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# MATERNAL AND NEONATAL OUTCOMES OF EARLY-ONSET AND LATE-ONSET PRE-ECLAMPSIA IN A RURAL HOSPITAL: A RETROSPECTIVE COHORT STUDY

Obstetrics & Gynaecology

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## ABSTRACT

**Introduction:** Preeclampsia, a hypertensive disorder of pregnancy, can present as early-onset preeclampsia (<34 weeks) or late-onset preeclampsia (≥34 weeks), with early-onset forms often linked to more severe maternal and neonatal outcomes. Differentiating these subtypes is crucial for tailored clinical management and predicting perinatal risks. **Aim:** To compare risk factors, clinical profiles, and maternal and neonatal outcomes between early-onset preeclampsia and late-onset preeclampsia, and assess maternal morbidity associated with each. **Materials And Methods:** A retrospective cohort study was conducted at Akash Hospital from May 2022 to May 2023, including all women diagnosed with preeclampsia. Data were obtained from hospital records, covering demographics, clinical features, laboratory parameters, maternal comorbidities, delivery details, and neonatal outcomes. Maternal complications (e.g., eclampsia, HELLP syndrome, PPH, ICU admission) and neonatal outcomes (e.g., birth weight, APGAR scores, NICU stay, complications) were analyzed. Statistical analysis was performed using SPSS v26.0 with significance set at $p < 0.05$. **Results:** Out of 78 cases, 30.9% were early-onset preeclampsia and 69.1% late-onset preeclampsia. Early-onset preeclampsia was associated with higher corticosteroid administration (38.1%). Cesarean section was the predominant delivery mode in both groups (93.6%). Early-onset preeclampsia had a greater incidence of low birth weight, preterm birth, and NICU stay >7 days. NICU admissions were required in 33.8% of cases, with early-onset preeclampsia contributing 33.3%. Neonatal complications such as respiratory distress, sepsis, and thrombocytopenia were common across both groups, though hyperbilirubinemia and hypoglycemia were more frequent in late-onset preeclampsia. **Conclusion:** In our study, patients with late onset preeclampsia were more than the early onset ones. Early-onset preeclampsia is associated with higher maternal morbidity and adverse neonatal outcomes, including preterm delivery, low birth weight, and increased NICU needs. Timely identification and management, including aspirin prophylaxis and corticosteroid use, are essential to mitigate complications. Distinguishing early-onset preeclampsia from late-onset preeclampsia is critical for improving perinatal outcomes and optimizing care strategies.

## KEYWORDS

Preeclampsia, Early-onset Preeclampsia, Late-onset Preeclampsia, Maternal Morbidity, Neonatal Outcomes, HELLP Syndrome, Eclampsia, Hypertension in Pregnancy.

## INTRODUCTION

Early-onset preeclampsia is frequently linked to more severe maternal complications than late-onset forms. Women with early-onset disease are at greater risk for serious conditions such as eclampsia, HELLP syndrome (characterized by hemolysis, elevated liver enzymes, and low platelet count), and placental abruption, often requiring intensive medical intervention and closer monitoring [1,2]. Evidence supports that initiating aspirin prophylaxis in high-risk women—particularly at doses above 100 mg and before 16 weeks of gestation—can reduce the incidence of preterm preeclampsia by over 60% [3].

In comparison, late-onset preeclampsia typically presents with less severe symptoms but is still associated with complications like gestational hypertension and moderate proteinuria. These cases, while generally milder, demand vigilant monitoring to prevent progression to more serious forms of the disease [4,5].

Neonatal outcomes also differ markedly between early- and late-onset preeclampsia. Infants born to mothers with early-onset preeclampsia face elevated risks of intrauterine growth restriction (IUGR), preterm birth, and low birth weight. These complications often necessitate NICU admission and may contribute to long-term developmental concerns [6,7]. On the other hand, babies born following late-onset preeclampsia tend to have more favorable birth weights and a lower incidence of severe prematurity-related issues, though they may still experience complications related to mild prematurity [8,9].

This study aimed to evaluate and compare the risk factors, clinical presentations, and both maternal and neonatal outcomes in cases of early-onset versus late-onset preeclampsia. It also sought to assess the extent of maternal morbidity associated with each type, providing a comprehensive understanding of how the timing of preeclampsia onset influences disease severity, management approaches, and perinatal outcomes.

### Objective Of The Study

This study was conducted to estimate the risk factors, clinical trends, and maternal & neonatal outcomes in early-onset compared with late-onset pre-eclampsia and associated maternal morbidity.

### Methodology

A retrospective cohort study was conducted at Akash Hospital from May 2022 to May 2023, including all women diagnosed with preeclampsia.

