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Research Article

Maternal and Perinatal Outcomes and Predictors of Adverse Outcomes in Severe Preeclampsia: A Multicenter Observational Study.

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Abstract: Background: Preeclampsia with severe features is a significant contributor to maternal and perinatal morbidity and mortality, especially in low and middle resource countries. Maternal neurological, hepatic, renal, hematological and cardiovascular complications can occur during disease progression, and placental insufficiency and medically indicated premature delivery greatly increases the risk for the newborn. ***Objective:*** To assess maternal and neonatal outcome of women with severe preeclampsia and clinical and obstetric risk factors for adverse outcome ***Methods:*** The study involved women admitted with preeclampsia with severe features across participating tertiary-care hospitals in Pakistan and was designed as a multicenter observational study. Inclusion criteria included singleton pregnancies ≥20 weeks of gestation meeting accepted diagnostic criteria for preeclampsia with severe features. Maternal parameters, blood pressure, laboratory parameters, gestational age at diagnosis and delivery, treatment, mode of delivery, and maternal complications were documented. The following numerical results are given for illustrative purposes only and should be changed to real hospital data before they are submitted for drafting. ***Results:*** The average maternal age in the illustrative group was 28.6 ± 5.4 years and 62 of the women (34.4%) presented prior to 34 wks gestation. The rate of cesarean delivery was 77.2%. HELLP syndrome, eclampsia, intensive care admission, placental abruption and acute kidney injury were the major complications of the mother (9.4%, 7.8%, 8.9%, 6.1% and 5.0%, respectively). The rates of preterm birth, low birth weight and fetal growth restriction were 60.6%, 56.7% and 26.7% respectively, while 43.3% of the pregnancies resulted in admission to the NICU. Infants delivered before the 34th week were significantly related to NICU admission, low birth weight, respiratory distress and stillbirth.Infants who were delivered before 34 weeks were significantly associated with admission to the NICU, LBW, respiratory distress, and stillbirth. ***Conclusion:*** There is significant maternal morbidity with severe preeclampsia and an even higher burden of neonatal complications. Early gestational presentation seems to have a special role in predicting poor perinatal outcome. Early diagnosis, stabilisation, the right timing of delivery and access to neonatal intensive care are still very important to improving outcomes.

Keywords: Preeclampsia / Severe Preeclampsia, Maternal and Perinatal Morbidity, Endothelial Dysfunction, Uteroplacental Insufficiency.

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INTRODUCTION

Preeclampsia is a multisystem disorder associated with the pregnancy, which includes new onset hypertension after 20 weeks of pregnancy and proteinuria and/or compromise of maternal organs or uteroplacental function. It is still one of the most important hypertensive disorders responsible for maternal and perinatal morbidity globally. With today's definitions of proteinuria, it is known that proteinuria is not a necessity if other signs of maternal organ dysfunction or uteroplacental compromise are present (1,2). The importance of early detection of severe features is highlighted in international and American guidelines as clinical deterioration can be rapid.The prevalence of preeclampsia is estimated at 2–8% of pregnancies, but can be higher or lower in different populations and health care systems (3). Severe disease can include: severe blood pressure, neurological disorders, low platelets, problems with the liver, kidney failure, lung swelling, eclampsia, placental abruption, or HELLP syndrome. These complications may lead to admission to intensive care unit (ICU), significant obstetric procedures, extended hospital stays, and, at its extreme, maternal mortality (1–4).

The mechanism underlying the disease process is complex. Abnormal placentation and impaired remodeling of the maternal spiral arteries lead to placental hypoperfusion and ischemia. This results in the release of a number of anti-angiogenic, inflammatory and vasoactive mediators, leading to generalized endothelial dysfunction in the mother (1). This process can

account for the various symptoms of preeclampsia, including cardiovascular, neurological, hematological, hepatic and renal symptoms.At the same time the fetus is subjected to the effects of uteroplacental insufficiency. Fetal growth restriction, oligohydramnios, abnormal fetal Doppler parameters, fetal compromise and still birth are all potential complications of reduced placental perfusion. In addition, delivery is the sole treatment for preeclampsia and a significant percentage of neonatal morbidity is related to the delivery of the infant, not just hypertension itself (5,6). Pre-eclamptic pregnancies have been consistently found to be associated with adverse outcomes, namely preterm delivery, low birth weight, fetal growth restriction, low Apgar scores, need for NICU admission, respiratory morbidity, stillbirth and neonatal death (7).

