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Original Research Article

Maternal and fetal outcomes in early-onset severe preeclampsia: a cross-sectional study from a tertiary care centre in Assam

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ABSTRACT

Background: Early-onset severe preeclampsia is associated with significant maternal and fetal risks due to its aggressive progression, which necessitates immediate termination, for maternal safety. This study aimed to evaluate and compare maternal and fetal outcomes in early-onset versus late-onset severe preeclampsia.
Methods: A prospective, hospital-based, cross-sectional study was conducted over one year at a tertiary care centre in Assam. A total of 135 pregnant women with severe preeclampsia were enrolled, of whom 44 had early-onset and 91 had late-onset disease. Maternal outcomes (e.g., eclampsia, Hemolysis Elevated Liver Enzymes Low platelets (HELLP) syndrome, pulmonary edema, acute kidney injury, disseminated intravascular coagulation, abruptio placenta, death) and fetal outcomes (e.g., intrauterine fetal demise, fresh still birth, respiratory distress syndrome, Neonatal Intensive Care Unit (NICU) admission, intrauterine growth retardation, neonatal death) were compared. Data were analyzed by using appropriate statistical tests (SPSS 16 version); $p<0.05$ was considered significant.
Results: Maternal complications were significantly more common in early-onset cases (59.1%) compared to late-onset controls (20.87%) (OR=6.03, $p<0.0001$). Maternal deaths occurred in 4.5% of cases and 1.09% of controls (OR=4.14, $p=0.258$). Fetal/neonatal death was significantly higher in early-onset cases (18.2%) than in controls (3.29%) (OR=6.30, $p=0.0065$). NICU admission (54.5% vs. 12.08%) and preterm delivery before 34 weeks were more frequent in early-onset cases.
Conclusions: Early-onset severe preeclampsia is associated with markedly increased maternal and fetal morbidity and mortality compared to late-onset severe preeclampsia. Early screening and diagnosis, close monitoring, and judicious timing of delivery are essential to improve outcomes in this high-risk group.

Keywords: Early-onset, Fetal outcome, Intrauterine fetal death, Late-onset, Maternal outcome, Preeclampsia

INTRODUCTION

Pre-eclampsia is a hypertensive disorder of pregnancy that significantly impacts maternal and fetal health. It typically presents after 20 weeks of gestation with hypertension (≥140/90 mmHg on two occasions, at least four hours apart), proteinuria (≥0.3g in a 24-hour urine collection or 1+ on dipstick), and multi-organ dysfunction, affecting 5-10% of pregnancies in developing countries, pre-eclampsia is responsible for 16% of maternal deaths worldwide (WHO, 2020).[1] Despite advances in obstetric care, its unpredictable onset and progression and consequent life-threatening complications highlights the need for early diagnosis and intervention.[2] Early-onset severe preeclampsia, defined as the onset of severe features before 34 weeks of gestation with blood pressure >/=160/110mmhg, proteinuria, with signs of end-organ dysfunction, presents a more aggressive clinical course than its late-onset counterpart. It is associated with a higher incidence of maternal complications, including eclampsia, pulmonary edema, acute renal failure, and HELLP syndrome.[3]

The pathophysiology of early-onset preeclampsia is thought to be rooted in abnormal placental implantation and inadequate spiral artery remodeling. These changes

result in placental ischemia and the release of anti-angiogenic factors into the maternal circulation, causing widespread endothelial dysfunction. Consequently, systemic hypertension, proteinuria, and multi-organ damage ensue. The placenta fails to support adequate fetal growth, leading to outcomes such as intrauterine growth restriction, stillbirth, prematurity and neonatal intensive care unit (NICU) admissions.[4-6]

Delivery remains the only definitive treatment for preeclampsia. However, determining the optimal timing of delivery in early-onset severe preeclampsia is challenging. Expectant management may be required in selected cases to prolong pregnancy and improve neonatal outcomes, though this must be balanced against growing risks to both mother and fetus.[7] This study aims to assess maternal and fetal outcomes in early-onset severe preeclampsia and to compare with late-onset severe preeclampsia, to evaluate management strategies, and to explore predictors of adverse outcomes.

