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Maternal and Perinatal Outcomes in Severe Preeclampsia and Eclampsia: A Retrospective Cohort Study from a Tertiary Care Teaching Hospital

Bharathi.P.[1], Srinivasa K.[2], [3]Bhavya K

[1] *Associate professor, Department of Department of Obstetrics and Gynecology, Chamarajanagar Institute of Medical College, Chamarajanagar -571313, Karnataka, India.*
[2] *Professor and Head, Department of Pharmacology, Chamarajanagar Institute of Medical College, Chamarajanagar -571313, Karnataka, India.*
Assistant professor, department of Anaesthesiology, MMCRI, Mysore- 570001. Karnataka, India.

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Corresponding Author:

Bharathi.P.

Associate professor, Department of Department of Obstetrics and Gynecology, Chamarajanagar Institute of Medical College, Chamarajanagar -571313, Karnataka, India.

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ABSTRACT

Background; Hypotensive disorders of pregnancy (HDP), particularly severe preeclampsia and eclampsia, are leading contributors to maternal and perinatal morbidity and mortality worldwide. Prematurity is linked to multisystem maternal involvement and unfavorable neonatal outcomes, especially in low- and middle-income settings. This study evaluated maternal and perinatal outcomes among women with severe preeclampsia and eclampsia and analyzed the correlation between gestational age at diagnosis and adverse outcomes.
Methods; Statistical analysis was conducted using SPSS version 26.0 (Statistical Package for the Social Sciences). The chi-square (χ^2) test, which evaluates if there is a significant association between categorical variables, was used to assess associations. The independent t-test, which compares the means of two independent groups to determine whether they differ, was used to evaluate the group means. Statistical significance was defined as a p-value less than 0.05, indicating that the results were unlikely to be due to chance.
Results; Most women (53.7%) were aged 21-30 years. Among them, 52.7% were nulliparous. Severe hypertension was present on admission in 80.0% of cases. Cesarean section was performed in 72.7% of deliveries. The most common maternal complications were postpartum hemorrhage
(38.2%), HELLP syndrome (18.2%), and kidney failure (18.2%). Maternal mortality was 0.9%. Major adverse perinatal outcomes included preterm birth (43.6%), fetal growth restriction (45.5%), and NICU admission (46.4%). There was a significant association between gestational age under 34 weeks and increased fetal complications ($\chi^2 = 10.842$, $p = 0.004$). Gestational age under 34 weeks was also significantly related to prolonged hospitalization ($\chi^2 = 24.316$, $p = 0.001$).
Conclusion; Preeclampsia and eclampsia cause significant maternal morbidity and negative perinatal outcomes, especially with early-onset cases. Earlier gestational age at diagnosis heightens the likelihood of fetal complications and extended hospitalization. Enhancing antenatal surveillance, promoting timely referral, and standardizing management protocols are essential to improve fetomaternal outcomes in tertiary care centers.

Keywords: *Severe preeclampsia; Eclampsia; Hypertensive disorders of pregnancy; Maternal morbidity; Perinatal outcomes; Fetal growth restriction; Prematurity; HELLP syndrome; Neonatal intensive care; Tertiary care hospital.*

INTRODUCTION

Hypertensive disorders of pregnancy (HDP) cause significant maternal and perinatal morbidity and mortality worldwide. They affect 8 to 10 percent of pregnancies. Despite advances in antenatal surveillance, risk stratification, and obstetric critical care, HDP still disproportionately leads to adverse maternal and neonatal outcomes. The impact is especially severe in low- and middle-income countries. Severe preeclampsia and eclampsia are the most life-threatening forms of HDP. These multisystemic conditions can progress rapidly.

Preeclampsia is a pregnancy-specific complication marked by hypertension after 20 weeks of gestation. It also involves proteinuria and/or maternal organ dysfunction. Its pathophysiology includes abnormal placentation, endothelial dysfunction, systemic inflammation, and vasospasm. These changes cause widespread maternal organ involvement. Severe preeclampsia is defined by blood pressure of 160/110 mmHg or higher, or end-organ dysfunction. Such dysfunction includes hepatic impairment, renal failure, thrombocytopenia, pulmonary edema, or neurological symptoms. Eclampsia is the most severe form. It involves generalized tonic-clonic seizures in a woman with preeclampsia and no other neurological disorders.