This is especially a conundrum when severe preeclampsia occurs beyond term. Further fetal maturation can be provided during continuing pregnancy but additional disease progression for the mother. On the other hand, immediate delivery decreases the exposure of the mother to continued breastfeeding, and increases the risk of complications from prematurity. In the PHOENIX randomized trial, the balance of these competing maternal and neonatal risks was shown to be important in women with late-preterm preeclampsia (6). More recent studies on severe disease before 34 weeks have also shown significant maternal and neonatal morbidity to be related to early gestational presentation (8,9).This is especially important in low- and middle-income countries where late presentation, inadequate antenatal monitoring, inadequate access to advanced neonatal services and the lack of critical care can negatively impact outcomes. Maternal and neonatal morbidity due to hypertensive disorders of pregnancy have been reported in significant numbers at various times in Pakistan (10–13). A recent study in Pakistan showed that the younger one is when one develops preeclampsia, the worse the neonatal outcome will be, highlighting the impact of preeclampsia, which happens earlier in pregnancy, in a resource-limited environment (10). Despite the large amount of evidence available internationally on preeclampsia, there are differences in outcomes across institutions, depending on the referral process, the availability of maternal-fetal medicine services, intensive care unit capacity, neonatal support, and the timing of presentation. Multicenter data are thus useful in identifying complications, resource allocation and enhanced local management pathways.

The aim of the present study was to assess maternal and neonatal outcomes of women with severe preeclampsia managed across participating tertiary-care hospitals and to explore clinical and obstetric factors associated with adverse maternal and neonatal outcomes. Special focus was placed on maternal disease severity, mode of delivery, major morbidity, prematurity, birth weight, and need for neonatal intensive care.

MATERIALS AND METHODS

Study Design and Setting

This was a retrospective, multicenter observational study conducted in the Departments of Obstetrics and Gynecology of participating tertiary-care hospitals in Pakistan. Women diagnosed with preeclampsia with severe features and treated between 1st January 2024 and 31st December 2025 were identified from the medical records of the participating centers. In total, 180 women meeting predefined eligibility criteria were analysed across the participating centers. Demographic, obstetric, clinical, laboratory, treatment, and delivery data were extracted from medical records and delivery registers at each center. Neonatal information, including gestational age at birth, birth weight, Apgar scores, neonatal/NICU admission, respiratory complications, stillbirth, and early neonatal mortality, was obtained from neonatal and NICU records. This study aimed at assessing maternal and neonatal complications of severe preeclampsia and determining clinical and obstetric factors related to adverse outcomes.

Study Population

Women who came to the presentation during pregnancy with preeclampsia with severe features were deemed eligible.
The criteria used to diagnose Preeclampsia were based on the current international consensus of new onset hypertension at or after 20 weeks gestation, with a systolic blood pressure ≥140 mmHg and/or a diastolic blood pressure ≥90 mmHg with the presence of proteinuria or evidence of relevant maternal organ or uteroplacental dysfunction, as per the current international guidelines (1–4).

Severe features were defined as having 1 or more of the following:
Systolic BP ≥ 160 mmHg and/or diastolic BP ≥ 110 mmHg;
When headache and visual symptoms are severe and persistent;

- thrombocytopenia;
- impaired liver function;
- renal impairment;
- pulmonary edema;
- neurological complications;
- eclampsia; or

Other clinically significant signs of dysfunction of maternal organs.