### Inclusion Criteria

1. All patients, irrespective of age, diagnosed with preeclampsia who delivered at Akash Hospital between May 2022 and May 2023.
2. Only subjects with confirmed gestation and disease onset timing (preeclampsia) were included.

### Exclusion Criteria

1. Preeclamptic women who terminated their pregnancy before the age of viability, i.e., gestational age <28 weeks.
2. Chronic hypertension.
3. Patients with chronic kidney disease, heart disease, anti-phospholipid antibody syndrome, or a history of drug abuse were excluded from the study.

The timing of preeclampsia onset—whether early or late—was determined based on hospital medical records. Comprehensive clinical and laboratory data were extracted from patient charts, including maternal age, parity, gestational age at diagnosis and delivery, and the presence or absence of severity features. Additional recorded variables included comorbidities such as anemia and gestational diabetes, as well as clinical signs like pallor and edema. Vital signs and biochemical parameters were meticulously noted, including systolic and diastolic blood pressure, liver enzymes (AST and ALT), serum creatinine, lactate dehydrogenase (LDH), coagulation profile, serum uric acid levels, urinary protein levels, complete blood count values, fundoscopy (to look for retinal changes) and growth scan with fetal doppler.

Specific preeclampsia-related symptoms such as headache, right upper quadrant pain, epigastric pain, vomiting, and blurred vision were also

documented. Delivery details, including mode of delivery (vaginal or cesarean), gestational age at birth, and the indication for cesarean section, were recorded. Indicators of maternal morbidity were analyzed, including occurrences of eclampsia, HELLP syndrome, pulmonary edema, hypertensive retinopathy, postpartum hemorrhage, placental abruption, the need for blood transfusion and need for ICU admission. Perinatal outcomes were evaluated through APGAR scores at the 1st and 5th minutes, neonatal birth weight, NICU admission status, neonatal complications, and neonatal mortality.

The data was collected and compiled in MS Excel. Descriptive statistics has been used to present the data. To analyse the data SPSS (Version 26.0) was used. Significance level was fixed as 5% ($\alpha = 0.05$). Qualitative variables are expressed as frequency and percentages and Quantitative variables are expressed as Mean and Standard Deviation. To compare the proportion between variables, chi-square test was used.

## RESULTS

The study cohort included 78 participants predominantly comprised women aged 21–35 years (87.2%), among whom 30.9% developed early-onset preeclampsia and 69.1% had late-onset preeclampsia. No cases of early-onset preeclampsia were observed in the ≤20 age group (7.7%), among which all patients had late-onset preeclampsia. Among women aged >35 years (5.1%), early-onset preeclampsia was observed in 33.3%. In terms of parity, 46.2% of women were primigravida, with 27.8% having early-onset preeclampsia and 72.2% late-onset preeclampsia. Among multigravidas (52.8%), early-onset preeclampsia occurred in 28.6% and late-onset in 69.4%. Regarding BMI, 65.4% of women had a normal range (18.5–24.9 kg/m²), with 31.4% developing early-onset and 68.6% late-onset preeclampsia. Notably, early-onset preeclampsia was seen more predominant in underweight women (66.7%), while obesity (12.8% of the cohort) was primarily associated with late-onset preeclampsia (90%). Rural residents made up 91.1% of the study population, with early-onset preeclampsia affecting 29.6% of them. Among urban residents (8.9%), only one case (14.3%) was early-onset. Women booked at the hospital (70.5%) had a lower incidence of early-onset preeclampsia (23.6%) compared to those booked elsewhere (29.5%), where early-onset occurred in 39.1% as shown in Table 1.

Gestational diabetes mellitus was present in 15.4% of women, with 41.7% of those affected developing early-onset preeclampsia. Hypothyroidism was seen in 11.5%, with early-onset preeclampsia noted in 44.4% of these cases. All uterine anomalies (3.8%) were associated with late-onset preeclampsia. Anemia was common (35.9%), with the majority (75%) of anemic women developing late-onset preeclampsia. A previous history of preeclampsia was noted in 9% of women, with 57.1% having early-onset. There were no cases of smoking or substance abuse as shown in Table 2.

6.4% of patients with preeclampsia underwent vaginal deliveries, all of which were induced, and 60% occurred in early-onset cases. Most women (93.6%) underwent lower segment cesarean section, with emergency cesarean accounting for 89%. Of these who underwent Emergency cesarean, early-onset preeclampsia was seen in 26% of cases. Deliveries at ≤34 weeks occurred only in early-onset cases (3.8%). Among those delivering at 34–37 weeks (25.6%), 45% had early-onset preeclampsia. Term deliveries (≥37 weeks) were more common in late-onset (81.8%) than early-onset (18.2%) as shown in Table 3.

