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Impact of Early-Onset Severe Pre-eclampsia on Maternal and Perinatal Outcomes, Assessing the Role of Expectant Management: A Prospective Observational Study

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ABSTRACT

Introduction: Early-onset severe pre-eclampsia (EOSP) is a critical hypertensive disorder arising before 34 weeks of gestation, significantly impacting maternal and neonatal outcomes. The condition necessitates challenging decisions regarding the timing of delivery to balance maternal safety with fetal development risks. **Objective:** This study aims to assess maternal and neonatal outcomes associated with expectant versus immediate delivery management in EOSP cases before 30 weeks of gestation. **Methods:** Conducted as a prospective observational study at Bangalore Medical College and Research Institute from January 2023 to March 2024, 142 women with EOSP diagnosed before 30 weeks were enrolled. Expectant management aimed to extend pregnancy by at least 48 hours, while immediate delivery was chosen when necessary. Key maternal and neonatal parameters were compared between the two groups using t-tests and chi-square tests to evaluate outcomes. **Results:** Of the 142 participants, 100 underwent expectant management, and 42 delivered immediately. Neonates in the expectant group had significantly higher weights (486.79 ± 253.12 g) than the immediate delivery group (330.03 ± 366.59 g, p < 0.05). Antepartum fetal demise was notably higher in the immediate delivery group, while expectant management resulted in improved live birth rates and higher APGAR scores (p < 0.05). Maternal complications, including uncontrolled hypertension (35.9%) and HELLP syndrome (23.2%), were common across groups but were not significantly exacerbated by expectantmanagement. **Conclusion:** Expectant management in EOSP before 30 weeks can enhance neonataloutcomes by improving birth weight and reducing stillbirth rates, though it must be carefully managed to mitigate maternal risks. Collaborative obstetric and neonatal care are essential for optimizing outcomes in this high-risk population

INTRODUCTION

Pre-eclampsia is a hypertensive disorder that arises during pregnancy, posing significant risks to both maternal and perinatal health. This condition, characterized by high blood pressure and proteinuria, is a major challenge in obstetric care, given its potentially severe complications [1]. When pre-eclampsia develops early in pregnancy, before 34 weeks of gestation, and presents with severe symptoms, it is classified as earlyonset severe preeclampsia (EOSP). The condition is associated with a high risk of adverse outcomes due to limited fetal development time and the challenges involved in managing both maternal and fetal health in this critical period [2]. Clinicians often face difficult decisions regarding when to intervene to prevent maternal morbidity, as early delivery increases the risk of complications for the neonate. Understanding EOSP's impact on maternal and perinatal health can inform better diagnostic and treatment approaches, ultimately improving outcomes[3].

Preeclampsia occurs in approximately 2–8% of pregnancies, though the incidence can vary widely due to differences in diagnostic practices and access to healthcare. In lower-resource settings, where healthcare infrastructure may be limited, pre-eclampsia remains a leading contributor to maternal and neonatal mortality [4]. In contrast, high-income countries have achieved reductions in mortality associated with pre-eclampsia due to advancements in prenatal care; however, the management of EOSP remains complex even in these settings [5]. This is because effective management often requires nbalancing the benefits of early intervention to protect maternal health with the risks associated with preterm birth, which can lead to complications for the newborn. Thus, studying EOSP's effects on maternal and perinatal outcomes is crucial for developing improved protocols and strategies [6].

The pathophysiology of pre-eclampsia is not fully understood, but it is generally regarded as a multisystem disorder involving extensive endothelial dysfunction and systemic inflammation. Specifically, early onset pre-eclampsia is thought to arise from placental insufficiency and abnormal trophoblastic invasion, which impair placental perfusion and contribute to hypoxia [7]. This process likely leads to oxidative stress and the release of antiangiogenic factors that enter the maternal bloodstream and cause symptoms of pre-eclampsia. These placental abnormalities are thought to be more pronounced in EOSP, making it distinct from late-onset pre-eclampsia, which is often less severe and may have different underlying mechanisms. Due to the unique features of EOSP, targeted research into its effects and management is essential [8].

The maternal complications of EOSP are serious and often life-threatening. Common complications include eclampsia, cerebral haemorrhage, renal failure, liver dysfunction, and HELLP syndrome, a condition marked by haemolysis, elevated liver enzymes, and low platelet count [9]. These issues result from widespread endothelial damage and increased vascular permeability, which disrupt the body's normal functions. The risk of these complications is especially high for women who develop EOSP before 28 weeks of gestation, as the options for intervention are limited, and outcomes are generally poorer [10]. Moreover, the inflammatory processes associated with EOSP may have long-term health consequences, with studies suggesting an increased risk of cardiovascular disease in women who experience severe pre-eclampsia [11].

