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Maternal and Fetal Outcomes in Early Onset Preeclampsia: A Cross-Sectional Study at a Tertiary Care Centre in South India

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ABSTRACT
Background: *Hypertensive disorders complicate approximately 5–10% of all pregnancies and remain a leading cause of maternal and perinatal morbidity and mortality worldwide. Early onset preeclampsia, defined as preeclampsia manifesting before 34 weeks of gestation, carries a disproportionately higher risk of adverse outcomes for both mother and fetus compared with late onset disease. Data from the Indian subcontinent, particularly from southern India, remain limited. The present study was undertaken to evaluate the spectrum of maternal and fetal outcomes in women diagnosed with early onset preeclampsia at a tertiary care centre.*
Methods: *A hospital-based cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at R L Jalappa Hospital and Research Centre, Kolar, over a period of five months. Fifty pregnant women with early onset preeclampsia (gestational age ≥20 weeks and <32 weeks, blood pressure ≥140/90 mmHg, and proteinuria) were enrolled after obtaining informed consent. Patients with chronic renal or hepatic disease, idiopathic haemolytic anaemia, idiopathic thrombocytopenic purpura, and epilepsy were excluded. Demographic, clinical, and outcome data were collected using a predesigned proforma and analysed using SPSS version 22. Qualitative variables were expressed as frequencies and percentages and compared using the chi-square test, whereas quantitative variables were expressed as mean and standard deviation and compared using the independent samples t-test.*
Results: *The mean age of the study population was 25.46 ± 3.82 years. Primigravidae constituted 54.0% of the cohort. Caesarean section was the predominant mode of delivery, performed in 68.0% of cases. Among maternal complications, HELLP syndrome was observed in 14.0%, eclampsia in 10.0%, renal impairment in 6.0%, and disseminated intravascular coagulation in 4.0%. One maternal death (2.0%) was recorded. Among fetal outcomes, 76.0% of neonates required neonatal intensive care unit admission, the mean APGAR score at five minutes was 6.14 ± 1.87, and fetal growth restriction was present in 38.0%. Preterm delivery occurred in 82.0%, stillbirth in 10.0%, and neonatal death in 8.0% of cases.*
Conclusion: *Early onset preeclampsia was associated with significant maternal morbidity, including HELLP syndrome and eclampsia, and adverse fetal outcomes including high rates of prematurity, NICU admission, and fetal growth restriction. These findings underscore the need for vigilant antenatal surveillance, timely referral, and multidisciplinary management in resource-limited settings.*
KEYWORDS: *Early onset preeclampsia, maternal outcome, fetal outcome, HELLP syndrome, preterm delivery, cross-sectional study*

I. INTRODUCTION

Hypertensive disorders of pregnancy constitute one of the most prevalent medical complications encountered during the gestational period, affecting an estimated 5–10% of all pregnancies globally [1]. These disorders encompass a spectrum of conditions including gestational hypertension, chronic hypertension, preeclampsia–eclampsia, and preeclampsia superimposed on chronic hypertension. Among these, preeclampsia

remains the most clinically significant entity owing to its multisystem involvement and the potential for rapid deterioration of maternal and fetal health [2]. The World Health Organization has identified hypertensive disorders as the second leading cause of direct maternal mortality worldwide, accounting for approximately 14% of all maternal deaths, with a disproportionately higher burden in low- and middle-income countries [3].

Preeclampsia is a pregnancy-specific syndrome characterised by the new onset of hypertension (blood pressure ≥140/90 mmHg) and proteinuria after 20 weeks of gestation, frequently accompanied by multiorgan dysfunction [4]. The pathophysiology of preeclampsia is complex and involves defective trophoblastic invasion, abnormal placental angiogenesis, endothelial dysfunction, and an exaggerated systemic inflammatory response. This cascade ultimately leads to widespread vasospasm, increased vascular permeability, and end-organ damage affecting the hepatic, renal, cerebral, and haematological systems [1,5].

