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Association of Fetomaternal Outcomes of Labour with Eclampsia

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ABSTRACT

Background: Eclampsia is a severe complication of hypertensive disorders in pregnancy and remains a significant cause of maternal and neonatal morbidity and mortality. While preeclampsia can be managed with early interventions, the transition to eclampsia leads to life-threatening complications. **Objective:** The objective of this study was to determine the frequency of adverse fetomaternal outcomes in patients with eclampsia and preeclampsia and to evaluate their association with these hypertensive disorders of pregnancy. **Study Design:** Descriptive study. **Duration and Place of Study:** This study was conducted from 01 October 2024 to 15 January 2025 at the Department of Obstetrics and Gynaecology, Mardan Medical Complex, Mardan. **Methodology:** A total of 100 patients diagnosed with preeclampsia or eclampsia were included. Participants aged 18–40 years with singleton pregnancies beyond 32 weeks of gestation were enrolled. Demographic data, clinical parameters, and fetomaternal outcomes were recorded. The primary outcomes assessed included acute kidney injury, HELLP syndrome, pulmonary edema, maternal mortality, perinatal mortality, and NICU admissions. **Results:** Among the study participants, acute kidney injury was observed in 24% of cases (70.8% in preeclampsia vs. 29.2% in eclampsia, p=0.685). HELLP syndrome was significantly higher in eclamptic patients (94.1% vs. 5.9%, p<0.001). Pulmonary edema occurred more frequently in eclampsia cases (83.3% vs. 16.7%, p=0.004). Maternal mortality was recorded in 3% of cases (33.3% in preeclampsia vs. 66.7% in eclampsia, p=0.165). **Conclusion:** Eclampsia poses greater fetomaternal risks than preeclampsia, including HELLP syndrome, pulmonary edema, and perinatal death. High NICU admissions highlight severe neonatal outcomes, underscoring the need for early diagnosis, vigilant monitoring, and timely intervention to improve maternal and neonatal outcomes.

INTRODUCTION

Preeclampsia is a pregnancy-induced disorder of hypertension with onset of high blood pressure (≥140/90 mmHg) and proteinuria after 20 weeks of gestation.[1] The pathophysiology involves impaired placentation, dysfunction in the endothelial cells, and imbalance in angiogenic factors that result in vasoconstriction, reduction in perfusion to organs, and hypercoagulable state.[2] It can present with a variety of symptoms like hypertension, edema, and proteinuria, and in severe forms, multi-organ dysfunction.[2] It can result in more severe forms like HELLP syndrome (Hemolysis, Elevated Liver enzymes, and Low Platelet count), eclampsia, and pulmonary edema, and can be treated by early delivery in case it becomes severe.[3]

Severe preeclampsia's worst complication, eclampsia, features a seizure in a woman with preeclampsia without a preceding neurological disorder.[4] The pathophysiology of eclampsia has not been clearly understood with cerebral vasospasm, damage to endothelial cells, and ischemia being hypothesized to be involved.[5] Eclampsia requires immediate anticonvulsant therapy with magnesium sulfate, regulation of blood pressures, and immediate delivery to prevent further sequelae.[6] Maternal morbidity due to eclampsia can be high with high-risk involvement of organs, stroke, and systemic sequelae. Severe fetomaternal complications in eclampsia and preeclampsia include HELLP syndrome, pulmonary edema, and acute kidney injury (AKI).[7] AKI due to renal hypoperfusion and damage to endothelial cells results in impaired renal function. Pulmonary edema due to increased capillary permeability and left ventricular dysfunction can result in respiratory failure and requires urgent intervention.[8] HELLP syndrome, a complication in severe preeclampsia, features hemolysis, raised liver enzymes, and low platelets and has a high risk for rupture of the liver, disseminated intravascular coagulation (DIC), and death.[9] Maternal mortality also has a risk

factor, particularly in eclampsia or severe preeclampsia that has not been diagnosed and treated early.[10]

For the fetus, in pregnancies with preeclampsia and eclampsia, perinatal mortality is considerably increased due to intrauterine growth restriction (IUGR), placental insufficiency, or prematurity.[11] Infants to women with severe hypertension disorders have a high rate of NICU admission, particularly those who were prematurely born, as they have a high risk of respiratory distress syndrome (RDS), jaundice, and prematurity and placental dysfunction-related complications.[12] Developmental delay and long-term health complications can ensue in these babies, and close monitoring and management in pregnancy and in the neonatal period are required.[13]