Managing EOSP has become more individualized over the years. Although antihypertensive medications are commonly used to control blood pressure and mitigate cerebral risks, these treatments do not address the root cause of the disease. Magnesium sulphate is another standard treatment, as it helps to prevent seizures in women with severe pre-eclampsia, although its use must be closely monitored due to potential toxicity [12]. In many cases, early delivery is the only definitive treatment for EOSP, but this decision must be carefully balanced against the risks that prematurity poses to the new born. The timing of delivery in EOSP cases is thus a highly complex issue that requires careful assessment of both maternal and fetal conditions [13].

The perinatal outcomes associated with EOSP are closely linked to gestational age and birth weight. The need for preterm delivery, which is often necessary to prevent maternal complications, poses considerable risks for the infant, including respiratory distress syndrome, intraventricular haemorrhage, necrotizing enterocolitis, and potential long-term developmental challenges [14]. In addition, infants born to mothers with EOSP often experience growth restriction, as placental insufficiency can hinder normal fetal growth and development. EOSP can also, in severe cases, lead to fetal demise, highlighting the critical need for effective monitoring and timely intervention [15].

With recent advancements in neonatal care, survival rates for preterm infants have improved, yet the risk of morbidity remains substantial, especially for those born before 28 weeks of gestation [16]. Infants born prematurely in these cases may face ongoing health challenges, including issues with motor skills, cognitive development, and respiratory health. Understanding the factors contributing to these outcomes is essential for improving neonatal care and enhancing the prognosis for infants affected by EOSP [17].

Expectant management, a strategy to delay delivery in early-onset severe pre-eclampsia (EOSP) cases, aims to prolong pregnancy for fetal development while carefully monitoring maternal health. This approach requires specialized care and vigilant monitoring due to the risk of sudden complications [18]. Decisions on expectant management consider factors like gestational age, maternal health, and fetal condition, as delaying delivery can elevate maternal risks. Though it may reduce the impacts of prematurity on infants, expectant management can also intensify complications from placental insufficiency. Socioeconomic factors influence EOSP outcomes globally, as limited access to prenatal care, medications, and neonatal support in low-resource regions heightens maternal and neonatal risks [19]. In higher-resource settings, advanced diagnostics and early interventions improve outcomes, but EOSP remains a critical public health issue worldwide. Reducing disparities in EOSP outcomes requires expanding access to quality prenatal care, early detection, and timely intervention across diverse healthcare settings [20].

The objectives of this study are to evaluate the maternal outcomes in cases of early-onset severe pre-eclampsia before 30 weeks of gestation, comparing those managed with expectant management versus those managed without it, and to assess the neonatal outcomes in these cases. By examining both maternal and neonatal outcomes, the study aims to provide insight into the risks and benefits of expectant management in earlyonset severe pre-eclampsia, contribu-

ting to the development of more effective strategies for improving maternal and perinatal health in this high-risk population.

MATERIAL AND METHODS

This prospective observational study, conducted at Bangalore Medical College and Research Institute from January 2023 to March 2024, involved women diagnosed with severe early onset pre-eclampsia before 30 weeks based on ACOG 2013 criteria. Participants were admitted to a highrisk unit, and expectant management was defined as extending pregnancy by 48 hours post-admission, with delivery considered based on factors like gestational age, eclampsia risk, and fetal status. Inclusion criteria included informed consent and diagnosis before 30 weeks, while exclusion criteria encompassed cases needing delivery within 48 hours, congenital malformations, gestation beyond 30weeks, intrauterine death, and lack of consent.

RESULT

Among the 142 participants, 82% were aged 20-30 years, 54% had primary education, and 27% had secondary education. The majority (66.9%) were homemakers, and 65.3% belonged to a lower socioeconomic status.