Maternal complications from severe preeclampsia and eclampsia include HELLP syndrome. HELLP stands for hemolysis, elevated liver enzymes, and low platelet count. Other complications are acute kidney injury, disseminated intravascular coagulation, placental abruption, pulmonary edema, cerebrovascular accidents, and maternal mortality. Long-term cardiovascular morbidity is also more common among affected women. Fetal complications stem from uteroplacental insufficiency. These include fetal growth restriction, oligohydramnios, preterm birth, low birth weight, intrauterine fetal demise, and greater neonatal intensive care needs. Preterm delivery is often needed to prevent maternal deterioration. This need further complicates neonatal outcomes.

Using clear treatment plans has improved outcomes for these conditions. These plans include medicines to lower blood pressure, magnesium sulfate to prevent seizures, and delivering the baby at the right time. However, HDP can still be unpredictable and exhibit varying levels of severity, making care challenging. Diagnosing high-risk cases early and identifying the most common local problems can improve outcomes.

This study looks back at patient records to assess how mothers and babies did after severe preeclampsia or eclampsia at a large teaching hospital. It reviews cases over three years to evaluate health problems in mothers and newborns. It also examines whether the timing of the condition during pregnancy affects the risk of adverse outcomes. Lastly, the study identifies factors tied to more serious problems for mothers and babies. The results are meant to help guide decisions and improve care using local data.

MATERIALS AND METHODS

Study Design and Setting: This retrospective cohort study was conducted at the Department of Obstetrics and Gynaecology, Chamarajanagar Institute of Medical Sciences (CIMS) in Chamarajanagar, Karnataka, India. CIMS is a tertiary care teaching hospital and serves as a referral centre for high-risk obstetric cases. The study aimed to comprehensively assess the target population and inform subsequent analyses. The methods described below outline the approach taken to ensure comprehensive data collection.

The analysis encompassed the period from January 2022 to December 2024. All eligible women diagnosed with severe preeclampsia or eclampsia during this period were included.

Participants were followed until delivery, and early postpartum outcomes were recorded from hospital records. To clarify which individuals formed the study cohort, the following section details the criteria used for participant selection.

Study Population: Eligibility screening included pregnant women admitted after 20 weeks of gestation, diagnosed with severe preeclampsia or eclampsia. Severe preeclampsia was defined by a systolic blood pressure of 160 mmHg or a diastolic blood pressure of 110 mmHg, recorded on two occasions at least four hours apart. Diagnosis also required proteinuria (300 mg in a 24-hour urine collection or 1+ on dipstick) and/or end-organ dysfunction. End-organ dysfunction encompassed thrombocytopenia, elevated liver enzymes, renal impairment, pulmonary edema, or permanent neurological symptoms. Eclampsia was defined as new generalized tonic-clonic seizures in a woman with preeclampsia not attributable to other neurological or metabolic conditions. To fully delineate the study group, clear inclusion and exclusion criteria are detailed below.

Exclusion criteria were as follows: (1) women with chronic hypertension diagnosed before pregnancy or prior to 20 weeks of gestation, since this would indicate a pre-existing condition rather than pregnancy-induced hypertension; (2) those with a history of seizure disorders unrelated to preeclampsia or eclampsia, such as epilepsy, to avoid confounding seizure etiology; (3) patients with pre-existing chronic renal disease, which could affect renal function parameters relevant to preeclampsia diagnosis; (4) women with systemic illnesses not related to pregnancy, as these could influence outcomes

independently; (5) individuals with hypertensive disorders that did not meet the strict criteria for severe preeclampsia or eclampsia; and (6) cases with incomplete medical records, to ensure the accuracy and completeness of the data analyzed. Each participant was systematically screened against all eligibility criteria.

Ethical Considerations: The study protocol was approved by the Institutional Ethics Committee of Chamarajanagar Institute of Medical Sciences (Approval No.:

CIMS/IEC/2022–/____). Informed consent was waived due to the retrospective, record-based design. All data were anonymized prior to analysis, and confidentiality was maintained in accordance with the Declaration. To clarify how the collected information was handled statistically, the subsequent section outlines the statistical methods used for data analysis.