A clinically important distinction has been made between early onset preeclampsia, which manifests before 34 weeks of gestation, and late onset preeclampsia, which develops at or after 34 weeks. Early onset preeclampsia is thought to arise predominantly from defective placentation and is typically associated with more severe clinical features, greater placental pathology, and worse maternal and perinatal outcomes [6]. In contrast, late onset disease is more frequently related to maternal constitutional factors such as metabolic syndrome and carries a comparatively favourable prognosis [7]. The differentiation between these two phenotypes has important implications for clinical management, as early onset disease often necessitates premature delivery with its attendant neonatal risks, whereas late onset disease may permit expectant management until term.

The maternal complications of early onset preeclampsia are diverse and potentially life-threatening. These include eclampsia, the syndrome of haemolysis, elevated liver enzymes, and low platelet count (HELLP), acute renal failure, disseminated intravascular coagulation (DIC), pulmonary oedema, cerebrovascular accidents, and placental abruption [2,8]. The fetal manifestations are equally concerning and encompass fetal growth restriction secondary to uteroplacental insufficiency, oligohydramnios, abnormal umbilical artery Doppler velocimetry, preterm delivery, low birth weight, low APGAR scores, neonatal intensive care unit (NICU) admission, stillbirth, and neonatal death [4,9].

In India, hypertensive disorders account for a substantial proportion of maternal morbidity and mortality. The incidence of preeclampsia in the Indian population has been reported to range from 8% to 10%, with considerable regional variation [3]. Despite the significant disease burden, data pertaining to the specific outcomes of early onset preeclampsia remain sparse, particularly from southern India. Most of the available literature originates from high-income settings, and the applicability of these findings to Indian tertiary care centres, where late presentation and limited resources are common, is uncertain [10].

Given the paucity of region-specific data and the clinical importance of early onset preeclampsia, the present study was undertaken to evaluate the maternal and fetal outcomes in women presenting with early onset preeclampsia at R L Jalappa Hospital and Research Centre, a tertiary care teaching hospital affiliated with Sri Devaraj Urs Medical College, Kolar, Karnataka. The findings of this study were expected to provide valuable insights into the local burden and pattern of complications, thereby contributing to improved clinical decision-making and resource allocation in similar healthcare settings.

II. AIMS AND OBJECTIVES

The present study was designed with the primary aim of evaluating the maternal and fetal outcomes in women diagnosed with early onset preeclampsia who were managed at a tertiary care centre in southern India. The investigation sought to characterise the demographic and clinical profile of affected women and to document the spectrum and frequency of maternal complications including eclampsia, HELLP syndrome, renal impairment, disseminated intravascular coagulation, and maternal mortality.

Additionally, the study aimed to assess fetal and neonatal outcomes with particular attention to the rates of fetal growth restriction, preterm delivery, low APGAR scores, neonatal intensive care unit admission, stillbirth, and neonatal death. The investigators further intended to examine the association between gestational age at diagnosis, severity of hypertension, and the nature and frequency of adverse outcomes. It was anticipated that the data generated from this study would contribute to the existing body of evidence on early onset preeclampsia in the Indian population and would help guide clinicians in optimising the timing and mode of delivery, thereby improving both maternal and perinatal outcomes in similar healthcare settings.

III. MATERIALS AND METHODS

Study Design and Setting

A hospital-based cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at R L Jalappa Hospital and Research Centre attached to Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India. The study was carried out over a period of five months. The institution is a tertiary care teaching hospital that caters to patients from Kolar district and the adjoining regions of Karnataka and Andhra Pradesh.

Prior to the commencement of the study, ethical clearance was obtained from the Institutional Ethics Committee of Sri Devaraj Urs Academy of Higher Education and Research.