A study conducted by Irene K. and colleagues revealed that the incidence of acute kidney injury and HELLP syndrome in eclamptic patients was both 20.8%.[14] Similarly, Agarwal M. and his team found that among eclamptic patients, pulmonary edema occurred in 6.81% of cases, maternal mortality was reported at 6.8%, perinatal mortality stood at 14.77%, and 34.09% of the cases required admission to the Neonatal Intensive Care Unit (NICU).[15]

It is important to carry out this study in a bid to have a better insight into the relationship between preeclampsia, eclampsia, and fetomaternal outcome during labor. Through a study of these relationships, it will be possible to identify principal risk factors, improve early detection and management, and in the long term, reduce complications and mortality from these disorders. The findings could be applied to inform clinical practice and enhance neonatal and maternal care, making it safer for mother and baby.

METHODOLOGY

This descriptive study was conducted at the Department of Obstetrics and Gynaecology, Mardan Medical Complex, Mardan, from 01 October 2024 to 15 January 2025. A total of 100 patients were included in the study, with the sample size calculated using the WHO sample size software, based on a 95% confidence level, a 5% margin of error, and an expected frequency of maternal death at 6.8% among eclamptic patients.[15] The inclusion criteria consisted of females with eclampsia, aged between 18 and 40 years with a singleton pregnancy confirmed by ultrasound, a gestational age of over 32 weeks according to the last menstrual period (LMP), and with any parity. Eclampsia, defined as preeclampsia accompanied by at least one seizure, with each seizure lasting between 60 to 75 seconds. Exclusion criteria included a history of epilepsy, prior seizures, or the presence of space-occupying lesions or intracerebral infections on CT scans.

Ethical approval was obtained for the study, and informed consent was taken from each patient or their attendant. Demographic information such as age, gestational age, parity, body mass index (BMI), diabetes status, education level, residential area, socioeconomic status, and profession was recorded. Patients were followed up until delivery, and fetomaternal outcomes were noted, including acute kidney injury, which was defined as a urine output of less than 500 mL/day and serum creatinine levels greater than 1.2 mg/dL for a duration of 12 hours. HELLP syndrome was identified as when laboratory tests showing elevated lactate dehydrogenase (LDH) levels above 600 IU/L, elevated bilirubin over 1.2 mg/dL, elevated liver transaminases (AST and/or ALT) greater than 70 IU/L, and thrombocytopenia with platelet counts below 100,000/microL. Pulmonary edema was diagnosed through chest X-ray with evidence of fluid accumulation in the lungs. Maternal death was recorded if the patient died within 48 hours of delivery, while perinatal mortality was noted if the neonate died within 48 hours of birth. Neonatal intensive care unit (NICU) admission was documented if the infant was admitted due to fetal distress.

Statistical analysis was carried out using IBM SPSS Version 26. Categorical variables were analyzed in terms of frequencies and percentages. Continuous variables were presented as mean ± standard deviation, or median (interquartile range) if the data were not normally distributed, with normality tested using the Shapiro-Wilk test. Comparisons of fetomaternal outcomes between eclamptic and preeclamptic patients were performed using the chi-square test or Fisher's exact test, with a p-value of ≤ 0.05 considered statistically significant.

RESULTS

The study included 100 patients with a mean age of 30.89±4.54 years, gestational age of 35.70±2.41 weeks, and a parity of 2.35±1.65. The mean BMI was 27.26±2.84 kg/m². Regarding education, 31% were uneducated, 47% had primary education, 18% had secondary education, and 4% had higher education. The socioeconomic status distribution showed that 31% were from a low-income background, 64% belonged to the middle class, and 5% were categorized as rich. The majority (64%) were from rural areas, and 36% were from urban regions. Most patients (89%) were housewives, while 11% had jobs. Diabetes was present in 10% of the participants, while 90% were non-diabetic. Among the study population, 74% had preeclampsia, whereas 26% had eclampsia (as shown in Table-I).

