

# Maternal and Foetal Outcomes Associated with Caesarean Deliveries in Patients with Severe Preeclampsia in Two Teaching Hospitals, Yaoundé

Essiben Félix<sup>1,2\*</sup>, Ngo Um Meka Esther<sup>1,3</sup>, Mve Koh Valère<sup>1,4</sup>, Gwos Laurentine<sup>1</sup>, Ojong Samuel<sup>1</sup>, Foumane Pascal<sup>1,3</sup>

<sup>1</sup>Faculty of Medicine and Biomedical Sciences, University of Yaounde, Yaounde, Cameroon

<sup>2</sup>Yaoundé Central Hospital, Yaounde, Cameroon

<sup>3</sup>Yaounde Gynaeco-Obstetric and Paediatric Hospital, Yaounde, Cameroon

<sup>4</sup>Yaounde Teaching Hospital Centre, Yaounde, Cameroon

Email: \*essibenx@yahoo.com, essiben@uy1.uninet.cm, estherum@yahoo.fr, vmvekoh@yahoo.com, laurelgwos@yahoo.fr, ojongsamuel27@gmail.com, pfoumane2004@yahoo.fr

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## Abstract

**Introduction:** Severe preeclampsia is a frequent cause of maternal death, and also a frequent indication for caesarean deliveries when faced with the need to expedite delivery. We sought complications specific to caesarean deliveries in patients with severe preeclampsia. **Methods:** It was a case-control study carried out over 6 months, from December 1st, 2015 to May 31st, 2016 at the Yaoundé Central and the Yaoundé Gynaeco-Obstetric and Paediatric Hospitals. We evaluated 159 women undergoing a caesarean delivery to assess the risk of maternal and foetal postoperative complications in patients with severe preeclampsia. Significance level was set at 0.05. **Results:** The incidence of postoperative complications stood at 26.4%. Maternal and foetal complications were more frequent in preeclamptic women at 54.5% versus 11.5% ( $p < 0.05$ ) and 47.3% versus 27.9% ( $p < 0.05$ ) respectively. The incidence of adverse events was greater in women with preeclampsia: pruritus and limb pain (RR = 2.96;  $p < 0.001$ ), the persistence of high blood pressure (RR = 4.51,  $p < 0.001$ ), maternal death (RR = 2.93,  $p < 0.001$ ), postpartum convulsions (RR = 3,  $p < 0.001$ ) headaches resistant to first-line analgesics (RR = 3,  $p < 0.001$ ), Disseminated Intravascular Coagulation (DIC) (RR = 2.92,  $p < 0.001$ ), a cute pulmonary oedema (RR = 2.92,  $p < 0.001$ ), prematurity (RR = 4.43,  $p < 0.001$ ), neonatal asphyxia (RR = 2.93,  $p < 0.001$ ), and hyaline membrane disease (RR = 2.93,  $p < 0.001$ ). **Conclusion:** Severe preeclampsia is associated

with an increased risk of postoperative complications.

## Keywords

Preeclampsia, Postoperative Complications, Caesarean Section, Yaoundé

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## 1. Introduction

Caesarean deliveries are the most common obstetrical surgical procedure and their incidence is increasing due to greater accessibility as well as a flexibility in indications. Although a caesarean section rate above 10% does not reduce maternal and neonatal mortality [1], the use of caesarean section worldwide is steadily increasing, reaching up to 50% of births in some countries [2]. Caesarean delivery rates also vary from one health facility to another. These rates are highest in reference hospitals. Studies in Yaoundé reveal rates varying between 12% and 19% in these reference hospitals [3] [4] with a national average of 2% [5].

In Cameroon, hypertension is present in almost 10% of pregnancies and consists mostly of preeclampsia [6]. Preeclampsia and eclampsia are major causes of maternal and neonatal morbidity and mortality [7]. These are responsible for 10% to 25% of maternal deaths in developing countries [8]. With severe hypertensive disorders in late pregnancy, caesarean sections often prove to be the fastest method of delivery when faced with the need for rapid control of blood pressure, this especially because the local obstetric conditions do not always favour normal vaginal births. Severe preeclampsia and eclampsia therefore become frequent indications for caesarean deliveries. Little data is available on the complications of caesarean section in cases of severe preeclampsia. The objective of this study was to evaluate the risk of complications in women with severe preeclampsia undergoing caesarean deliveries.