Table 1: Characteristics

Age, y	23.85 ± 3.51
Nulliparous	82 (57.75%)
Body mass index	20.92 ± 1.99
Gestational age at admission, week	27.60 ± 1.60
History of HDP	29 (20.42%)
Systolic blood pressure at admission, mm Hg	147.24 ± 7.82
Diastolic blood pressure at admission, mm Hg	95.21 ± 5.92

Among the 142 women with severe pre-eclampsia onset before 30 weeks, the mean age was 23.85 ± 3.51 years, and 57.75% were nulliparous. The average gestational age at admission was 27.60 ± 1.60 weeks, with 20.42% having a history of hypertensive disorders in pregnancy (HDP), and mean blood pressures were 147.24 ± 7.82 systolic and 95.21

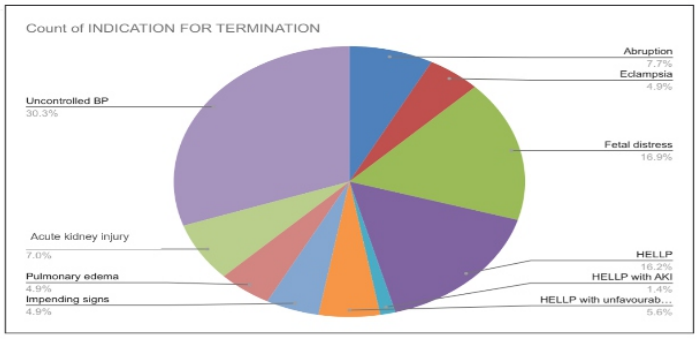

Figure 1: Indications for Termination

Among 142 women with severe pre-eclampsia, 42 delivered immediately, while 100 underwent expectant management. An unpaired t-test compared maternal parameters (age, BMI, BP, gestational age) and neonatal outcomes (baby weight, APGAR score). Results showed that babies of expectant mothers had significantly higher weights (486.79 ± 253.12) than those of delivered mothers (330.03 ± 366.59, p<0.05).

Table 2: Stillbirth and Live Birth Data Comparison

Variables	Delivered (42)	Expectant (100)	Unpaired t/ Chi square statistic	p value
Stillbirths (58)				
Antepartum	31 (73.81%)	27 (27%)	24.92	<0.001
Intrapartum	5 (11.90%)	37 (37%)	7.78	0.005
Baby weight	330.03 ± 366.59	486.79 ± 253.12	2.53	0.01
Live births (85)	14.29%	36%	5.69	0.01
APGAR ≥ 7 at 5 minutes	7 (16.67%)	36 (36%)	4.36	0.03
APGAR at 5 mins (11,73)	6.03 ± 1.67	6.64 ± 1.75	1.12	0.27

A chi-square test showed significant associations between maternal (HDP, LSCS) and neonatal outcomes (antepartum, intrapartum fetal demise, live births, APGAR ≥ 7 at 5 minutes). Antepartum fetal demise was higher in delivered mothers (73.81%), while intrapartum fetal demise, live births, and APGAR ≥ 7 scores were significantly higher in expectant mothers ($p<0.05$).

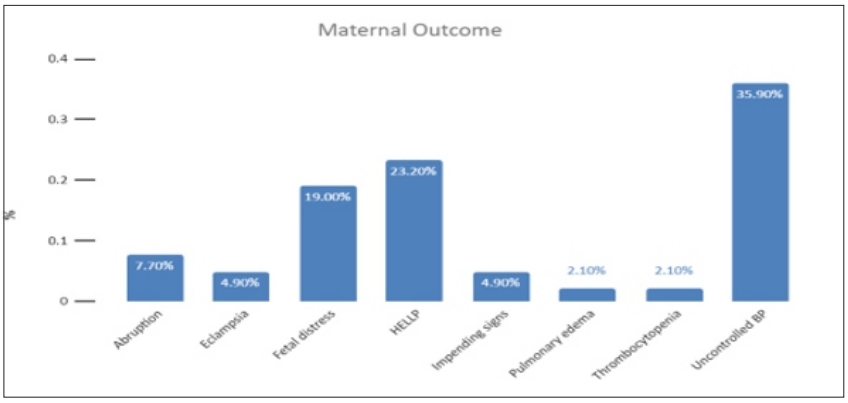

Figure 2: Complications

The table summarizes maternal complications in women with severe pre-eclampsia. The most common omplication was uncontrolled blood pressure (35.9%), followed by HELLP syndrome (23.2%). Other complications included abruption (7.7%), eclampsia (4.9%), impending signs (4.9%), pulmonary edema (2.1%), and thrombocytopenia (2.1%). These findings highlight the prevalence of severe health risks associated with pre-eclampsia

Table 3: Neonatal Complications

Neonatal	F (%)
NICU stay (1-3 weeks)	60 (30.28%)
Hypoxic Ischemic Encephalopathy	2 (1.41%)
Intracranial hemorrhage	1 (0.70%)
NEC	1 (0.70%)
Neonatal sepsis	13 (9.15%)
RDS	23 (16.20%)

The table details neonatal complications associated with severe pre-eclampsia. A significant portion required NICU stays of 1-3 weeks (30.28%), and other complications included respiratory distress syndrome (16.20%) and neonatal sepsis (9.15%). Less frequent issues were hypoxic ischemic encephalopathy (1.41%), intracranial haemorrhage (0.70%), and necrotizing enterocolitis (0.70%), indicating varied neonatal risks.

