Syndrome (RR 1.50), maternal death (RR 1.48), acute pulmonary oedema (RR 1.58), admission to intensive care unit (RR 2.51), and hospital stay of > 7 days (RR 1.76). These findings are similar to those observed in Brazil where the risk of severe maternal morbidity (RR=1.65) and for hospitalisation longer than 7 days (RR=2.33) was significantly higher in the caesarean group [12]. We recorded many more adverse outcomes compared to the latter study though, probably because of their shorter 1-year

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prospective approach, more rigid diagnostic criteria for maternal outcomes, and their smaller sample size. The higher prevalence of complications in the CS group suggests slower resolution or emergence of new complications in this group, since the prevalence of most of these complications did not show a statistically significant difference between the groups before delivery. A study in 2018 reported that emergency caesarean delivery in women with PE is associated with more complications. They also revealed that the complications were related to the worsening of PE rather than complications of the surgical procedure [15].

After multivariate analyses, however, only acute pulmonary oedema and admission to intensive care unit were shown to be independently associated with mode of delivery. Acknowledging the latter may be influenced by routine admission into this unit for routine post-operative care, rather than complications of severe preeclampsia alone, acute pulmonary oedema may be enhanced by perturbed fluid balance. Preeclampsia is characterised by pathologic vascular permeability that leads to fluid leakage into the extravascular space and intravascular volume depletion. Coupled with the fluid overload caused by pregnancy, irrational correction of such intravascular fluid depletion could readily lead to further leakage of fluid and cause or worsen oedema, in most structures of the body, including the lungs [17, 18].

Limitations

This study was observational and, therefore, subject to selection bias because the decision for patients to undergo a caesarean or vaginal delivery was not randomized, and was rather the decision of the attending physician or taken according to hospital protocol. As such, case severity or poorer Bishop scores could have influenced the choice of caesarean delivery in some cases, as suggested by the higher frequency of eclampsia in the CS group, even though the difference in frequency of other complications between both groups was not statistically significant.

The outcome, too, could have been influenced by treatment received by participants other than route of delivery. In addition, admission to intensive care, one of the maternal outcome variables in this study, may be influenced by service protocol rather than true maternal morbidity due to severe PE. Multivariate analysis, was expected, however, to eliminate this bias.

Since our study was a 10-year retrospective study, there were many missing records and many cases were excluded. This too could have influenced the generalisability of our results.

Conclusion

The frequency of complications of severe preeclampsia before delivery were similar amongst those who eventually had a caesarean or vaginal delivery, but for eclampsia, which was more frequent in the caesarean group; and the success rate of induction of labour was high.

Most complications in severe preeclampsia patients improved after delivery regardless of the route of delivery. While most were significantly more prevalent in the caesarean group, only acute pulmonary oedema, and admission to intensive care unit stood out as outcomes independently associated with caesarean delivery.

We suggest a more rigorous management of intravenous fluids at caesarean section for this group of patients and a consideration of induction of labour for women who do not have a formal indication for caesarean delivery

Authors' contribution: Cliford E Ebong: co-supervision of research, writing of the initial manuscript, and corrections, Emilia B Mukwele: Conception of research project, data collection and initial study report, Veronique M Batoum and Isidore Tompeen: Co-supervised the research project, Serge R Nyada, Claude H Mbia: Reviewed the manuscript, Julius S Dohbit: Reviewed and approved the manuscript, Robinson E Mbu: Supervised the project

Declaration of conflict of interest: The authors declare no conflict of interest

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