Hypertensive crisis occurred in 39.7% of patients, with a higher proportion in late-onset preeclampsia (64.5%). Symptoms like headache (19.2%), facial swelling (3.8%), abdominal wall edema (6.4%), and pedal edema (43.6%) were predominantly reported in late-onset cases. Generalized tonic-clonic seizures occurred in 3.8%, equally affecting both groups. Elevated serum creatinine (≥1.1 mg/dL) was seen in 3.8%, and platelet count <100,000/mm³ in 2.6%, with no marked difference between onset types. ALT >64 IU/L was observed in 3.8% overall, two-thirds of which were in early-onset. AST >62 IU/L was seen in 5.1%, equally distributed. Elevated LDH (>600 IU/L) was rare (1.3%) and observed only in late-onset. Serum uric acid >6 mg/dL was recorded in 19.2%, with 40% of those cases being early-onset. Retinal changes were exclusively observed in early-onset (2.6%). Proteinuria was absent in 29.5%, with 34.8% of them being early-onset. Among those with trace to 3+ proteinuria, higher grades (2+ and 3+) were more common in late-onset as shown in Table 4.

As depicted in Table 5, Oligohydramnios was present in 9%, with early-onset preeclampsia accounting for 42.9% of those cases. Maternal ascites occurred in 12.8%, mostly in late-onset (90%). Abruption occurred in 2.6%, all in late-onset. Postpartum hemorrhage and blood transfusion were each required in 15.4% of cases, with early-onset comprising 25% of those. ICU admission was necessary in 5.1%, equally distributed between early- and late-onset. Imminent signs during the postpartum period were seen in 21.8%, with 35.3% in early-onset. Hospital stays longer than seven days were reported in 62.8%, with 32.7% in early-onset.

Aspirin prophylaxis was used in 21.8% of patients, the majority of whom (82.4%) had early-onset preeclampsia, reflecting targeted preventive efforts. Antihypertensive therapy included labetalol in all patients and nifedipine in 10.3%, predominantly among early-onset (62.5%). Magnesium sulfate was administered in 15.4% of women, 41.7% of whom had early-onset. Corticosteroids for fetal lung maturity were given in 53.8% of cases, mainly betamethasone (42 cases), with 38.1% in early-onset as shown in Table 6.

Among neonatal outcomes as shown in Table 7, 98.7% of infants were live births, with the single stillbirth occurring in early-onset. Low birth weight (<1.5 kg) was exclusive to early-onset (3 cases). Of those weighing 1.5–2.4 kg (37%), 36.7% were born to mothers with early-onset. A majority (59.3%) weighed ≥2.5 kg, with 79.2% from late-onset. APGAR scores <7 at 1 minute were observed in 10% of neonates, including 3 early-onset and 5 late-onset cases. Only one neonate had a 5-minute APGAR <7, which was a late-onset case. NICU admission was required in 33.8%, with early-onset accounting for 33.3%. Longer NICU stays (>7 days) were more common in early-onset (50%). One neonatal death occurred, which was in the early-onset group.

The leading reasons for NICU admission as depicted in Table 8 included prematurity (77.8%), with early-onset contributing 52.4%. Respiratory distress syndrome (81.5%) and resuscitation (81.5%) were more common in late-onset. Surfactant therapy (7.4%) and meconium aspiration (3.7%) were seen only in late-onset. Hyperbilirubinemia occurred in 74.1% of NICU cases, with 80% in late-onset. Hypoglycemia (14.8%) and sepsis (18.5%) were also more frequent in late-onset. Thrombocytopenia (11.1%) was seen mostly in early-onset. Small for gestational age (44.4%) and intrauterine growth restriction (40.7%) were nearly equally distributed between early- and late-onset, reflecting the fetal growth impact of both subtypes.

## DISCUSSION

Approaching preeclampsia through the lens of early-onset versus late-onset forms offers deeper insight into the complex etiopathogenesis of this multifaceted condition. This distinction, though relatively recent, has gained widespread recognition for its clinical relevance. It enables a more accurate assessment of disease severity, underlying mechanisms, and prognosis. Recognizing early- and late-onset preeclampsia as distinct subtypes allows for improved risk stratification, tailored management strategies, and ultimately, better maternal and neonatal outcomes [10,11].