## 2. Methods

We conducted a cohort study from December 1st, 2015 to May 31st, 2016 for a period of 6 months, at the Yaoundé Gynaeco-Obstetrical and Paediatric Hospital (YGOPH), and the Central Hospital of Yaoundé (CHY). Patients who had caesarean deliveries were evaluated during the postoperative period. They were subsequently divided into two groups: one composed of women operated in a context of pre-eclampsia (exposed) and the other comprised of women who had had a caesarean section for another indication (unexposed).

Pregnant women operated in other hospitals and referred to both study sites were excluded from the study. We did not include cases of chronic hypertension or mild pre-eclampsia as well as patients with chronic disease.

We defined mild preeclampsia as blood pressures with systolic and diastolic values ranging 140 - 159 mmHg and 90 - 109 mmHg respectively, associated to significant proteinuria ranging 0.3 - 1 g/24h or a 2+ value on urine test strips.

Furthermore, we defined severe preeclampsia as blood pressures with systolic and diastolic values  $\geq 160$  mmHg and  $\geq 110$  mmHg respectively, associated to significant proteinuria  $> 1$  g/24h or 3+ on urine test strips or oliguria less than 400 ml/24h. Our sampling was consecutive and exhaustive during the study period.

We obtained information about our patients from their medical records, a face-to-face interview using a pre-established and pre-tested data collection sheet, and a daily physical examination of each woman during her stay at the hospital. Consent to participate in the study was obtained from each patient or from their guardians (for legally underage patients or those who were unconscious). All patients were followed up until they left the hospital.

The variables studied included: socio-demographic characteristics (age, occupation, marital status), clinical characteristics (pregnancy, parity, number of abortions or miscarriages, number of children alive, gestational age, surgical history, type of anaesthesia performed, history of severe pre-eclampsia or eclampsia) and maternal post-operative follow-up data (infectious, respiratory, haemorrhagic, neurological complications). In addition, we evaluated for foetal complications (Apgar score, admission to neonatology, neonatal infection, prematurity, hyaline membrane diseases, respiratory distress, and neonatal jaundice).

We used the CSPro version 5.0 software for data entry and clearance and later exported to SPSS version 18.0 for analysis. Word and Excel 2013 were used for the realization of the tables.

We compared the exposed and non-exposed groups for their socio-demographic and clinical characteristics by calculating odds ratios (OR) and their 95% confidence interval. The risk of occurrence of events in the context of preeclampsia was assessed by calculating the relative risk (RR) and its 95% confidence interval. p-values were calculated with the Chi square test with  $p < 0.05$  being considered statistically significant

### 3. Results

We recruited 159 women, of whom 55 had a caesarean section in a context of severe preeclampsia being an incidence of 34.6% (55/159). Caesarean deliveries were performed in emergency for almost all patients 98.2% (54/55).

- Sociodemographic data

**Table 1** presents the socio-demographic characteristics of our patients. Often, pre-eclamptic patients were  $< 25$  years old (OR = 5.35, CI = 2.28 - 12.59  $p < 0.001$ ) and were pupil (OR = 3.27; CI = [1.29 - 8.23]  $p < 0.012$ ).

- Clinical data

Pre-eclamptic patients were more often nulliparous (OR = 16.66, CI = [5.35 - 51.88],  $p < 0.001$ ); had a history of preterm birth (OR = 12.14, CI = [5.23 - 28.18],  $p < 0.001$ ) and had an intergenetic interval  $< 2$  years (OR = 2.20; CI = [1.12 - 4.32],  $p = 0.021$ ) (**Table 2**).