METHODS

This hospital-based, prospective, cross sectional study was conducted among pregnant women diagnosed with severe preeclampsia who delivered at Department of Obstetrics and Gynaecology at Fakhruddin Ali Ahmed Medical College and Hospital (FAAMCH), Barpeta, Assam, carried out over a period of one year, from 1st November 2023 to 31st October 2024.The study population consisted of total 135 pregnant women out of 9760 total deliveries during study period, who diagnosed with severe preeclampsia at FAAMCH, out of these 44 women had early-onset severe preeclampsia (case) and 91 had late-onset severe preeclampsia (control). Each case of early-onset severe preeclampsia was matched with two consecutive cases of late-onset severe preeclampsia. And some cases have been excluded such as patients with chronic hypertension, gestational hypertension without severe features, multiple gestation, known renal, hepatic, or cardiovascular disease prior to pregnancy.

The primary outcomes included maternal complications (eclampsia, HELLP syndrome, pulmonary edema, acute kidney injury, DIC, maternal death) and fetal complications (low birth weight, intrauterine growth restriction, respiratory distress syndrome, sepsis, NICU admission, intrauterine fetal death, neonatal death). Maternal outcomes were assessed through clinical monitoring, laboratory investigations, and clinical course. Fetal outcomes were evaluated using birth records, APGAR score at 1 min and 5min, NICU admissions, birth weights.Data collection was carried out prospectively by using a pre-designed and pre-tested structured proforma, after obtaining written informed consent. Clinical data were recorded from patient history, physical examination findings, inpatient records, investigation reports, and delivery notes.

Maternal data comprised of demographic information (maternal age, address, socioeconomic status, and education), obstetric history (gravidity, parity, history of previous preeclampsia or eclampsia, booking status, antenatal care visits, and gestational age at diagnosis of severe preeclampsia), presenting complaints (e.g., headache, visual disturbances, epigastric pain), blood pressure readings, and signs of organ involvement, investigations (urine dipstick for proteinuria, complete blood count, liver function tests, renal function tests, serum lactate dehydrogenase, coagulation profile, and Doppler studies when available), management details (use of antihypertensives, administration of magnesium sulphate, corticosteroid therapy for fetal lung maturation, mode of delivery (vaginal or caesarean), indication for delivery, expectant versus non-expectant management, and maternal complications and postpartum details (time taken to achieve blood pressure control, duration of hospital stay, and need for intensive care).

Fetal and neonatal data comprised of, Gestational age at delivery, Birth weight (categorized as normal, low birth weight (LBW), very low birth weight (VLBW), or extremely low birth weight (ELBW), APGAR scores: at 1 minute and 5 minutes post-delivery, NICU admission (indication, duration of stay, and outcome), Perinatal outcomes (intrauterine fetal death (IUFD), neonatal death, or live birth).

All data were verified for completeness and accuracy, by using (SPSS 16) t-tests depending on data distribution. A p value <0.05 was considered statistically significant.

RESULTS

A total of 135 women diagnosed with severe preeclampsia were included in the study, comprising 44 cases with early-onset severe preeclampsia and 91 controls with late-onset disease. Table 1 shows the age and parity distribution. The majority of the participants in both groups were aged between 21-30 years, accounting for 47.7% in the case group and 53.84% in the control group and there was no statistically significant difference in age distribution between the groups (p=0.77). With respect to parity, 50% of cases and 56.05% of controls were primigravidae and multigravidae (G2 or higher) comprised 50% of cases and 44.3% of controls. The parity distribution was similar between groups and were not statistically significant (p=0.513). Among patients with severe preeclampsia, a majority of 68.2% cases and 76.92% control were unbooked, indicating a lack of antenatal surveillance may contribute to delayed diagnosis and increased risk of complications. There is no statistically significant difference in antenatal visits between case and control (p=0.22).

Most cases (61.4%) were diagnosed between 32-34 weeks, with 22.7% diagnosed between 28-31 weeks and 15.9% between 24-27 weeks. No patients were reported between

20-24weeks. In contrast, most of the patients (51.1%) in control group diagnosed between 35-37 weeks.

Table 1: Demographic characteristics of participants.