In the present study, the majority of women diagnosed with preeclampsia were between 21 and 35 years of age (87.2%), among whom 30.9% developed early-onset preeclampsia and 69.1% had late-onset preeclampsia. Early-onset preeclampsia was not observed in any woman aged ≤20 years (7.7%), whereas 100% of these younger women developed late-onset disease. Among women aged >35 years (5.1%), 33.3% had early-onset preeclampsia, supporting the link between advanced maternal age and higher risk for early disease onset. Similarly, Teka et al. [12] reported a mean age of 27.4 years (SD 6.3) in their study on early- versus late-onset preeclampsia-eclampsia (PE-E) syndrome among 27% and 73% respectively. Gomathy et al. [11] reported that late-onset preeclampsia accounted for 72.4% of all PE cases, while early-onset preeclampsia constituted 27.6% with 68.2% in the 20 to 35 years age group, closely matching our distribution. However, Gomathy et al. [11] found a higher proportion of teenage pregnancies among late-onset preeclampsia (15.3%) than early-onset preeclampsia (8.3%), which was statistically significant ($p = 0.0473$).

In our study, 46.2% of participants were primigravida, with 27.8% experiencing early-onset and 72.2% late-onset preeclampsia. Among multigravidas (52.8%), 28.6% had early-onset and 69.4% late-onset preeclampsia. This near-equal distribution indicates that parity did not

significantly impact the type of onset which was identical with the Teka et al. [12] study where they also observed no significant parity difference between early-onset preeclampsia and late-onset preeclampsia, indicating consensus on parity's limited role in onset timing, while Gomathy et al. [11] found early-onset preeclampsia more common in primigravidas (53.3%), and late-onset preeclampsia in multigravidas (58.6%), which was statistically significant (p = 0.017). Most women (65.4%) had a normal BMI (18.5–24.9 kg/m²), among whom 31.4% developed early-onset and 68.6% late-onset disease. Early-onset preeclampsia was notably more frequent in underweight women (66.7%), while 90% of obese women (12.8%) had late-onset disease, indicating differing metabolic associations.

In the current study, 91.1% of participants were from rural areas, and 29.6% of them had early-onset preeclampsia. Among the smaller urban group (8.9%), early-onset cases accounted for just 14.3%. Conversely, Teka et al. [12] had a more balanced urban-rural split (61.6% urban), with no significant difference in early-onset preeclampsia distribution by residence, likely reflecting regional healthcare access differences. Women booked at our hospital (70.5%) had a lower rate of early-onset preeclampsia (23.6%) compared to those booked outside (29.5%), where 39.1% had early-onset disease. These findings suggest that consistent, hospital-based antenatal care may contribute to earlier detection and potentially reduce the risk of early-onset disease.

In the current study, gestational diabetes mellitus was present in 15.4% of women, with 41.7% of them developing early-onset preeclampsia. Hypothyroidism was observed in 11.5% of women, with 44.4% of these cases linked to early-onset disease. All uterine anomalies (3.8%) were associated with late-onset preeclampsia. Anemia, a prevalent condition (35.9%), was mostly linked with late-onset disease (75%). A previous history of preeclampsia was noted in 9% of women; of these, 57.1% had early-onset disease, highlighting the importance of past obstetric history in risk stratification. No participants in this study reported smoking or substance use. Comparatively, Teka et al. [12] found no significant risk factor differences (diabetes or BMI), though obesity was common overall and reported 6.1% had history of PE-E, showing prior disease as a known risk factor in their research, while gestational diabetes mellitus (GDM) was slightly more common in early-onset preeclampsia (9.3%) compared to late-onset preeclampsia (5.9%), with no significant difference (p = 0.699) in the Akbar et al. [13] study.

In our study, only 6.4% of deliveries were vaginal, all of which were induced, and 60% occurred in women with early-onset disease. The vast majority (93.6%) underwent cesarean section, of which 89% were emergency LSCS. Among these, 26% were early-onset cases. Singleton pregnancies accounted for 96.2% of the cohort, with 28% of these associated with early-onset preeclampsia. All diagnoses made at ≤34 weeks (28.2%) were classified as early-onset, while all diagnoses after 34 weeks (71.8%) were late-onset. Deliveries before 34 weeks occurred only in early-onset cases (3.8%). Among women who delivered between 34 and 37 weeks (25.6%), 45% had early-onset preeclampsia. Most term deliveries (≥37 weeks, 70.5%) were associated with late-onset preeclampsia (81.8%). At the same time, Teka et al. [12] found about 43% cesarean rates, not significantly different between groups, suggesting variability in obstetric practices or resource settings and Akbar et al. [13] showed that cesarean delivery was slightly more common in late-onset preeclampsia (66.7%) than early-onset preeclampsia (60.5%) and observed no significant difference in cesarean vs. vaginal delivery rates between groups. Also, Gomathy et al. [11] reported 53.3% LSCS in early-onset preeclampsia vs. 58.6% in late-onset preeclampsia in their study and spontaneous vaginal delivery was significantly higher in early-onset preeclampsia in their study (89.3% vs. 23.1%, p = 0.0001).