Study Population and Sample Size

A total of 50 pregnant women diagnosed with early onset preeclampsia were enrolled in the study. The sample size was determined based on the feasibility of patient recruitment within the stipulated study period at the study centre. All consecutive patients who fulfilled the inclusion criteria during the study period were recruited by convenience sampling after obtaining written informed consent.

Inclusion Criteria

Pregnant women with a gestational age of 20 weeks or more and less than 32 weeks who had a blood pressure of 140/90 mmHg or higher on two occasions at least four hours apart and who demonstrated proteinuria (either ≥1+ on dipstick testing or ≥300 mg in a 24-hour urine collection) were eligible for inclusion in the study.

Exclusion Criteria

Patients with pre-existing chronic renal disease or hepatic disease, idiopathic haemolytic anaemia, idiopathic thrombocytopenic purpura, and epilepsy were excluded from the study. Women who declined to provide informed consent were also excluded.

Data Collection and Procedure

After obtaining informed consent, a detailed history was taken from each participant using a predesigned proforma. The proforma captured demographic details including age, parity, and gestational age at diagnosis. A comprehensive clinical examination was performed including general physical examination (assessment of anaemia, jaundice, lymphadenopathy, pulse rate, blood pressure, body mass index, and temperature) and systemic examination of the cardiovascular and respiratory systems. Relevant laboratory investigations were recorded, including haemoglobin levels, blood grouping, and other investigations as clinically indicated.

All enrolled women were followed up until delivery. Maternal outcomes documented included the mode of delivery (vaginal or caesarean section) and the occurrence of complications including eclampsia, HELLP syndrome (defined as haemolysis with a microangiopathic blood smear, elevated liver enzymes with AST or ALT >70 IU/L, and a platelet count <100,000/μL), renal impairment, disseminated intravascular coagulation (DIC), and maternal death. Fetal and neonatal outcomes assessed included the APGAR score at one and five minutes, the need for NICU admission, the occurrence of fetal growth restriction (FGR) or intrauterine growth restriction (IUGR) defined as estimated fetal weight below the tenth percentile for gestational age, preterm delivery, stillbirth, and neonatal death.

Statistical Analysis

All data were entered into Microsoft Excel 2016 and subsequently analysed using SPSS software version 22 (IBM Corporation, Armonk, NY, USA). Qualitative data were represented as frequencies and percentages and compared using the chi-square test or Fisher exact test as appropriate. Quantitative data were expressed as mean ± standard deviation and compared using the independent samples t-test. A two-tailed p-value of less than 0.05 was considered statistically significant for all analyses.

IV. RESULTS

A total of 50 pregnant women diagnosed with early onset preeclampsia were enrolled in the study. The demographic and clinical characteristics of the study population are presented in Table 1. The mean age of the participants was 25.46 ± 3.82 years, with the majority (44.0%) falling in the 20–25 years age group. Primigravidae constituted 54.0% (n = 27) of the study population. The mean gestational age at the time of diagnosis of preeclampsia was 27.84 ± 2.96 weeks, with the largest proportion (44.0%) presenting between 29 and 31 weeks of gestation. The mean body mass index was 26.32 ± 3.14 kg/m². The mean systolic blood pressure at presentation was 162.40 ± 14.56 mmHg and the mean diastolic blood pressure was 106.80 ± 8.72 mmHg.

Table 1: Demographic and Clinical Characteristics of the Study Population (N = 50)

Parameter	n (%)	Mean ± SD
Age (years)	–	25.46 ± 3.82
<20 years	4 (8.0)	–
20–25 years	22 (44.0)	–

26–30 years	18 (36.0)	–
>30 years	6 (12.0)	–
GA at diagnosis (weeks)	–	27.84 ± 2.96
20–24 weeks	8 (16.0)	–
25–28 weeks	20 (40.0)	–
29–31 weeks	22 (44.0)	–
Primigravida	27 (54.0)	–
Multigravida	23 (46.0)	–
BMI (kg/m²)	–	26.32 ± 3.14
Systolic BP at presentation (mmHg)	–	162.40 ± 14.56
Diastolic BP at presentation (mmHg)	–	106.80 ± 8.72