	Case		Control	
	Number	Percent	Number	Percent
Age group (years)				
</=20	14	31.8	24	26.37
21-30	21	47.7	49	53.84
> 30	9	20.5	18	19.78
Gravida				
Primi	22	50.0	51	56.05
G2	12	27.3	18	19.78
G3 or more	10	22.7	22	24.17
Antenatal visits				
Booked	14	31.8	21	23.08
Unbooked	30	68.2	70	76.92
Total	44	100	91	100

Table 2: Gestational age at delivery.

	Case		Control	
Gestational age at delivery				
Years	**Number**	**Percent**	**Number**	**Percent**
24 - <28	4	9.1	0	0.0
28 - <32	10	22.7	0	0.0
32-34	16	36.4	0	0.0
>34	14	31.8	0	0.0
35- <38	0	0.0	15	16.48
38-40	0	0.0	73	80.21
>40	0	0.0	3	3.29

The distribution of gestational age at delivery is summarized in Table 2. Among the early-onset group, 68.2% delivered before 34 weeks, with 9.1% delivered between 24-27 weeks. Most participants in the control group delivered at term (38-40 weeks). The difference in gestational age at diagnosis and delivery between the two groups was statistically significant (p=0.0001), with early-onset cases associated with a significantly higher rate of preterm delivery. The distribution of mode of delivery between the two groups was also statistically significant (Chi-square test p=0.0001), indicating that early-onset preeclampsia was associated with more caesarean deliveries (63.6%), whereas late-onset cases delivered predominantly at term, through both vaginal (45.5%) and caesarean (54.5%) routes.

In both groups, there was a statistically significant association between gestational age at delivery and birth weight (Chi-square p=0.001 in cases and p=0.0024 in control). Preterm delivery enhances the risk of low-birth-weight babies, both the groups faced complications due to low-birth-weight babies and incidence of very low birth weight babies and extremely low birth weight babies noted in early-onset severe preeclampsia, thus perinatal complications were more in cases than controls.

Table 3: Maternal outcome.

	Cases		Control	
Maternal outcome	**Number**	**Percent**	**Number**	**Percent**
Normal	18	40.9	72	79.12
DIC	2	4.5	1	1.09
Eclampsia	5	11	3	3.29
Pulmonary edema	4	9.1	4	4.39
HELLP	4	9.1	2	2.19
Postpartum eclampsia	2	4.5	1	1.09
Wound infection	2	4.5	1	1.09
Abruption	6	13	4	4.39
PRES	1	2.3	0	0.0
AKI	4	9.1	2	2.19
Death	2	4.5	1	1.09
Complication present	26	59.1	19	20.87
No complication	18	40.9	72	79.12

As shown in Table 3, maternal complications were more frequent in the early-onset group. Abruptio placentae was the most common complication among cases (13%), followed by eclampsia (11%), pulmonary edema (9.1%), HELLP syndrome (9.1%), and acute kidney injury (9.1%). Death occurred in 4.5% of cases versus 1.09% of controls. Other complications such as disseminated intravascular coagulation (DIC), wound infection, and posterior reversible encephalopathy syndrome (PRES) were also more commonly seen in the early-onset group.

Overall, 59.1% of women in the early-onset group experienced at least one maternal complication, compared to only 20.87% in the late-onset group. This difference was statistically significant (OR=6.03, p<0.0001), indicating a six-fold higher risk of maternal morbidity in early-onset severe preeclampsia. Although maternal death was more common in the early-onset group, but the difference was not statistically significant (OR=4.14, p=0.258).

Table 4 summarizes the fetal and neonatal outcomes observed in both groups. Intrauterine fetal death (IUFD) occurred in 11.4% of the early-onset group compared to 2.19% in the late-onset group. Fresh Stillbirths were recorded in 2.3% of cases and 1.09% of controls. Neonatal deaths were reported only in the case group (4.5%). Intrauterine growth restriction (IUGR) was apparently equally prevalent in both groups (22.7% in cases and 23.07% in control). Neonatal complications such as respiratory distress syndrome (RDS) and neonatal sepsis were more common in the early-onset group (15.9% vs. 6.59% for RDS and 6.8% vs. 1.09% for sepsis). NICU admissions were significantly higher among cases (54.5%) compared to controls (12.08%). Overall fetal/neonatal survival was lower in the early-onset group (81.8%) than

in the control group (96.7%). The difference was statistically significant (OR=6.30, p=0.0065), indicating a six-fold increased risk of perinatal morbidity in early-onset preeclampsia.