Statistical Analysis: Data were entered into Excel and analyzed with SPSS version 26.0 (IBM Corp.). Continuous variables were summarized as mean ± standard deviation. Categorical variables were presented as frequencies and percentages. Independent t-tests compared continuous variables. Chi-square or Fisher's exact tests were used to compare categorical variables. Statistical significance was defined as $p < 0.05$.

Clinical Presentation of Study Participants: A total of 110 women diagnosed with severe preeclampsia or eclampsia were included in the analysis. Most respondents were aged 21-25 years (28.0%) and 26-30 years (25.5%). Women aged 31-35 years comprised 23.5% of cases. Adolescents (<20 years) accounted for 12.0% of the cohort, and women aged 35+ accounted for 11.0%.

More than half (52.5%) of the women had a normal BMI (18.5-25 kg/m2). Overweight and obese women made up 38.5% and 8.0%, respectively. Most women were nulliparous (53.0%), followed by women with one prior birth (33.5%).

The most common comorbidities were anemia (33.5%), hypothyroidism (22.0%), and diabetes mellitus (21.0%). A prior history of preeclampsia was present in 18.0% of women. Most cases were diagnosed at 28-34 weeks (36.5%) and 34-37 weeks (29.0%). (Table 1)

Table 1: Socio-Demographic and Obstetric Characteristics (n = 110)

Variable	Number of Subjects (n=110)	Percentage (%)
1. Age Group		
<20 years	13	11.8
21–25 years	31	28.2
26–30 years	28	25.5
31–35 years	26	23.6
>35 years	12	10.9
2. Body Mass Index (BMI)		
<18.5	1	0.9
18.5–25	58	52.7
25–30	42	38.2
>30	9	8.2
3. Obstetric Score		
Nullipara	58	52.7
Para 1	37	33.6
Para 2	13	11.8
Para 3	1	0.9
>3	1	0.9
4. Associated Risk Factors		
Anaemia	37	33.6
Diabetes	23	20.9
New paternity	7	6.4
Multiple pregnancy	2	1.8

History of preeclampsia	20	18.2
Hypothyroidism	24	21.8
PCOD	6	5.5
Recurrent UTI	3	2.7
SLE	3	2.7
5. Gestational Age at Diagnosis (weeks)		
<28	8	7.3
28–34	40	36.4
34–37	32	29.1
>37	30	27.3

Values are presented as number (n) and percentage (%). Percentages were calculated using the total study population (n = 110) as the denominator. BMI = Body Mass Index; PCOD = Polycystic Ovarian Disease; SLE = Systemic Lupus Erythematosus.

Clinical Presentation at Admission Among women in the studied age group, headache was the most frequently reported symptom at admission (50.0%), followed by pedal edema (49.0%) and high blood pressure (80.0%). Blurring of vision was reported in 14.0% of women, and epigastric pain in 10.0%. Documented convulsions occurred in 6.5% of cases, depicting women with eclampsia. A lower proportion was also noted in oliguria (3.0%) and generalized edema (13.0%).

Table 2: Clinical Presentation of Study Participants (n = 110)

Symptoms	**Number of Cases (n=110)**	**Percentage (%)**
Convulsion	7	6.4
Headache	55	50.0
Vomiting	10	9.1
Blurring of vision	15	13.6
Epigastric pain	11	10.0
Pedal edema	54	49.1
Oliguria	3	2.7
Generalized edema	14	12.7
Severe hypertension (≥160/110 mmHg)	88	80.0

Values are expressed as frequencies and percentages, calculated using the total sample size (n = 110). Percentages may exceed 100% as multiple symptoms were reported in some patients.

Gestational Age at Diagnosis: Hypertensive disease was found to occur at an early age (less than 28 weeks) in 4.5% of the women. The highest proportion (36.5) was found between 28 and 34 weeks, with the highest percentage (25.0) found between 34 and 37 weeks. About 34.0 per cent were diagnosed after 37 weeks of gestation.