Table 4; Neonatal Outcome by Gestational Age

Neonatal outcome	<24 (n=8)	24-24+6 (n=6)	25-25+6 (n=3)	26-26+6 (n=14)	27-28 (n=95)	29-30 (n=16)	F/ Chi square statistic	p value
Baby weight	369.00 ± 61.29	456.67 ± 19.66	466.67 ± 25.17	542.12 ± 00.81	603.66 ± 202.49	597.06 ± 00.88	2.67	0.03
Apgar at 5 mins				(1) 6.00	(68) 6.03 ± 1.73	(15) 6.47 ± 1.55	0.41	0.67
Alive at birth	0 (0%)	0 (0%)	0 (0%)	0 (0%)	68 (80.95%)	15 (17.86%)	54.29	<0.001
NICU stay	0 (0%)	0 (0%)	0 (0%)	0 (0%)	34 (82.93%)	7 (17.07%)	16.52	0.005
Death	8 (8%)	6 (6%)	3 (3%)	13 (13%)	61 (61%)	9 (9%)	2.18	0.82

The table presents neonatal outcomes by gestational age groups in severe pre-eclampsia cases. Baby weight significantly increased with gestational age (p = 0.03), and survival at birth was notably higher in the 27–28-week group (80.95%) compared to earlier weeks (p < 0.001). NICU admissions were highest in the 27–28-week group (82.93%, p = 0.005), while mortality rates decreased with advancing gestational age.

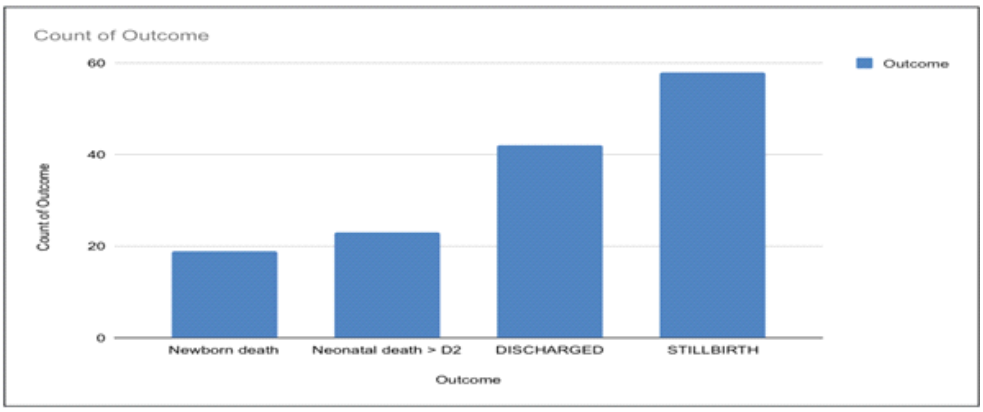

Figure 3: Neonatal Outcomes in Severe Pre-eclampsia Cases

The chart illustrates neonatal outcomes in cases of severe pre-eclampsia. Stillbirths were the most frequent outcome, followed by discharges, neonatal deaths after two days, and newborn deaths. The high count of stillbirths highlights the significant perinatal risks associated with severe preeclampsia, emphasizing the need for improved management strategies to enhance neonatal survival.

DISCUSSION

Pre-eclampsia, a hypertensive disorder during pregnancy, poses serious risks to maternal and perinatal health, particularly when it occurs early and severely, known as early-onset severe pre-eclampsia (EOSP). EOSP can lead to complications such as eclampsia, HELLP syndrome, and even fetal demise. Clinicians face challenges balancing early delivery to protect maternal health and the risks premature birth poses to the infant. Managing EOSP requires careful assessment and may involve expectant management, where delivery is delayed under close monitoring to improve fetal maturity. This approach is complex and resource-intensive, especially in low-resource settings. This study aims to evaluate maternal and neonatal outcomes in EOSP cases, comparing expectant and non-expectant management to inform safer treatment approaches and reduce health disparities associated with EOSP [21].