**Table 1.** Socio-demographic characteristics.

Variables	Pre-eclamptic patients N = 55 n (%)	Non pre-eclamptic patients N = 104 n (%)	OR (IC)	p value
Age				
<25	33 (60.0)	17 (16.3)	5.35 (2.28 - 12.59)	0.000
≥25	22 (40.0)	87 (83.6)	0.19 (0.08 - 90.44)	0.000
Marital status				
Married	10 (18.2)	34 (32.7)	0.46 (0.21 - 1.02)	0.054
Widow	45 (81.8)	70 (67.3)	2.18 (0.98 - 4.86)	0.054
Profession				
Trader	14 (25.5)	17 (16.3)	1.75 (0.78 - 3.88)	0.170
Pupil	13 (23.6)	9 (8.6)	3.27 (1.29 - 8.23)	0.012
Student	9 (16.4)	9 (8.6)	2.06 (0.76 - 5.55)	0.150
Civil servant	2 (3.6)	27 (25.9)	0.10 (0.02 - 0.40)	0.003
Household	11 (20.0)	23 (22.1)	0.88 (0.39 - 1.97)	0.75
Private employee	6 (10.9)	19 (18.3)	0.54 (0.20 - 1.46)	0.23

**Table 2.** Clinical characteristics.

Variables	Pre-eclamptic patients N = 55 n (%)	Non pre-eclamptic patients N = 104 n (%)	OR (IC)	p value
Number of pregnancies				
1 - 2	33 (60.0)	47 (45.2)	1.82 (0.94 - 3.54)	0.077
3 - 4	12 (21.8)	29 (27.9)	0.72 (0.33 - 1.56)	0.407
5+	10 (18.2)	28 (26.9)	0.49 (0.22 - 1.10)	0.084
Number of term deliveries				
0	22 (40.0)	4 (3.8)	16.66 (5.35 - 51.88)	0.000
1 - 2	22 (40.0)	56 (53.8)	0.57 (0.29 - 1.10)	0.098
3 - 4	6 (10.9)	35 (33.65)	0.24 (0.09 - 0.61)	0.003
5+	5 (9.1)	9 (8.6)	1.05 (0.33 - 3.31)	0.926
History of premature deliveries				
0	23 (41.8)	94 (90.4)	0.07 (0.03 - 0.17)	0.000
1	31 (56.4)	10 (9.6)	12.14 (5.23 - 28.18)	0.000
2	1 (1.8)	0 (0.0)	5.75 (0.23 - 143.59)	0.286
Intergenic interval				
<2 years	35 (63.6)	46 (44.2)	2.20 (1.12 - 4.32)	0.021
≥2 years	20 (36.4)	58 (55.8)	0.45 (0.23 - 0.88)	0.021
History of pre-eclampsia				
Yes	51 (92.7)	102 (98.1)	0.25 (0.04 - 1.41)	0.116

**Continued**

No	4 (7.3)	2 (1.9)	4 (0.709 - 22.57)	0.116
Gestational Age				
≤28	3 (5.4)	1 (0.9)	2.23 [1.21 - 4.10]	0.009
]28 - 32[	4 (7.3)	1 (0.9)	2.41 [1.47 - 3.95]	0.000
[32 - 37[	28 (50.9)	8 (7.7)	3.54 [2.43 - 5.6]	0.000
[37 - 42[	19 (34.5)	94 (90.4)	0.21 [0.13 - 0.33]	0.000
≥ 42	1 (1.8)	0 (0.0)	2.92 [2.35 - 3.63]	0.000

Pre-eclamptic women were more likely to have an emergency caesarean delivery (RR = 15.24, CI = [2.18 - 106],  $p = 0.006$ ) and this, under general anaesthesia (RR = 2.02; CI= [1.31 - 3.09],  $p = 0.001$ ).

Birth weights were significantly smaller in patients with pre-eclampsia with a 3-foldrisk for low birth weights between 1000 and 2000 g (RR = 2.57; IC = [1.93 - 3.93];  $p < 0.001$ ) and a 2-foldrisk for birth weight between 2000 and 3000g (RR = 1.77, CI = [1.15 - 2.72],  $p = 0.009$ ) (**Table 3**).

- Complications after the surgery

We registered complications in 43 of the 159 patients in our study, being an incidence of 26.4%. Maternal complications were more frequent in patients who had caesarean deliveries in a context of preeclampsia than in those who had caesarean deliveries for another indication (54.5% versus 11.5%,  $p = 0.02$ ). With regards to foetal complications, they were also more frequent in pre-eclamptic patients compared to patients without preeclampsia (47.3% versus 27.9%,  $p = 0.001$ ) (**Figure 1**).