Table 3: Gestational Age at Diagnosis (n = 110)

Age Group (Weeks)	**Frequency (n=110)**	**Percentage (%)**
<28 weeks	5	4.5
28–34 weeks	28	25.5
34–37 weeks	40	36.4
>37 weeks	37	33.6
Total	**110**	**100**

Values are reported as number (n) and percentage (%), calculated using the total study population (n = 110) as the denominator.

Mode of Delivery: The most common delivery mode was cesarean section, accounting for 72.5 percent of deliveries. Vaginal delivery was performed in 25.0 percent of women, and 2.5 percent had instrumental delivery. The high rate of cesarean delivery reflects complications in maternal health or the need for rapid birth.

Table 4. Mode of Delivery (n = 110)

Mode of Delivery	**Frequency (n=110)**	**Percentage (%)**
Vaginal delivery	28	25.5
Caesarean section	80	72.7
Instrumental delivery	2	1.8
Total	**110**	**100**

Values are presented as number (n) and percentage (%), calculated using total deliveries (n = 110) as the denominator.

Maternal Complications

Postpartum hemorrhage was the most frequent maternal complication, occurring in 38.2 percent of cases. In addition, renal dysfunction and HELLP syndrome were each observed in 18.2 percent of women. Eclampsia was identified in 12.7 percent. Furthermore, placental abruption and disseminated intravascular coagulation (DIC) were both reported in 7.3 percent of cases. Pulmonary edema and acute respiratory distress syndrome (ARDS) were less common, each affecting 1.8 percent. Finally, one maternal death (0.9 percent) occurred during the study period.

Table.5. Maternal Complications (n = 110)

Factor	**requency (n=110)**	**entage (%)**	
Eclampsia	14	12.7	
HELLP syndrome	20	18.2	
Renal dysfunction	20	18.2	
Postpartum haemorrhage (PPH)	42	38.2	
Pulmonary edema	2	1.8	
Placental abruption	8	7.3	
Disseminated intravascular coagulation (DIC)	8	7.3	
Acute respiratory distress syndrome (ARDS)	2	1.8	
Posterior reversible encephalopathy syndrome (PRES)	4	3.6	
Maternal death	1	0.9	

Values are expressed as frequency (n) and percentage (%), calculated using the total study population (n = 110). HELLP = Hemolysis, Elevated Liver Enzymes, and Low Platelet Count; DIC = Disseminated Intravascular Coagulation; ARDS = acute respiratory distress syndrome; PRES = Posterior Reversible Encephalopathy Syndrome; PPH = Postpartum Haemorrhage.

Perinatal Outcomes: Among the 110 births, 96.4% ended with live births, while stillbirth was present in 3.6 percent. Additionally, the neonatal mortality rate was noted as 1.8%. Preterm and FGR cases were recorded at 43.6% and 45.5%, respectively. Furthermore, almost half of the newborns (46.4%) were admitted to the NICU. At 1 minute, a low APGAR score was noted in 20.9% of infants.

Table:6. Perinatal Outcomes (n = 110)

Factor	**Frequency (n=110)**	**Percentage (%)**
Live births	106	96.4
Stillbirths	4	3.6
Neonatal death	2	1.8
Prematurity	48	43.6
Low APGAR at 1 minute	23	20.9
Meconium aspiration	3	2.7
NICU admission	51	46.4
Fetal growth restriction (FGR)	50	45.5

Data are presented as number (n) and percentage (%), calculated using total births (n = 110) as the denominator. NICU = Neonatal Intensive Care Unit; FGR = Fetal Growth Restriction; APGAR = Appearance, Pulse, Grimace, Activity, Respiration score

Association Between Gestational Age and Fetal Complications

Gestational age at diagnosis was significantly associated with fetal complications ($\chi 2 =$ 10.842, p = 0.004). The highest rate of fetal complications occurred among women diagnosed before 34 weeks (72.9%, 35/48 cases), followed by 52.9% in the 34–37 weeks group (18/34 cases), and 39.3% in the group diagnosed at 37 weeks or later (11/28 cases).

Table 7: Association Between Gestational Age and Fetal Complications (n = 110)

Gestational Age	No Fetal Complications n (%)	mplications n (%)	Chi- Square	p Value
<34 weeks (n=48)	13 (27.1)	35 (72.9)		
34–37 weeks (n=34)	16 (47.1)	18 (52.9)	10.842	0.004*
>37 weeks (n=28)	17 (60.7)	11 (39.3)		

Data are expressed as number (n) and percentage (%) within each gestational age category. Association was assessed using the Chi-square test. A p-value <0.05 was considered statistically significant.