In the present study, Hypertensive crisis (SBP ≥160 mmHg and/or DBP≥110 mmHg) was reported in 39.7% of cases, with 64.5% of these belonging to the late-onset group. Clinical symptoms such as headache (19.2%), facial swelling (3.8%), abdominal wall edema (6.4%), and pedal edema (43.6%) were more frequent in late-onset preeclampsia. Generalized tonic-clonic seizures occurred in 3.8% of women, equally across both groups. ALT elevation (>64 IU/L) was more commonly seen in early-onset cases (66.7%), while AST elevation (>62 IU/L) occurred equally in both groups. Elevated LDH (>600 IU/L) was rare (1.3%) and found only in late-onset cases. Retinal changes were exclusively noted in early-onset cases (2.6%). Serum uric acid >6 mg/dL was found in 19.2% of patients, with early-onset preeclampsia present in 40% of these. Higher grades of proteinuria (2+ and 3+) were predominantly found in late-onset cases, although mild or absent proteinuria occurred across both groups. Similar to our study, Teka et al. [12] reported significantly higher rates of severe PE features in early-onset preeclampsia (AOR 2.92), including headaches, facial swelling, elevated diastolic BP, and raised liver enzymes (AST), whereas Gomathy et al. [11] reported a diastolic mean of 109.7 mmHg in early-onset preeclampsia vs. 106 mmHg in late-onset preeclampsia (p = 0.002) and showed slightly higher systolic BP in early-onset preeclampsia (173 vs. 169 mmHg), but this was not statistically significant (p = 0.073).

In the current study, oligohydramnios was reported in 9% of cases, with early-onset contributing to 42.9% of these. Maternal ascites was seen in 12.8% of women, predominantly among late-onset cases (90%). Placental abruption occurred in 2.6%, all in the late-onset group. Postpartum hemorrhage and blood transfusions were required in 15.4% of cases each, with early-onset comprising 25% of both. ICU admissions were necessary in 5.1%, equally distributed between groups. Imminent postpartum complications were noted in 21.8%, with 35.3% in the early-onset group. Hospital stays exceeding seven days were common (62.8%), with 32.7% of these among women with early-onset disease, while Teka et al. [12] found significantly longer hospital stays in early-onset preeclampsia (AOR 4.7) in their study and Akbar et al. [13] observed a significantly longer hospital stay in early-onset preeclampsia (8 vs. 6 days, p = 0.00). At the same time, Gomathy et al. [11] reported a mean stay of 5.6 days for early-onset preeclampsia vs. 5.3 days for late-onset preeclampsia (p = 0.0001).

In our study, Aspirin prophylaxis was employed in 21.8% of patients, with a notable 82.4% developing early-onset preeclampsia, suggesting appropriate use in high-risk groups. Therefore, complication rates were lower in those with early onset preeclampsia. All women were treated with labetalol, while 10.3% received additional nifedipine, predominantly in early-onset cases (62.5%). Magnesium sulfate was used in 15.4%, with 41.7% of these in early-onset cases. Corticosteroids for fetal lung maturity were given in 53.8% of women, primarily betamethasone, and used more often in early-onset preeclampsia (38.1%), whereas in the Teka et al. [12] study, 54.9% used corticosteroids and hydralazine was the most common antihypertensive and nearly universal use of magnesium sulfate (>95%) with low aspirin use (<50%) reported in their study.

In our study, neonatal outcomes varied significantly by disease onset. Of the 78 births, 98.7% were live births, with the single stillbirth occurring in the early-onset group. All neonates weighing <1.5 kg (3.7%) were born to mothers with early-onset disease. Among neonates with birthweights of 1.5–2.4 kg (37%), 36.7% were from early-onset cases, while 79.2% of those ≥2.5 kg (59.3%) were from late-onset pregnancies. APGAR scores <7 at one minute were noted in 10%, with early-onset accounting for 3 cases. The only low 5-minute APGAR score was seen in a late-onset neonate. NICU admissions occurred in 33.8% of cases, with early-onset accounting for 33.3%. Prolonged NICU stay (>7 days) was more common in early-onset (50%). The sole neonatal death also occurred in this group.

Similarly, Teka et al. [12] found low birth weight (AOR 10.14), neonatal mortality (AOR 6.82), and low 5-minute APGAR scores significantly higher in early-onset preeclampsia and Akbar et al. [13] found a statistically significant higher rate of preterm delivery in EO-PE (97.6% vs. 38%), lower birthweight (1,525g vs. 2,650g), shorter birth length, and lower 1- and 5-minute APGAR scores (all p = 0.00). Comparatively, Gomathy et al. [11] reported 91.6% of early-onset preeclampsia neonates weighed <2,000g compared to only 15.2% in late-onset preeclampsia (p = 0.0001) and recorded 15% stillbirths in early-onset preeclampsia vs. 3.2% in late-onset preeclampsia, a statistically significant disparity in their study.