Table I

Patient Demographics (n=100)

Demographics	Mean ± SD
Age (years)	30.890±4.54

Gestational Age (weeks)		35.700±2.41
Parity		2.350±1.65
BMI (Kg/m^2)		27.258±2.84
Education	Uneducated n (%)	31 (31%)
	Primary n (%)	47 (47%)
	Secondary n (%)	18 (18%)
	Higher n (%)	4 (4%)
Socioeconomic Status	Low n (%)	31 (31%)
	Middle n (%)	64 (64%)
	Rich n (%)	5 (5%)
Residential Status	Rural n (%)	64 (64%)
	Urban n (%)	36 (36%)
Profession	House wife n (%)	89 (89%)
	Job n (%)	11 (11%)
Diabetes	Yes n (%)	10 (10%)
	No n (%)	90 (90%)
Preeclampsia/ Eclampsia	Preeclampsia n (%)	74 (74%)
	Eclampsia n (%)	26 (26%)

The prevalence of adverse fetomaternal outcomes revealed that 24% developed acute kidney injury, 17% had HELLP syndrome, 6% experienced pulmonary edema, and 3% resulted in maternal death. Perinatal mortality was observed in 6% of cases, and NICU admission was required in 33% of neonates (as shown in Table-II).

Table II

Prevalence of adverse fetomaternal outcomes

Adverse fetomaternal outcomes	Frequency	% age
Acute Kidney Injury	24	24%
HELLP Syndrome	17	17%
Pulmonary Edema	6	6%
Maternal Death	3	3%
Perinatal Mortality	6	6%
NICU Admission	33	33%

Comparison of adverse fetomaternal outcomes between preeclampsia and eclampsia demonstrated significant differences in certain complications. HELLP syndrome was significantly higher in eclamptic patients (94.1% vs. 5.9%, p<0.001). Pulmonary edema was more prevalent in eclampsia cases (83.3% vs. 16.7%, p=0.004), and perinatal mortality was significantly elevated in eclampsia cases (83.3% vs. 16.7%, p=0.004). NICU admissions were also significantly associated with eclampsia (39.4% vs. 60.6%, p=0.032). However, acute kidney injury (70.8% in preeclampsia vs. 29.2% in eclampsia, p=0.685) and maternal death (33.3% in preeclampsia vs. 66.7% in eclampsia, p=0.165) did not show statistically significant differences between the two groups (as shown in Table-III).

Table III

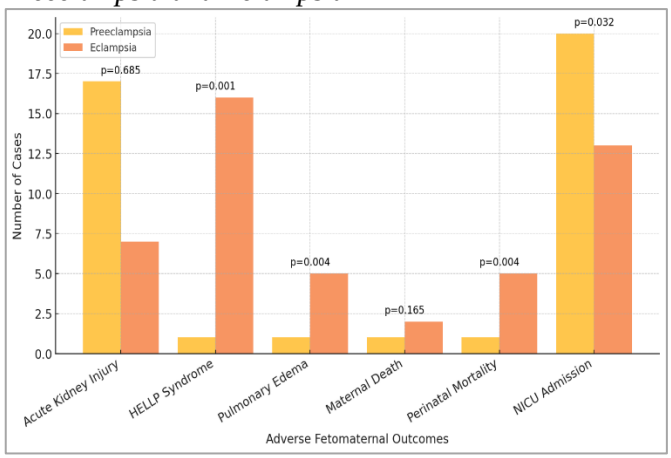
Comparison of adverse fetomaternal outcomes between preeclampsia and eclampsia (n=100)

Adverse fetomaternal outcomes	Preeclampsia n=74 n (%)	Eclampsia n=26 n (%)	P value
Acute Kidney Injury	17 (70.8%)	7 (29.2%)	**0.685**
HELLP Syndrome	1 (5.9%)	16 (94.1%)	**<0.001***
Pulmonary Edema	1 (16.7%)	5 (83.3%)	**0.004***
Maternal Death	1 (33.3%)	2 (66.7%)	**0.165***
Perinatal Mortality	1 (16.7%)	5 (83.3%)	**0.004***
NICU Admission	20 (60.6%)	13 (39.4%)	**0.032**

*Fischer Exact Test

Graph I

Comparison of Adverse Fetomaternal Outcomes in Preeclampsia and Eclampsia



DISCUSSION

The findings indicate that eclampsia has a higher risk for severe complications in both mother and neonate, emphasizing its life-threatening potential compared to preeclampsia.

Our research revealed that in our population, fetomaternal complications had a prevalence such that 24% presented with acute kidney injury, 17% with HELLP syndrome, 6% with pulmonary edema, and 3% resulted in death. Perinatal death occurred in 6% and NICU admission in 33% of babies. Although percentage distribution in preeclampsia and eclampsia would appear high compared to others, in absolute numbers, it's in a similar range to that in previous studies.