The incidence of the following events was greater in the group of women operated in the context of severe preeclampsia: pruritus and extremity pain (RR = 2.96, CI = [2.38 - 3.69],  $p < 0.001$ ), persistently raised blood pressure (RR = 4.51, CI = [3.22 - 6.31],  $p < 0.001$ ), maternal death (RR = 2.93, CI = [2.36 - 3, 63],  $p < 0.001$ ), postpartum convulsions (RR = 3, IC = [2.40 - 3.74],  $p < 0.001$ ), headaches resistant to usual analgesics (RR = 3, IC = [2.40 - 3.74],  $p < 0.001$ ), HELLP Syndrome (RR = 2.92, IC = [2.35 - 3.63],  $p < 0.001$ ) and acute pulmonary edema (RR = 2.92, IC = [2.35 - 3.63],  $p < 0.001$ ), **Table 4**.

We noted a greater incidence of prematurity (RR = 4.43, CI = [2.89 - 6.80],  $p < 0.001$ ), neonatal asphyxia (RR = 2.93, CI = [2, 36 - 3.63],  $p < 0.001$ ) and hyaline membrane disease (RR = 2.93, IC = [2.36 - 3.63],  $p < 0.001$ ), **Table 5**.

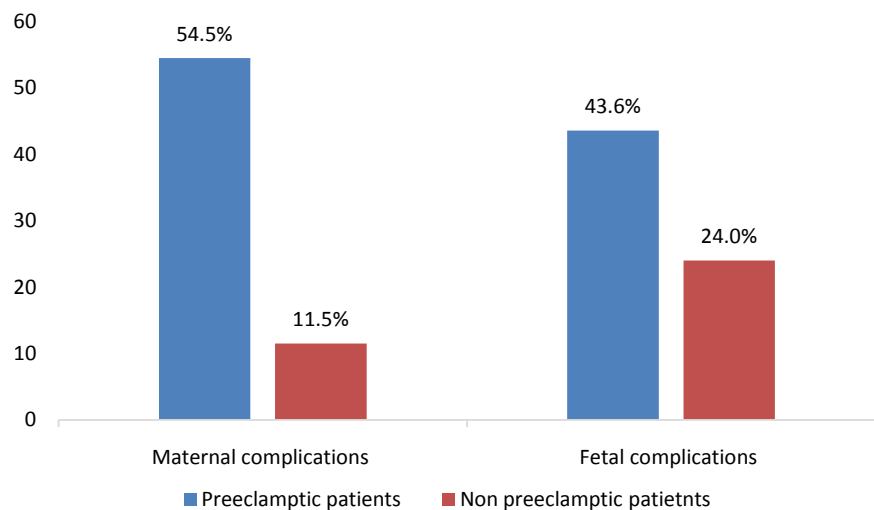
#### 4. Discussion

The results of our study of 159 cases of caesarean deliveries reveal that severe preeclampsia/eclampsia is a frequent indication for operative obstetric procedures in our daily practice. We found that 34.6% of caesarean deliveries were indicated for severe preeclampsia/eclampsia. This rate is far higher than the 5.1% rate described by Nkwabong *et al.* at the University Hospital Centre of Yaoundé

**Table 3.** Clinical outcome.

Variables	Pre-eclamptic patients N = 55 n (%)	Non pre-eclamptic patients N = 104 n (%)	RR (IC)	p value
Emergency Caesarean section				
yes	54 (98.2)	70 (67.3)	15.24 (2.18 - 106)	0.006
No	1 (1.8)	34 (32.7)	0.06 (0.01-0.45)	
Type of anaesthesia				
GA	31 (56.4)	31 (29.8)	2.02 [1.31 - 3.09]	0.001
LRA	24 (43.6)	73 (70.2)	0.49 (0.32 - 0.75)	
Foetal weight				
[500 - 1000[	1 (1.9)	0 (0.0)	2.88 [2.30 - 3.60]	0.000
[1000 - 2000[	13 (25.5)	3 (3.2)	2.57 [1.93 - 3.93]	0.000
[2000 - 3000[	25 (49.0)	26 (27.7)	1.77 [1.15 - 2.72]	0.009
[3000 - 4000[	12 (23.5)	55 (58.5)	0.35 [0.20 - 0.62]	0.000
≥4000	0 (0.0)	10 (10.6)	0.12 [0.0207 - 1.81]	0.126

GA: General Anaesthesia; LRA: Loco Regional Anaesthesia.