Inclusion Criteria

To be eligible, women had to be:

1. had a gestational age of ≥20 weeks;
2. had a singleton pregnancy;
3. Met the criteria for preeclampsia with severe features; and
4. Was born in one of the participating study hospitals or was institutionalized until the outcome of pregnancy was identified; and
5. had sufficiently complete maternal and neonatal medical records.

Exclusion Criteria

Excluded patients included those who:

1. Fetal abnormalities at birth that are life-threatening;
2. multiple pregnancy;
3. incomplete medical records preventing assessment of the main outcomes; or
4. Transferred to another institution before maternal outcome and/or neonatal outcome could be determined.

Women with chronic hypertension who have superimposed preeclampsia can be analyzed as a prespecified sub-group or omitted from the analysis based on the specific study design. The decision has to be reached prior to the analysis of real data.

Sample Size

An illustrative sample of 180 women was used for the demonstration of the structure of the manuscript.

The number of women in the final sample should be the number of women that were actually included in the study during the period confirmed. Assessment of sample size can also be embedded in a formal study if the study is prospective.

Data Collection

Maternal demographic and obstetric risk factors assessed were maternal age, gravidity and parity, gestational age at diagnosis, gestational age at delivery, previous history of preeclampsia, chronic hypertension, diabetes mellitus, and status in antenatal care.Clinical data consisted of systolic and diastolic blood pressure, headache, visual symptoms, epigastric or right upper quadrant pain, edema and neurological symptoms. Laboratory tests performed consisted of platelet count, hemoglobin concentration, serum creatinine, alanine aminotransferase, aspartate aminotransferase, serum lactate dehydrogenase (where available) and quantification of proteinuria.Many people have been interested in the link between laboratory abnormalities and disease severity. The severity of proteinuria alone should not influence timing of delivery, though in recent studies, there has been some evidence that as proteinuria increased, certain adverse outcomes increased (14). In a similar fashion, high LDH levels have been linked to higher rates of maternal and fetal complications, such as in low and middle income countries (LMIC) (15). The treatment factors were magnesium sulfate, antihypertensive drugs, use of antenatal corticosteroids when needed, induction of labor, and cesarean delivery.

Maternal Outcomes

The main outcomes of the mother were:

- eclampsia;
- HELLP syndrome;
- placental abruption;
- acute kidney injury;
- pulmonary edema;
- postpartum hemorrhage;
- admission to an intensive care unit;
- blood-product transfusion;
- mode of delivery; and
- maternal mortality.

A composite adverse maternal outcome was defined as having at least one of the major maternal complications.

Neonatal Outcomes

The neonatal/perinatal outcomes were:

- gestational weight gain; and
- low birth weight under 5.5 pounds; or
- particularly/very premature birth before 34 weeks;
- birth weight;
- low birth weight (<2500 g);
- fetal growth restriction;
- 1 and 5 minute Apgar scores;

- NICU admission;
- respiratory distress;
- need for ventilatory or respiratory support;
- stillbirth; and
- early neonatal death.

These findings were chosen as they have been seen in previous systematic reviews and cohort studies of preeclamptic pregnancies (7–10).

Gestational-Age Subgroups

Women were stratified by delivery gestational age as follows:

- <34 weeks, and
- ≥34 weeks.

The 34-week cut-off was chosen because there is a marked shift in management and prognosis of the neonate at that gestational age and also because of the difficulty in achieving a maternal safety/foetal maturity balance for severe preeclampsia before 34 weeks (8,9).

Statistical Analysis

Data analysis was proposed to perform in SPSS software version [insert software version]. Means and standard deviations were used to describe continuous variables when they were normally distributed; otherwise the median and interquartile range were used. Categorical data were displayed as frequencies and percentages.The Chi-square test or Fisher's exact test was used to compare categorical outcomes. Independent-samples t-test or Mann–Whitney U test, whichever was appropriate, was used to compare continuous variables.

Selected adverse outcomes were calculated as odds ratios with 95% confidence interval. Where large enough numbers of events were available, multivariable logistic regression was to be performed to determine independent predictors of composite maternal and neonatal adverse outcomes. A two-sided p-value <0.05 was considered statistically significant.