The maternal outcomes are detailed in Table 2. Caesarean section was the predominant mode of delivery, performed in 34 (68.0%) women, while vaginal delivery was accomplished in 16 (32.0%) cases. Among the maternal complications, HELLP syndrome was the most frequently encountered, observed in 7 (14.0%) women. Eclampsia occurred in 5 (10.0%) cases. Placental abruption and renal impairment were each observed in 3 (6.0%) women. Disseminated intravascular coagulation was documented in 2 (4.0%) cases. One maternal death (2.0%) was recorded during the study period; this patient had developed multiorgan dysfunction syndrome secondary to severe HELLP syndrome complicated by DIC.

Table 2: Distribution of Maternal Outcomes (N = 50)

Maternal Outcome	n (N=50)	Percentage (%)
Mode of delivery		
Vaginal delivery	16	32.0
Caesarean section	34	68.0
Eclampsia	5	10.0
HELLP syndrome	7	14.0
Renal impairment	3	6.0
Disseminated intravascular coagulation	2	4.0
Placental abruption	3	6.0
Maternal death	1	2.0

The fetal and neonatal outcomes are summarised in Table 3. Preterm delivery was the most common adverse fetal outcome, occurring in 41 (82.0%) cases. Low birth weight (birth weight less than 2500 g) was observed in 42 (84.0%) neonates. Fetal growth restriction was documented in 19 (38.0%) cases. A total of 38 (76.0%) neonates required admission to the NICU. Stillbirth occurred in 5 (10.0%) cases and neonatal death was recorded in 4 (8.0%) cases.

Table 3: Distribution of Fetal and Neonatal Outcomes (N = 50)

Fetal/Neonatal Outcome	n (N=50)	Percentage (%)
Preterm delivery (<37 weeks)	41	82.0
FGR/IUGR	19	38.0
NICU admission	38	76.0
Stillbirth	5	10.0
Neonatal death	4	8.0

Low birth weight (<2500 g)	42	84.0

The distribution of APGAR scores at one minute and five minutes is presented in Table 4. At one minute, 10 (20.0%) neonates had a severely depressed APGAR score (0–3), 22 (44.0%) had moderately depressed scores (4–6), and 18 (36.0%) had normal scores (7–10). At five minutes, there was an improvement in the distribution, with 28 (56.0%) neonates achieving normal scores. The mean APGAR score at one minute was 4.86 ± 2.14, which improved to 6.14 ± 1.87 at five minutes. This difference was statistically significant (p = 0.002).

Table 4: Distribution of APGAR Scores at 1 Minute and 5 Minutes (N = 50)

APGAR Score Category	At 1 minute, n (%)	At 5 minutes, n (%)
0–3 (Severe depression)	10 (20.0)	6 (12.0)
4–6 (Moderate depression)	22 (44.0)	16 (32.0)
7–10 (Normal)	18 (36.0)	28 (56.0)
Mean ± SD	4.86 ± 2.14	6.14 ± 1.87

The comparison of maternal complications and fetal outcomes between primigravidae and multigravidae is presented in Table 5. The rate of HELLP syndrome was higher in primigravidae (18.5%) compared to multigravidae (8.7%), although this difference did not reach statistical significance (p = 0.323). Similarly, the rates of eclampsia (11.1% vs 8.7%, p = 0.782), renal impairment (7.4% vs 4.3%, p = 0.648), and DIC (3.7% vs 4.3%, p = 0.908) did not differ significantly between the two groups. Caesarean section rates were higher among primigravidae (74.1%) compared to multigravidae (60.9%), but this difference was not statistically significant (p = 0.312). Fetal growth restriction was observed more frequently in primigravidae (44.4%) than in multigravidae (30.4%), without statistical significance (p = 0.307).