**Figure 1.** Maternal and foetal complications following caesarean deliveries.**Table 4.** Maternal complications associated with the context of preeclampsia.

Variables	Pre-eclamptic patients N (%)	Non-preeclamptic patients N (%)	RR(IC)	P value
Pruritus and limb pains	2 (3.6)	0 (0.0)	2.96 (2.38 - 3.69)	0.000
Post-partum haemorrhage	1(1.8)	3(2.9)	0.72 (0.13 - 3.97)	0.704
Infection	0 (0.0)	4 (3.8)	0.28 (0.02 - 3.93)	0.346
Abdominal wall haematoma	0 (0.0)	1 (0.9)	0.72 (0.06 - 7.97)	0.786

**Continued**

Hypovolemic shock	0 (0.0)	2 (1.9)	0.48 (0.03 - 6.09)	0.571
Persistently raised blood pressure	27 (49.1)	1 (0.9)	4.51 (3.22 - 6.31)	0.000
Maternal death	1 (1.8)	0 (0.0)	2.93 (2.36 - 3.63)	0.000
Convulsions	3 (5.5)	0 (0.0)	3 (2.40 - 3.74)	0.000
Resistant headaches	3 (5.5)	0 (0.0)	3 (2.40 - 3.74)	0.000
HELLP syndrome	1 (1.8)	0 (0.0)	2.92 (2.35 - 3.63)	0.000
Acute pulmonary oedema	1 (1.8)	0 (0.0)	2.92 (2.35 - 3.63)	0.000

**Table 5.** Foetal complications associated with the context of preeclampsia.

Variables	Eclamptic patients N (%)	Non eclamptic patients N (%)	RR(IC)	P value
Prematurity	35 (63.6)	10 (9.6)	4.43 (2.89 - 6.80)	0.000
Neonatal asphyxia	1 (1.8)	0 (0.0)	2.93 (2.36 - 3.63)	0.000
Disease of hyaline membranes	1 (1.8)	0 (0.0)	2.93 (2.36 - 3.63)	0.000
Respiratory distress	4 (7.3)	5 (4.8)	1.31 [0.61 - 2.81]	0.492
Neonatal jaundice	5 (9.1)	7 (6.7)	1.22 [0.60 - 2.48]	0.573
Neonatal infection	5 (9.1)	7 (6.7)	1.22 [0.60 - 2.48]	0.573
Death	8 (14.5)	12 (11.5)	1.18 [0.66 - 2.12]	0.573

(Cameroon) in 2006 or 8.4% found by Some Der *et al.* in Burkina Faso in 2010 [4] [9]. Our study was conducted during the dry season where the frequency of pre-eclampsia is significantly higher compared to the rainy season [10]. Our attitude towards pre-eclampsia/eclampsia at the end of pregnancy is to systematically perform emergency caesarean deliveries when cervical obstetric conditions are not favourable. Mbu *et al.* in Yaoundé in 2006 [11] found that caesarean deliveries seemed to have a relative benefit compared to vaginal delivery.

In our cohort, women were aged between 13 and 40 with an average age of 28.16 years. Women under 25 were most represented in the pre-eclamptic group. Essiben *et al.* in Yaoundé [12] found similar results. Like young age, nulliparity predominated in the pre-eclamptic group. It follows from the literature that nulliparity is a risk factor for preeclampsia [13] [14].

The overall incidence of maternal complications was 26.4%. This rate, although higher, is comparable to that found by Kemfang *et al.* [3], and this increase could be explained by the fact that we included complications that could be side effects of anaesthetic drugs or the clinical manifestation of a late management of the disease. In fact, oedema of the limbs can cause paraesthesia just like anaesthetic drugs. Yet the fact remains that in the context of preeclampsia, the incidence of maternal complications is much greater, with almost one in two patients presenting a complication. Most of these procedures take place urgently

and most patients arrive with an altered general condition. Emergency caesarean deliveries are likely to cause more complications (20% to 30%) than elective cases (2% to 3%) [15] [16]. In addition, complications related to the state of preeclampsia will worsen the condition of the patient. We observed more complications related to the worsening of pre-eclampsia than those attributable to the surgical procedure and the circumstances surrounding the intervention.