Relationship Between Gestational Age and Duration of Hospitalization: The length of hospitalization was significantly correlated with gestational age at diagnosis (r = 2.416, p = 0.001). Women who were diagnosed earlier (before 34 weeks) had significantly higher chances of staying in hospital (length of stay 11 days or more) than women who were diagnosed later (after 37 weeks).

Table 8: Association Between Gestational Age at Diagnosis and Length of Hospital Stay (n = 110)

Gestational Age	≤10 days n (%)	≥11 days n (%)	Chi-Square	P Value
<34 weeks (n=48)	10 (20.8)	38.(79.2)		
34-37 weeks (n=48)	16 (47.1)	18 (52.9)	24.316	0.001*
>37 weeks (n=28)	22 (78.6)	6 (21.4)		

Values are reported as number (n) and percentage (%) within each gestational age group. Association was evaluated using the Chi-square test. A p-value <0.05 was considered statistically significant.

DISCUSSION

This retrospective cohort study was conducted to assess maternal and perinatal outcomes among women with severe preeclampsia and eclampsia at a tertiary care teaching hospital. The results indicate high rates of maternal morbidity and a high rate of neonatal complications, especially in women who present at earlier gestational ages.

Young, nulliparous women predominated, reflecting global trends that identify nulliparity as a risk factor for preeclampsia. Similar age patterns are seen in multicenter studies from South Asia and sub-Saharan Africa, where hypertensive disorders are common among women in their twenties.

Our high cesarean section rate (72.7%) compares favorably with that of other tertiary care facilities, which range from 60 to 75%. This demonstrates the necessity for delivery to prevent maternal deterioration, especially when the fetus is compromised or HELLP syndrome develops.

The most common maternal complication was postpartum hemorrhage (38.2%), which is elevated compared to some local research (20-30%). This could be due to referral bias, as our institution is a high-risk obstetric care provider. The HELLP syndrome rate (18.2%) is similar to published data, which describes rates of 10-20% in severe preeclampsia cases.

The perinatal outcomes recorded, especially high percentages of prematurity (43.6%), fetal growth restriction (FGR) (45.5%), and NICU admission (46.4%), indicate the heavy burden of uteroplacental insufficiency in severe hypertensive disease. These results correlate with global data showing prematurity rates of 40-50% in women with severe preeclampsia. The stillbirth rate of 3.6% and neonatal mortality of 1.8% are also within the range observed in other tertiary settings.

Fetal complications and long maternal hospitalizations were strongly linked to early gestational age at diagnosis. Complications were nearly twice as common before 34 weeks compared to diagnoses after 37 weeks. This aligns with literature noting more severe placental dysfunction with early-onset preeclampsia.

Earlier gestational age at onset is strongly associated with longer hospital stays and intensive monitoring, highlighting the resource demands of early-onset disease.

These findings underscore the need for early diagnosis, regular follow-up, and prompt care in severe hypertensive pregnancies. Improving antenatal surveillance and referral can reduce maternal and neonatal morbidity in tertiary settings.

CONCLUSION

In tertiary care settings, severe preeclampsia and eclampsia continue to be major causes of maternal and perinatal morbidity. This paper illustrates the high occurrence of maternal complications, especially postpartum hemorrhage, HELLP syndrome, and acute kidney injury, accompanied by high levels of neonatal morbidity such as preterm birth, fetal growth restriction, and high rates of NICU admission. Early gestational age at diagnosis was closely linked with poor neonatal outcomes and prolonged hospitalization, underscoring the urgent need for vigilant monitoring, timely intervention, and continued research to reduce the impact of early-onset disease.

These results highlight the need for early antenatal diagnosis, standardized care, prompt referral, and multidisciplinary management to improve fetomaternal outcomes. Reducing severe hypertensive disorders in pregnancy depends on maximizing resources for obstetric and neonatal care and improving surveillance in resource-limited settings. Further multicenter research is needed to refine risk stratification and management.

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