Table 5: Comparison of Outcomes Between Primigravidae and Multigravidae

Complication	Primigravida (n=27)	Multigravida (n=23)	p-value
Eclampsia	3 (11.1%)	2 (8.7%)	0.782
HELLP syndrome	5 (18.5%)	2 (8.7%)	0.323
Renal impairment	2 (7.4%)	1 (4.3%)	0.648
DIC	1 (3.7%)	1 (4.3%)	0.908
Caesarean section	20 (74.1%)	14 (60.9%)	0.312
FGR/IUGR	12 (44.4%)	7 (30.4%)	0.307
NICU admission	22 (81.5%)	16 (69.6%)	0.319

The analysis of fetal outcomes stratified by gestational age at diagnosis is presented in Table 6. Women diagnosed before 28 weeks of gestation had significantly higher rates of fetal growth restriction (54.5% vs 25.0%, p = 0.031), NICU admission (90.9% vs 64.3%, p = 0.027), low birth weight (100.0% vs 71.4%, p = 0.006), and lower mean APGAR scores at five minutes (5.32 ± 1.94 vs 6.79 ± 1.48, p = 0.004) compared to those diagnosed at 28 weeks or later. The rates of stillbirth (18.2% vs 3.6%, p = 0.088) and neonatal death (13.6% vs 3.6%, p = 0.196) were higher in the earlier gestational age group, although these differences did not achieve statistical significance, likely owing to the small sample size.

Table 6: Fetal Outcomes Stratified by Gestational Age at Diagnosis

Fetal Outcome	<28 weeks (n=22)	≥28 weeks (n=28)	p-value
FGR/IUGR	12 (54.5%)	7 (25.0%)	0.031*
NICU admission	20 (90.9%)	18 (64.3%)	0.027*
Stillbirth	4 (18.2%)	1 (3.6%)	0.088
Neonatal death	3 (13.6%)	1 (3.6%)	0.196
LBW (<2500 g)	22 (100.0%)	20 (71.4%)	0.006*

Mean APGAR at 5 min	5.32 ± 1.94	6.79 ± 1.48	0.004*

** Statistically significant ($p < 0.05$)*

V. DISCUSSION

The present cross-sectional study evaluated the maternal and fetal outcomes in 50 women with early onset preeclampsia managed at a tertiary care centre in southern India. The findings highlighted the significant burden of morbidity associated with this condition and provided important region-specific data that may inform clinical practice.

The mean age of the study cohort was 25.46 ± 3.82 years, with the majority of participants in the 20–25 years age group. These findings are consistent with those reported by Patel et al. [11] who observed a mean age of 24.8 years among women with early onset preeclampsia in a similar Indian tertiary care setting. The predominance of primigravidae (54.0%) in the present study is in agreement with the well-established association between nulliparity and preeclampsia, as documented by Duckitt and Harrington [12], who identified primiparity as one of the strongest risk factors for the development of preeclampsia in their systematic review.

Caesarean section was the predominant mode of delivery in the present study, performed in 68.0% of cases. This finding is concordant with the observations of Haddad et al. [13] who reported a caesarean delivery rate of 71.5% in their series of 239 women with severe preeclampsia between 24 and 33 weeks of gestation. A slightly lower caesarean rate of 58% was reported by Gaugler-Senden et al. [14] in a Dutch cohort, likely reflecting differences in institutional protocols and patient populations. The high caesarean rate in the present study was attributable to the non-reassuring fetal status and failed induction of labour in the majority of cases.

HELLP syndrome was the most commonly encountered maternal complication in this study, affecting 14.0% of the participants. This figure is comparable to the 12.5% reported by Vigil-De Gracia et al. [15] in their multicentric study of early onset severe preeclampsia. However, it is higher than the 9.2% observed by Budden et al. [16] in a systematic review of expectant management of severe preeclampsia remote from term. The higher rate in the present study may reflect the severity of disease at the time of presentation to the tertiary care centre. Eclampsia occurred in 10.0% of cases, which is comparable to the 8–12% incidence reported in various Indian studies [11,17].