Ethical Considerations

This is a draft, as the data presented is simulated data and no actual patient data was accessed at this stage. For a real multicenter hospital-based study, the manuscript should include the actual IRB/Ethics approval or waiver with approval number (if applicable) before submission. The principles of patient confidentiality and institutional data-protection protocols need to be adhered to.

RESULTS

Important Draft Status

The numerical results in this section are illustrative and simulated in order to present the final presentation. These should not be considered as observations in the hospital until they are replaced and confirmed with the actual study data set.

The illustrative analysis included a total of 180 women who have severe preeclampsia. The basic obstetric and demographic data are summarized in Table 1.

The average maternal age was 28.6 ± 5.4 years. The majority of women were in their twenties and thirties. Out of 58 women, 32.2% were primigravida and 122 (67.8%) had at least one previous pregnancy. Twenty-nine women (16.1%) had a history of preeclampsia, 21 women (11.7%) had a history of chronic hypertension and 14 women (7.8%) had a history of diabetes mellitus.

62 women (34.4%) suffered from severe disease and delivered before 34 weeks, highlighting the substantial number of pregnancies with severe disease.

Table 1: Baseline maternal and obstetric characteristics

Characteristic	Value, n (%) or Mean ± SD
Total participants	180
Maternal age, years	28.6 ± 5.4
Age <20 years	12 (6.7)
Age 20–34 years	138 (76.7)
Age ≥35 years	30 (16.7)
Primigravida	58 (32.2)
Multigravida	122 (67.8)
Previous preeclampsia	29 (16.1)

Chronic hypertension	21 (11.7)
Diabetes mellitus	14 (7.8)
Gestational age <34 weeks	62 (34.4)
Gestational age 34–36+6 weeks	47 (26.1)
Gestational age ≥37 weeks	71 (39.4)
Mean gestational age at delivery, weeks	34.8 ± 3.2

Clinical and laboratory severity indicators are shown in Table 2.The average systolic blood pressure at admission was 168.4 ± 14.7 mmHg and the average diastolic blood pressure was 108.2 ± 10.6 mmHg. Severe range (systolic blood pressure ≥160 mmHg) was found in 141 women (78.3%). The most common symptom was headache in 86 women (47.8%) followed by visual symptoms in 39 (21.7%) and epigastric or right-upper-quadrant pain in 31 (17.2%).Thrombocytopenia below 100 $\times 10^9$/L was recorded in 28 women (15.6%). Thirty-five (19.4%) had elevated hepatic transaminases, and 17 (9.4%) had serum creatinine>1.1 mg/dL.

Table 2: Clinical and laboratory characteristics

Variable	Value
Systolic BP, mmHg	168.4 ± 14.7
Diastolic BP, mmHg	108.2 ± 10.6
Systolic BP ≥160 mmHg	141 (78.3%)
Headache	86 (47.8%)
Visual disturbance	39 (21.7%)
Epigastric/RUQ pain	31 (17.2%)
Platelet count <100 $\times 10^9$/L	28 (15.6%)
Elevated AST/ALT	35 (19.4%)
Serum creatinine >1.1 mg/dL	17 (9.4%)
Significant proteinuria	146 (81.1%)
Magnesium sulfate administered	166 (92.2%)
Antihypertensive treatment	173 (96.1%)
Antenatal corticosteroids where indicated	55/62 (88.7%)

Maternal Outcomes

Summary of maternal outcomes is shown in Table 3. Cesarean section was the most common delivery method (139 women, 77.2%) and 41 women (22.8%) delivered vaginally.To conclude, 20.0% (36) of the mothers had a major maternal morbidity. The incidence of HELLP syndrome was 17 (9.4%) women and the incidence of eclampsia was 14 (7.8%). Eleven (6.1%) had placental abruption, 13 (7.2%) had postpartum hemorrhage, and 9 (5.0%) had acute kidney injury.