The most common reasons for NICU admission in the present study were prematurity (77.8%), with early-onset preeclampsia accounting for 52.4% of those cases. Respiratory distress syndrome and need for resuscitation (each 81.5%) were more frequent among late-onset neonates. Surfactant therapy (7.4%) and meconium aspiration (3.7%) were exclusively seen in late-onset cases. Hyperbilirubinemia was common (74.1%), with 80% of affected neonates from the late-onset group. Hypoglycemia (14.8%) and neonatal sepsis (18.5%) were also more prevalent in late-onset. Thrombocytopenia (11.1%) was observed more in neonates of early-onset mothers. Small for gestational age (44.4%) and intrauterine growth restriction (40.7%)

occurred in both groups, with early-onset contributing slightly more to IUGR (36.4%), while asphyxia (11.7% vs. 1.3% (p = 0.0001) was more common in early-onset preeclampsia in the Gomathy et al. [11] study.

## CONCLUSION

Our study highlighted that early-onset preeclampsia was more common among women who were underweight, while late-onset preeclampsia was predominantly seen in women with normal or higher BMI, suggesting differing underlying metabolic and placental pathophysiology. Our study also highlights the protective role of consistent antenatal care, as women booked and followed at the study hospital had lower rates of early-onset preeclampsia compared to those with irregular or outside care, emphasizing the importance of structured monitoring in reducing severe disease onset.

Clinically, early-onset preeclampsia was associated with more severe maternal complications, including earlier gestational age at diagnosis and delivery, higher frequency of laboratory abnormalities such as elevated liver enzymes and retinal changes, and a greater need for intensive interventions such as corticosteroids, magnesium sulfate, and emergency cesarean sections. In contrast, late-onset preeclampsia cases more often presented with hypertensive crises and overt symptoms near term but generally had more favorable maternal clinical outcomes. Despite a higher rate of cesarean deliveries overall, pregnancies complicated by early-onset preeclampsia had a greater incidence of preterm birth and prolonged hospitalization, reflecting the complexity and severity of early disease.

Neonatal outcomes further distinguished the two groups, with early-onset preeclampsia associated with significantly higher rates of prematurity, low birth weight, neonatal intensive care admissions, and neonatal morbidity including thrombocytopenia and intrauterine growth restriction. Neonates born to mothers with early-onset preeclampsia experienced longer NICU stays and higher mortality, underlining the substantial perinatal risks posed by early disease onset. Conversely, neonates born to mothers with late-onset preeclampsia generally had better birth weights, despite a higher prevalence of certain complications such as respiratory distress syndrome and hyperbilirubinemia.

Overall, our study emphasizes the critical need to differentiate preeclampsia by timing of onset for more precise risk stratification and tailored management. Early identification of women at risk for early-onset preeclampsia, close antenatal surveillance, and timely therapeutic interventions are essential to mitigate adverse maternal and neonatal outcomes. Meanwhile, managing late-onset preeclampsia with appropriate symptom monitoring and planned delivery near term can optimize outcomes for both mother and child. These findings have important implications for improving clinical protocols and resource allocation in similar healthcare settings, aiming to reduce the burden of preeclampsia-related morbidity and mortality.

### Tables And Figures

**Table 1: Demographic Characteristics Of Study Participants (n=78)**

| VARIABLES | TOTAL,n(%) | EARLY ONSET,n(%) | LATE ONSET,n(%) |
|---|---|---|---|
| Age (in years) | | | |
| ≤20 | 6 (7.7) | 0(0) | 6(100) |
| 21-35 | 68 (87.2) | 21(30.9) | 47(69.1) |
| >35 | 4 (5.1) | 1(33.3) | 3(66.7) |
| Gravida | | | |
| Primi | 36 (46.2) | 10(27.8) | 26(72.2) |
| Multi(2-4) | 42 (52.8) | 12(28.6) | 30(69.4) |
| BMI ($Kg/m^2$) | | | |
| Underweight(<18.5) | 3 (3.8) | 2(66.7) | 1(33.3) |
| Normal(18.5-24.9) | 51 (65.4) | 16(31.4) | 35(68.6) |
| Overweight(25-29.9) | 14 (17.9) | 3(21.4) | 11(78.6) |
| Obesity(≥30) | 10 (12.8) | 1(10) | 9(90) |
| Residence | | | |
| Urban | 7(8.9) | 1(14.3) | 6(85.7) |
| Rural | 71(91.1) | 21(29.6) | 50(70.4) |
| Booked | | | |
| At our hospital | 55(70.5) | 13(23.6) | 42(76.4) |
| Outside | 23(29.5) | 9(39.1) | 14(60.9) |