Our study's findings, showing that 82% of participants were aged 20-30, 54% had primary education, and 66.9% were homemakers with 65.3% from lower socioeconomic backgrounds, align with the sociodemographic patterns reported by Ndwiga C et al., 2020, and Teka H et al., 2023. Ndwiga's study noted minor differences between Early Onset (EO-PE) and Late Onset Pre-eclampsia (LO-PE) groups in age, parity, and residence, with a higher mean age in EO-PE (p = 0.008) and more urban residents in LO-PE. Teka's study further supported these trends, highlighting urban residence and antenatal care access among participants, reinforcing our sociodemographic insights [22, 23].

Our findings, showing that among 142 women with severe pre-eclampsia onset before 30 weeks, the mean age was 23.85 years, with 57.75% nulliparous and 20.42% having a history of HDP, align with the clinical profiles reported by Teka H et al., 2023, and Ndwiga C et al., 2020. Teka's study highlighted similar blood pressure readings (150.3/103.4 mmHg) and a high rate of antenatal care (93.2%), while Ndwiga's study observed parity and gravidity distributions with most women at lower levels, comparable across early and late onset pre-eclampsia groups, reflecting consistent demographic and clinical patterns [22,23].

Our findings, showing that expectant management in severe pre-eclampsia led to significantly higher neonatal weights compared to immediate delivery, align with the studies by Teka H et al., 2023, and Ndwiga C et al., 2020, who highlighted similar maternal and fetal outcomes. Both studies reported maternal indications for delivery in pre-eclampsia cases, including severe hypertension, neuro - logical, renal, and liver complications, as well as hema - tologic issues like anemia. Fetal outcomes like intrauterine growth restriction (IUGR) and stillbirth were also significant concerns. These findings reinforce the importance of individualized management strategies to improve neonatal health in severe pre-eclampsia cases [22, 23].

Our findings, showing significant associations between maternal (HDP, LSCS) and neonatal outcomes with higher antepartum fetal demise in delivered mothers and improved outcomes (live births, APGAR ≥ 7) in expectant mothers align with studies by Teka H et al., 2023, and Ndwiga C et al., 2020. Teka's study highlighted a stillbirth rate of 13.1%, particularly among early-onset preeclampsia cases, where neonatal complications and low APGAR scores were prevalent. Similarly, Ndwiga reported higher stillbirth rates (33.9%) in early-onset preeclampsia, with improved live birth rates in late-onset cases, underscoring the benefits of managed expectant care [22, 23].

Our findings, showing that uncontrolled blood pressure (35.9%) and HELLP syndrome (23.2%) are the most

common complications in severe pre-eclampsia, align with the studies by Teka H et al., 2023, and Ndwiga C et al., 2020, which identified similar severe complications. Teka reported high rates of renal insufficiency, liver involvement, and neurologic issues like blurred vision and abnormal movements, particularly in early-onset pre-eclampsia (EO-PE). Ndwiga's findings also noted increased risks of HELLP syndrome, antepartum hemorrhage, and renal failure in EO-PE, emphasizing the elevated maternal health risks associated with early onset cases in low-resource settings [22, 23].

Our findings, showing neonatal complications in severe pre-eclampsia where 30.28% required NICU stays, with respiratory distress (16.20%) and sepsis (9.15%) as common issues correlate with the work of Ndwiga C et al., 2020, and Teka H et al., 2023. Teka's study highlighted similar neonatal risks, particularly in early-onset pre-eclampsia (EO-PE) cases, were preterm infants frequently experienced respiratory distress and sepsis. Ndwiga also reported increased neonatal mortality, low APGAR scores, and low birth weights in EO-PE cases. Both studies support our findings that neonatal risks are pronounced in severe pre-eclampsia, especially with early delivery, and demonstrate improved outcomes with advancing gestational age [22,23].

CONCLUSION

While most live births (80.95%) and higher birth weight were found in babies delivered at 27-28 weeks of gestation, better neonatal outcome was found with further increasing gestational age. This was not the same for maternal condition which had good outcome (79.59%) at 27-28 weeks and was not the same with later gestational age. Before 27 weeks, expectant management offers no added benefit and termination can be offered in such cases in view of high perinatal mortality and risk of maternal morbidity. Expectant management in severe pre eclampsia can be considered after carefully weighing the risks and fetal condition, as well as efficient counselling by both obstetrician and neonatologist.

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