Of the 16 women (8.9%), 16 had to be admitted to the intensive care unit. There were no cases of pulmonary edema (0.8%). One death was added to the simulated dataset and the maternal mortality proportion was set at 0.6%, a typical value.The results in this study reflect the multisystemic nature of severe preeclampsia and underscore the fact that negative maternal events often occur together.

Table 3: Maternal outcomes among women with severe preeclampsia

Maternal outcome	n (%)
Cesarean delivery	139 (77.2)
Vaginal delivery	41 (22.8)
Composite major maternal complication	36 (20.0)
HELLP syndrome	17 (9.4)
Eclampsia	14 (7.8)
Placental abruption	11 (6.1)
Acute kidney injury	9 (5.0)
Postpartum hemorrhage	13 (7.2)
Pulmonary edema	5 (2.8)
ICU admission	16 (8.9)
Blood transfusion	12 (6.7)
Maternal mortality	1 (0.6)

Neonatal Outcomes

There was a higher overall burden of neonatal complications than of maternal complications, with prematurity being the major concern.Table 4 shows that 109 (60.6%) neonates were born before 37 completed weeks of gestation, of which 62

(34.4%) were born before 34 weeks, while 100 (54.3%) were born at 37 to 41 weeks.As seen in table 4, 109 (60.6%) neonates were born before completing 37 weeks of gestation—62 (34.4%) before 34 weeks and 100 (54.3%) between 37 and 41 weeks.

102 neonates (56.7%) had low birth weight and 48 (26.7%) had FGR.Thirty-four neonates had an Apgar score of less than seven after 5 minutes (18.9%). 43.3% (78) neonates had to be admitted to the NICU, and 41 (22.8%) were found to have clinically important respiratory distress.
In the 10 pregnancies where stillbirth occurred, there was an illustrative proportion of stillbirths of 5.6%. Eight live-born neonates experienced early neonatal death.

Table 4: Neonatal and perinatal outcomes

Neonatal outcome	n (%)
Preterm delivery <37 weeks	109 (60.6)
Delivery <34 weeks	62 (34.4)
Birth weight <2500 g	102 (56.7)
Fetal growth restriction	48 (26.7)
5-minute Apgar score <7	34 (18.9)
NICU admission	78 (43.3)
Respiratory distress	41 (22.8)
Stillbirth	10 (5.6)
Early neonatal death	8 (4.4)*

It is presented as an illustrative denominator for simplicity (total pregnancies); the final analysis should be based on early neonatal mortality among live births.

Influence of Early Gestational Age

For the illustrative analysis, a clear association was found between gestational age and neonatal outcome.Of the 62 women delivering before 34 weeks, 48 neonates (77.4%) were admitted to the NICU but only 30 of 118 (25.4%) were admitted to the NICU if delivered at or after 34 weeks.
The incidences of low birth weight were 83.9% compared to 42.4% and respiratory distress was 43.5% compared to 11.9%.Stillbirth also occurred more often in those pregnancies that were delivered at less than 34 weeks.Table 5 shows the illustrative comparison.

Table 5: Comparison of outcomes according to gestational age at delivery

Outcome	<34 weeks n=62	≥34 weeks n=118	Odds Ratio	p-value
Major maternal complication	19 (30.6%)	17 (14.4%)	2.63	0.018
Cesarean delivery	53 (85.5%)	86 (72.9%)	2.19	0.063
Low birth weight	52 (83.9%)	50 (42.4%)	7.07	<0.001
5-min Apgar <7	19 (30.6%)	15 (12.7%)	3.03	0.005
NICU admission	48 (77.4%)	30 (25.4%)	10.06	<0.001
Respiratory distress	27 (43.5%)	14 (11.9%)	5.73	<0.001
Stillbirth	7 (11.3%)	3 (2.5%)	4.88	0.033
Early neonatal death	5 (8.1%)	3 (2.5%)	3.36	0.126

The highest correlation was noted in NICU admission. The illustrative unadjusted analysis found approximately 10-fold higher risk of NICU admission for deliveries prior to 34 weeks. Low birth weight and respiratory distress were also highly associated with early delivery. The difference in early neonatal mortality was not statistically significant, though, with the relatively few events and relatively small illustrative sample size.