**Table 2: Risk Factors Of The Study Participants**

| VARIABLES | TOTAL,n(%) | EARLY ONSET,n(%) | LATE ONSET, n(%) |
|---|---|---|---|
| GDM | 12 (15.4) | 5(41.7) | 7(58.3) |
| UTERINE ANOMALY | 3 (3.8) | 0(0) | 3(100) |
| HYPOTHYROIDISM | 9 (11.5) | 4(44.4) | 5(55.6) |
| ANEMIA | 28 (35.9) | 7 (25) | 21 (75) |
| PREVIOUS HISTORY OF PREECLAMPSIA | 7(9) | 4(57.1) | 3(42.9) |
| SMOKING/ SUBSTANCE ABUSE | 0(0) | 0(0) | 0(0) |

**Table 3: Maternal Characteristics Of The Study Participants**

| CHARACTERISTIC | TOTAL, n(%) | EARLY ONSET, n (%) | LATE ONSET, n (%) |
|---|---|---|---|
| Mode of delivery | | | |
| Vaginal delivery | 5 (6.4) | 3(60) | 2(40) |
| Spontaneous vaginal delivery | 0(0) | 0(0) | 0(0) |
| Induced vaginal delivery | 5(100) | 3(60) | 2(40) |
| LSCS | 73 (93.6) | 19(26) | 54 (74) |
| Emergency LSCS | 65(89) | 17(26.2) | 48(73.8) |
| Elective LSCS | 8(11) | 2(25) | 6 (75) |
| Number of gestations | | | |
| Singleton | 75 (96.2) | 21(28) | 54(69.2) |
| Twins | 3 (3.8) | 1(33.3) | 2(66.7) |
| Gestational age at which preeclampsia was detected (in weeks) | | | |
| ≤34 | 22(28.2) | 22(100) | 0(0) |
| 34-37 | 22(28.2) | 0(0) | 22(100) |
| ≥37 | 34(43.6) | 0(0) | 34(100) |
| Gestational age at delivery (in weeks) | | | |
| ≤34 | 3(3.8) | 3(100) | 0(0) |
| 34-37 | 20 (25.6) | 9 (45) | 11 (55) |
| ≥37 | 55 (70.5) | 10 (18.2) | 45 (81.8) |

**Table 4: Maternal Severity Of Symptoms & Complications**

| VARIABLES | TOTAL,n(%) | EARLY ONSET, n (%) | LATE ONSET, n (%) |
|---|---|---|---|
| HYPERTENSIVE CRISIS (SBP≥160 AND/OR DBP ≥110) | 31(39.7) | 11(35.5) | 20(64.5) |
| HEADACHE | 15(19.2) | 4(26.7) | 11(73.3) |
| FACIAL SWELLING | 3 (3.8) | 1(33.3) | 2(66.7) |
| ABDOMINAL WALL EDEMA | 5 (6.4) | 1(20) | 4(80) |
| PEDAL EDEMA | 34 (43.6) | 9(26.5) | 25(73.5) |
| GENERALISED TONIC CLONIC SEIZURES | 3 (3.8) | 1(33.3) | 2(66.7) |
| S. CREATININE ≥1.1 | 3 (3.8) | 1(33.3) | 2(66.7) |
| PLATELET <1,00,000 | 2 (2.6) | 1(50) | 1(50) |
| ALT >64 | 3 (3.8) | 2(66.7) | 1(33.3) |
| AST >62 | 4 (5.1) | 2(50) | 2(50) |
| LDH >600 | 1 (1.3) | 0(0) | 1(100) |
| S. URIC ACID >6 | 15(19.2) | 6(40) | 9(60) |
| RETINAL CHANGES | 2 (2.6) | 2(100) | 0(0) |
| URINE PROTEIN | | | |
| ABSENT | 23(29.5) | 8(34.8) | 15(65.2) |
| TRACES | 21(26.9) | 6(28.6) | 15(71.4) |
| 1+ | 22(28.2) | 6(27.3) | 16(72.7) |
| 2+ | 11(14.1) | 2(18.2) | 9(81.8) |
| 3+ | 1(1.3) | 0(0) | 1(100) |