Table 4: Fetal/neonatal outcome.

	Cases		Control	
Fetal/neonatal outcome	**Number**	**Percent**	**Number**	**Percent**
IUFD	5	11.4	2	2.19
Still birth	1	2.3	1	1.09
IUGR	10	22.7	21	23.07
Neonatal sepsis	3	6.8	1	1.09
NICU admission	24	54.5	11	12.08
Normal	12	27.2	44	48.35
RDS	7	15.9	6	6.59
Death	2	4.55	0	0.0
Survived	36	81.8	88	96.70
Did not survive	8	18.2	3	3.29

DISCUSSION

Preeclampsia remains a major contributor to both maternal and fetal mortality and morbidity globally. The World Health Organization (WHO) reported in 2020 that approximately 287,000 maternal deaths occurred worldwide, with 16% resulting from preeclampsia and related hypertensive disorders.[1] This study's key strength lies in its cross sectional design conducted at a tertiary care hospital involving 135 participants. The research focused on comparing early-onset and late-onset severe preeclampsia and evaluating their respective maternal and fetal outcomes. Since few studies offer this direct comparison, our findings fill an important gap. We found that early-onset preeclampsia significantly increases the risk of adverse outcomes for both mother and neonate. Our results are consistent with previous studies.[8,9]

The main factor influenced the pregnancy outcome was gestational age at diagnosis. Mean gestational age at diagnosis was 31 weeks in early-onset severe preeclampsia and 37 weeks in late onset severe preeclampsia, respectively in our study. There was a positive correlation between gestational age at diagnosis and fetal outcomes. gestational age at onset of the disease should be taken as a crucial indicator of the severity of the disease, with adverse maternal and fetal outcome, which corroborates with previous studies.[10-13]

The definitive treatment for severe preeclampsia is delivery. Although termination of pregnancy in early onset severe preeclampsia can lead to premature delivery and increased incidence of induction of labour and caesarean section to prevent morbidity and mortality in the mother and fetus. Maternal indication was found to be the most common cause for termination of pregnancy in 59% (26/44) patients in early-onset severe preeclampsia and in 74.7% (68) patients in late-onset severe preeclampsia. However; some authors reported that fetal indications are more common as compared to maternal indications which prompted early termination of pregnancy.[16,17] Most of the women underwent termination of pregnancy at 32 to 34 weeks in early onset severe preeclampsia study group, whereas those with late-onset severe preeclampsia underwent termination at 38 to 40 week. In the study by Hall et al, mean gestational age at delivery found to be 33 weeks.[15] Mode of delivery also differed significantly between the two groups. Caesarean section was more commonly performed in early-onset cases, especially at lower gestational ages, due to the urgency of delivery for maternal or fetal indications. In contrast, mode of delivery relatively balanced in the late-onset group, often occurring at term. The statistical difference in delivery mode (p=0.0001) reflects the clinical reality that early-onset cases often require rapid termination of pregnancy by caesarean section to prevent maternal deterioration. Similar views expressed in some other studies.[14,17,18,22]

In our study, maternal morbidity and mortality account for 47.7 % in early-onset severe preeclampsia study group and 23.8% in late-onset severe preeclampsia study group. (OR=6.03, p<0.0001). Thrombocytopenia (below 1.5 lakh/mm^3) was found 13.5% in early-onset group and 3.1% in late-onset group. Altered renal function tests includes serum creatinine and s. urea found 9.1% cases in early-onset group and 2.14% late-onset group. Altered coagulation profile and liver function parameters found 14.4% and 38% respectively in early-onset group and 3.2% and 9.8% respectively in late-onset group. Hyperuricemia also found high in early-onset preeclampsia study group (48%) than late-onset study group (9.1%). Uric acid is a good predictor in determining the fetal outcome than blood pressure.[14] Laboratory abnormality is significantly high in early-onset preeclampsia group than late-onset group (p value <0.05). Some study showed that early-onset cases presented more severe signs and symptoms, highest median blood pressure level, and more abnormal laboratory findings compared to those with late onset preeclampsia group.[14] Eclampsia (11%), pulmonary edema (9.1%) and placental abruption (13%) were the major contributors to maternal morbidity, in early-onset severe preeclampsia study group. Other complications observed included disseminated intravascular coagulation (DIC), hemolysis elevated liver enzymes low platelet count (HELLP) syndrome, acute kidney injury (AKI). Several studies reported, more severe maternal complications such as eclampsia, uncontrolled blood pressure, liver dysfunction and prolonged hospital stay in early-onset cases compared to late-onset group.[8,9,19] In this study, maternal mortality (4.5%) found more in the early-onset severe preeclampsia group, compared to in late-onset severe preeclampsia group (1.1%) (OR = 4.14, p=0.258). Our findings corroborates with several studies.[8-10,21]