HELLP Syndrome was more severe in eclamptic patients (94.1% vs. 5.9%, p<0.001), consistent with Memon et al. [16] who reported a lesser incidence rate of HELLP syndrome in eclampsia at 5%, and Chimrani et al. [17] who had a prevalence rate of 3.57% in severe preeclampsia. Subburam et al. [18] had a slightly higher rate at 12.35%. The much higher rate in our study can be explained by a more severe manifestation of eclampsia cases in which there's a worsening of disease due to endothelial dysfunction and coagulation abnormalities.

Pulmonary Edema was present in eclampsia patients more frequently in our study (83.3% vs. 16.7%, p=0.004) than in Memon et al. [16] (9%) and Chimrani et al. [17] (0.89%). This high prevalence in our study reflects that eclampsia patients exhibited more severe hypertensive crises, with fluid overload and cardiopulmonary complications. The discrepancy between our findings and those in previous studies may be explained by

differences in disease severity at presentation and in fluid management.

Perinatal Mortality was much higher in eclampsia patients (83.3% as opposed to 16.7%, p=0.004), a rate higher than that reported by Nguyen et al. [19] with a perinatal mortality rate of 6.3% in pregnancies with hypertension, and Bozdağ et al. [20] with neonatal mortality rates in severe preeclampsia and early-onset preeclampsia being 24% and 30%, respectively. Similarly, Memon et al. [16] reported intrauterine death in 20% and early neonatal death in 30% in eclamptic women, while Chimrani et al. [17] had a rate of 16.07% in perinatal mortality. The lower rate of perinatal mortality in earlier studies could be due to better obstetric interventions, while our study population could have been affected by factors like delayed hospitalization and lack of neonatal intensive care.

NICU Admissions were much more frequent in eclampsia patients (60.6% vs. 39.4%, p=0.032), in agreement with Chimrani et al. [17] (43.75%) and Bozdağ et al. [20] (67% in severe preeclampsia and 91% in early-onset preeclampsia). Subburam et al. [18] had reported 30.8% NICU admission in neonates whose mothers had severe preeclampsia. The relatively high rate of NICU admission in our study may be due to complications such as preterm birth, intrauterine growth restriction, and fetal distress, which are more likely to be present in eclampsia patients.

AKI was present in 24% of patients, and there was no statistically significant difference between eclampsia and preeclampsia (70.8% and 29.2%, p=0.685). This contrasts with Nguyen et al. [19] with a rate of renal complications at 1.6%, and Memon et al. [16] with a prevalence rate of renal impairment at 8%. Venkatesh et al. [21] stated that fetal growth restriction was more likely to be a contributory factor in neonatal complications, but comorbidities had no effect on maternal complications such as AKI. Our findings show that AKI in hypertensive disorders may be a result of systemic endothelial dysfunction and not merely due to the severity of hypertension.

Maternal Mortality occurred in 3% of patients, with no statistically significant difference in eclampsia and preeclampsia (33.3% vs. 66.7%, p=0.165). This is consistent with Memon et al. [16] who had a single death in a mother, and Bozdağ et al. [20] who had a rate of 1% for maternal mortality. No maternal deaths were documented by Nguyen et al. [19] while a PRES in eclampsia/preeclampsia in Saxena et al. [22] considerably increased maternal mortality and morbidity. The high rate of maternal mortality in our study in comparison to previous studies may be due to delayed referrals, poor critical care, and severe disease presentation.

Our findings agree with those of Saxena et al. [22] who compared fetomaternal outcome in eclampsia and preeclampsia with PRES. They found that PRES was present in 62.5% of patients, predominantly in antepartum eclampsia (47.5%) and was associated with increased ICU admission, cesarean section, and neonatal complications. Our study also indicates the extremely high risk of poor outcome in eclampsia and highlights the need for early diagnosis and management.

There are some limitations to our study. Being a single-center study, results do not generalize to the general population. The small sample size limits our comparisons' statistical power, and it may cause some of our findings to be non-significant. The study design does not account for long-term neonatal and maternal outcome, which would provide a better insight into pregnancy with hypertensive disorders. Large-scale multicentric prospective studies in the future would be needed to validate our findings and study further risk factors for poor outcome in preeclampsia and eclampsia.

CONCLUSION

Our study has confirmed that eclampsia has a much higher risk for fetomaternal complications than preeclampsia, with a high prevalence of severe complications such as HELLP syndrome, pulmonary edema, and perinatal death. The high frequency of NICU admission in neonates born to eclamptic women indicates severe neonatal outcome due to pregnancy-induced hypertension. These findings emphasize the imperative need for early diagnosis, rigorous antenatal monitoring, and early medical interventions to prevent eclampsia from being a complication of preeclampsia and improve maternal and neonatal outcome.

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