**Table 5: Comparison Of Maternal Morbidity Indicators Between Early-onset And Late-onset Preeclampsia**

| VARIABLES | TOTAL,n(%) | EARLY ONSET, n(%) | LATE ONSET, n (%) |
|---|---|---|---|
| OLIGOHYDRAMNIOS | 7 (9) | 3(42.9) | 4(57.1) |
| MATERNAL ASCITES | 10(12.8) | 1(10) | 9(90) |
| ABRUPTION | 2 (2.6) | 0(0) | 2(100) |
| PPH (ATONIC UTERUS) | 12 (15.4) | 3(25) | 9(75) |
| BLOOD TRANSFUSION | 12 (15.4) | 3(25) | 9(75) |
| ICU ADMISSION | 4 (5.1) | 2(50) | 2(50) |
| IMMINENT SIGNS DURING | 17(21.8) | 6(35.3) | 11(64.7) |

| | | | |
|---|---|---|---|
| POSTPARTUM PERIOD | | | |
| DURATION OF HOSPITAL STAY > 7 DAYS | 49(62.8) | 16(32.7) | 33(67.3) |

**Table 6: Management Of Preeclampsia And Eclampsia**

| MANAGEMENT | TOTAL,n (%) | EARLY ONSET,n(%) | LATE ONSET,n(%) |
|---|---|---|---|
| ASPIRIN PROPHYLAXIS FOR PREVENTION | | | |
| YES | 17(21.8) | 14(82.4) | 3(17.6) |
| NO | 61(78.2) | 8(13.1) | 53(86.9) |
| ANTIHYPERTENSIVES | | | |
| NIFEDIPINE | 8 (10.3) | 5(62.5) | 3(37.5) |
| LABETALOL | 78 (100) | 22(28.2) | 56(71.8) |
| ANTICONVULSANT USE | | | |
| MgSO4 | 12 (15.4) | 5(41.7) | 7(58.3) |
| STEROID FOR LUNG MATURITY | | | |
| DEXAMETHASONE | 1 (1.3) | 0(0) | 1(100) |
| BETAMETHASONE | 42 (53.8) | 16(38.1) | 26(61.9) |

**Table 7. Neonatal Outcomes**

| VARIABLES | TOTAL, n (%) | EARLY ONSET, n (%) | LATE ONSET, n (%) |
|---|---|---|---|
| Outcome of delivery | | | |
| Live | 77 (98.7) | 21(27.3) | 56(72.7) |
| Still birth | 1 (1.3) | 1(100) | 0(0) |
| Birthweight (in Kg) | | | |
| <1.5 | 3 (3.7) | 3(100) | 0(0) |
| 1.5-2.4 | 30 (37) | 11(36.7) | 19(63.3) |
| ≥2.5 | 48 (59.3) | 10(20.8) | 38(79.2) |
| APGAR (<7) | | | |
| At 1min | 8 (10) | 3(37.5) | 5(62.5) |
| At 5mins | 1 (1.3) | 0(0) | 1(100) |
| NICU admission | | | |
| Yes | 27 (33.8) | 9(33.3) | 18(66.7) |
| No | 53 (66.3) | 13(24.5) | 40 (75.5) |
| Duration of NICU stay (in days) | | | |
| ≤7 | 15 (55.6) | 3(20) | 12(80) |
| >7 | 12 (44.4) | 6(50) | 6(50) |
| Status of neonate at discharge | | | |
| Alive | 79 (98.7) | 21 (26.6) | 58(73.4) |
| Dead | 1 (1.3) | 1(100) | 0(0) |

**Table 8. Reasons for NICU admission**

| REASONS | TOTAL,n(%) | EARLY ONSET, n (%) | LATE ONSET, n (%) |
|---|---|---|---|
| PREMATURITY | 21 (77.8) | 11(52.4) | 10(47.6) |
| RESPIRATORY DISTRESS SYNDROME | 22 (81.5) | 7(31.8) | 15(68.2) |
| SURFACTANT | 2 (7.4) | 0(0) | 2(100) |
| RESUSCITATION | 22 (81.5) | 7(31.8) | 15(68.2) |
| NEONATAL HYPERBILIRUBINEMIA | 20 (74.1) | 4(20) | 16(80) |
| HYPOGLYCEMIA | 4 (14.8) | 1(25) | 3(75) |
| MECONIUM ASPIRATION | 1 (3.7) | 0(0) | 1(100) |
| THROMBOCYTOPENIA | 3 (11.1) | 2(66.7) | 1(33.3) |
| LEUCOPENIA | 1 (3.7) | 0(0) | 1(100) |
| SEPSIS | 5 (18.5) | 1(20) | 4 (80) |
| SMALL FOR GESTATIONAL AGE | 12 (44.4) | 6(50) | 6(50) |
| INTRAUTERINE GROWTH RESTRICTION | 11 (40.7) | 4(36.4) | 7(63.6) |

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