The incidence of total perinatal deaths (consisting of IUFD, still birth and neonatal death) and severe neonatal morbidities were more in early-onset severe preeclampsia group (18.2%) as compared to late-onset severe preeclampsia study group (3.4%) (OR=6.30, p=0.0065). Our findings corroborates with other studies.[10] Neonatal outcome depends on intensive care facilities and gestational age at birth and it is improved with increasing birth weight, while respiratory distress syndrome reduced with increasing gestational age.[14] The administration of antenatal steroid has shown significant reduction in neonatal mortality and morbidity. In our study 22.7% of cases found to be IUGR and 15.9% of case were RDS, despite of this 54.5% of cases required NICU admission in early-onset severe preeclampsia study groups. In late onset severe preeclampsia study group, 23% of cases were IUGR, 6.59% of cases found to be RDS and 12% of cases required NICU admission. And high incidence of low APGAR at 5 minutes, SGA were found in early-onset group as compared to late-onset group, these findings found to be correlated by several studies.[9,24] APGAR scores improved with increasing gestational age. Perinatal mortality was 9.1% at 24-27 weeks, whereas it was only 2.2% in 32-35 weeks of gestation. The incidence of RDS was high at 28-31 weeks (11.3%). Several studies correlate the same findings.[12,15] Low birth weight babies (1.5-2.5kg), very low birth weight babies (1-1.5 kg), extreme low birth weight (<1 kg) babies were more in number in early onset severe preeclampsia as compared to late onset severe preeclampsia group. There is rapid fall in death rate and perinatal morbidity as birth weight increases.[14,20,23]

In our study, the mean prolongation of pregnancy was 3 days and perinatal mortality was 4.5%. Expectant management required for prolongation of pregnancy, thus provides benefits by decreasing fetal morbidities. In the group with more than 5 days of prolongation of pregnancy, only one maternal morbidity and two fetal morbidities were recorded. Hall et al reported that, in their study mean prolongation of pregnancy was 11 days and perinatal mortality was 24%.[15] Odendaal et al, reported mean prolongation of pregnancy was 7.1 days, lowers the number of neonates requiring ventilation and neonatal complications.[25] The comparatively shorter mean prolongation observed in our study may be attributed to the higher proportion of patients presenting with severe manifestations at diagnosis, which warranted early termination.

The study is limited by its single-center design and relatively small sample size, which may affect the generalizability of the results. However, the prospective nature and methodology strengthen the validity of the findings. Larger, multicentric studies are needed to further explore the factors influencing outcomes and to develop standardized management protocols.

CONCLUSION

This study demonstrates that early-onset severe preeclampsia is associated with significantly higher maternal and fetal morbidity and mortality compared to late-onset disease. Women with early-onset preeclampsia had a greater risk of complications such as eclampsia, HELLP syndrome, pulmonary edema, abruptio placentae, and acute kidney injury. Fetal outcomes were also notably poorer in the early-onset group, with higher rates of intrauterine fetal death, neonatal death, NICU admission, and low birth weight, primarily due to prematurity. In contrast, late-onset cases, typically diagnosed and delivered at or near term, showed better maternal and perinatal outcomes. These findings underscore the importance of early identification, close monitoring, and timely intervention in cases of early-onset severe preeclampsia to reduce adverse outcomes. Routine incorporation of early screening into antenatal care protocols in India is essential. Specialized care and delivery in facilities equipped for high-risk pregnancies and neonatal support are crucial to improve survival and reduce complications in this vulnerable group.

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