Renal impairment and DIC were observed in 6.0% and 4.0% of cases, respectively. These figures are in general agreement with those reported by Sibai et al. [18] who documented renal dysfunction in 5% and DIC in 3% of women with severe preeclampsia. The one maternal death (2.0%) in the present study occurred due to multiorgan dysfunction syndrome complicating HELLP syndrome with DIC. Duley [19] in a comprehensive review noted that the case fatality rate of eclampsia and severe preeclampsia in developing countries ranges from 1% to 5%, consistent with the present observation.

Among the fetal outcomes, preterm delivery was the most frequent adverse event, occurring in 82.0% of cases. This high rate is an expected consequence of the early gestational age at which the diagnosis was made and the need for premature termination of pregnancy for maternal or fetal indications. Low birth weight was observed in 84.0% of neonates, which is comparable to the findings of Jain et al. [17] who reported low birth weight in 80.3% of neonates born to mothers with early onset preeclampsia. Fetal growth restriction was present in 38.0% of cases, reflecting the underlying uteroplacental insufficiency characteristic of early onset disease.

The rate of NICU admission in the present study was 76.0%, which is concordant with the 72% reported by Hall et al. [20] and the 78.6% observed by Patel et al. [11]. The mean APGAR score at five minutes was 6.14 ± 1.87, with a significant improvement from the one-minute score of 4.86 ± 2.14 ($p = 0.002$), suggesting that timely neonatal resuscitation contributed to improved outcomes in many cases. Stillbirth and neonatal death rates were 10.0% and 8.0%, respectively. Gaugler-Senden et al. [14] reported a perinatal mortality rate of 18% in early onset preeclampsia, while Budden et al. [16] reported perinatal loss rates ranging from 5% to 15% depending on the gestational age at delivery.

The sub-group analysis based on gestational age at diagnosis revealed significantly worse fetal outcomes in women diagnosed before 28 weeks compared to those diagnosed at 28 weeks or later. The rates of FGR (54.5% vs 25.0%, $p = 0.031$), NICU admission (90.9% vs 64.3%, $p = 0.027$), and low birth weight (100.0% vs 71.4%, $p = 0.006$) were all significantly higher in the earlier group, and the mean five-minute APGAR score was significantly lower (5.32 vs 6.79, $p = 0.004$). These observations are consistent with the concept that earlier onset of disease is associated with more severe placental dysfunction and poorer outcomes, as discussed by Lisonkova and Joseph [6].

The comparison between primigravidae and multigravidae did not reveal statistically significant differences in the rates of complications, although trends toward higher rates of HELLP syndrome, caesarean section, and fetal growth restriction were observed in primigravidae. The lack of significance may be attributable to the relatively small sample size.

The present study had certain limitations. The cross-sectional design precluded the establishment of causal relationships. The sample size of 50 was relatively small, which limited the statistical power to detect

significant differences in sub-group analyses. The single-centre design may limit the generalisability of the findings. Future multicentric prospective studies with larger sample sizes are recommended to validate these findings.

VI. CONCLUSION

Early onset preeclampsia was associated with a considerable burden of maternal morbidity, with HELLP syndrome and eclampsia being the most frequently encountered complications. The fetal outcomes were characterised by high rates of prematurity, low birth weight, fetal growth restriction, and NICU admission. Gestational age at diagnosis was a significant determinant of fetal outcome, with earlier diagnosis portending worse outcomes. These findings emphasise the critical importance of vigilant antenatal surveillance for early detection and timely referral of women with preeclampsia to tertiary care centres equipped with neonatal intensive care facilities. A multidisciplinary approach involving obstetricians, neonatologists, and intensivists is essential for optimising outcomes in these high-risk pregnancies.

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