Most pre-eclamptic women put to birth between the 32nd and 37th week of pregnancy (GA). It is often the period during which the disease is discovered and the complications thus more frequent. Lee *et al.* found that the most feared and common complication of pre-eclampsia occurred in 50% of cases before 37 GA [17].

The death registered in our study population was among women operated in the context of pre-eclampsia who had a 3-fold risk of death. Mbu *et al.* found a death rate of 12% in pre-eclamptic women [11] against 1.8% in our study Mboudou *et al.* in 2009 [6] at HGOPY in Cameroon who had a mortality of 2.88% in patients with high blood pressure in pregnancy. In contrast, Fomulu *et al.* in 2006 found a death rate of 33.44% among women with eclampsia [18].

This difference in prevalence could be explained by study population differences. Of the pre-eclamptic patients in whom spinal anaesthesia was performed, 5.5% presented with persistence of headaches resistant to the usual analgesics, which necessitated the use of opioids. The risk of these headaches increased by a factor of three. Beye *et al.* in 2008 [19] in Senegal found that post-spinal anaesthesia headaches, and nausea and vomiting were the most common postoperative complications with an incidence of 15.3%. SimaZué *et al.* [20] linked Spino-can needles to the occurrence of post-spinal anaesthesia headaches. These are the same needles that are used in our environment. This complication was not observed in the group of non-preeclamptic patients. One might think that spinal anaesthesia aggravated headaches that already existed because of the severity of pre-eclampsia and made them resistant to the usual analgesics.

The incidence of DIC and acute pulmonary oedema was low or comparable to that in literature [6] [20]. The occurrence of postpartum seizures was inferior to that found by Lee *et al.* [21] and Sabiri *et al.* [22] who found a postpartum eclampsia prevalence of 19% to 30%. The mode of rapid delivery by caesarean section, which stops the evolution of the disease, could explain this finding.

The context of severe preeclampsia has influenced the immediate neonatal prognosis. Prematurity, neonatal asphyxia, and hyaline membrane disease were more common with a 3-fold or 4-fold risk. Children born to pre-eclamptic mothers had a higher risk of having a low birth weight. The definite treatment for pre-eclampsia consists of the expulsion of the products of conception whatever the term of the pregnancy. The severity of the disease imposes childbirth to interrupt the course of the disease and leads to prematurity. In addition, placental abnormalities related to the pathology may be responsible for retarded foetal growth. Many authors have found lower rates of prematurity related to hyper-



tensive diseases in pregnancy [23] [24].

Our high prematurity rate could be explained by our obstetric management in case of severe pre-eclampsia at the end of pregnancy. We found that severe preeclampsia/eclampsia increases the risk of hyaline membrane disease by 2. This result is consistent with Chérif *et al.* [24] in 2008 who found that the risk of developing hyaline membrane disease is significantly increased in the presence of preeclampsia. PES/E causes a decrease in placental vasculature. This defect of vascularization will be at the origin of a delay of maturation of the foetal organs and in particular the respiratory apparatus.

Our results which are a true reflection of our work however have some limitations. First, some of our patients with preeclampsia opted for a discharge from hospital against medical advice, hence we could not follow them up appropriately to ensure satisfactory improvement in their states. Their decision was backed by diverse reasons such as financial difficulties family pressure or adverse medical events. Also, a longer study period will have enabled us to recruit more patients. Finally, some patients' inability to cover their healthcare costs could impact their quality of care and hence our results.

## 5. Conclusion

Severe preeclampsia favours the occurrence of postoperative complications. Maternal complications were dominated by the complications of severe pre-eclampsia but were less frequent than those described in literature. Prematurity was the main foetal complication.

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## Authors' Contributions

Essiben Felix, Foumane Pascal and GwosLaurentine conceived the study, participated in the study design and collection data. Essiben Félix and Meka Um Esther have been involved in analysis and interpretation of data and drafting the manuscript. Ojong Samuel and Mve Koh Valere in review of the article. Foumane supervised the study. All authors have read and approved the final manuscript.

## Conflicts of Interest

The authors declare no conflict of interests.

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