DISCUSSION

The current study is an evaluation of the maternal and neonatal impact of severe preeclampsia in a tertiary-care hospital. An important clinical pattern illustrated by the analysis is that while there is significant maternal morbidity associated with severe preeclampsia, most of the burden of the adverse outcomes is among neonates, particularly if delivery occurs before 34 weeks in severe disease.Preeclampsia isn't just a disorder of high blood pressure; it's a syndrome. Severe disease can present as endothelial dysfunction in several organ systems, such as eclampsia, thrombocytopenia, hepatic injury, renal impairment, pulmonary oedema, placental abruption, or other severe complications which can be life-threatening (1–4). This is why management relies on blood pressure reading as well as symptoms, laboratory abnormalities, gestational age, fetal status and evidence of disease progression.

Overall, about 20% of women in the illustrative cohort had an important maternal problem. This was a clinically realistic magnitude if compared with studies of women who have severe disease. Nisly et al. explored women with severe preeclampsia prior to 34 weeks and found significant maternal morbidity—particularly with severe disease before 34 (8). Likewise, severe features at a time distant from term have been shown to result in significant extra maternal morbidity on evaluation of women for whom delivery is recommended at the time of evaluation.In the present analysis, important complications were HELLP syndrome and eclampsia. These both represent a major systemic illness with urgent stabilization and critical evaluation of the delivery timing. Magnesium sulfate is still the cornerstone of eclamptic seizure prevention and treatment in appropriate women with severe features, and treatment of severe hypertension should be started immediately to minimize maternal cerebrovascular risk (2–4).

The cesarean delivery rate in this draft is also as expected in women with severe disease. Gestational age, fetal presentation, fetal condition, previous obstetric history, cervical status, urgency of delivery and maternal deterioration are all factors that affect cesarean delivery in preeclampsia. The cesarean section does not have to be performed for preeclampsia; induction of labor may be considered if maternal and fetal conditions allow. Thus, the final meaning of the local cesarean rate should take into consideration indications and not consider only operative delivery as a result of the diagnosis.The neonatal findings should be highlighted. The proportion of neonates with low birth weight (LBW) was more than half and about two-fifths of the neonates were admitted to the NICU. The findings are similar to those of placental insufficiency and to the high incidence of medically indicated preterm delivery.A systematic review by Atamamen et al. determined that some of the most significant neonatal outcomes associated with preeclampsia included: prematurity, low birth weight, fetal growth restriction, low Apgar score, NICU admission, respiratory complications, stillbirth, and neonatal mortality (7).The best predictor of the neonatal outcome in the illustrative dataset was gestational age. Woman having deliveries before 34 weeks had significantly increased rates of low birth weight, respiratory distress, low Apgar, NICU admission and stillbirth. This relationship is anticipated due to significant maturation of organs, especially the pulmonary maturation, occurring with gestation.

A recent study by Islam et al., Pakistan is particularly relevant. Of 324 women who underwent treatment for preterm preeclampsia at Aga Khan University Hospital, serious maternal complications were seen in 13.9% and neonatal mortality and intensive care unit requirement increased significantly at earlier gestational ages. With regards to this, the investigators noted that extremely preterm deliveries had a significantly high rate of neonatal mortality, and that overall, there was a significant interaction between the severity of preeclampsia with gestational age at delivery in a Pakistani setting (10).These observations emphasize an important difference: severe preeclampsia can cause pre maturity due to the need for delivery, and can also cause disease of the placenta – both of which can impact the newborn. There is, therefore, no definite association between severe preeclampsia and neonatal respiratory morbidity, which does not necessarily suggest a direct hypertensive mechanism. Some of that relationship could be attributed to gestational age.The delivery time is one of the most difficult decisions in preeclampsia. Delivery is acceptable once preeclampsia is diagnosed and it is at term. Management is more complex before term. The PHOENIX trial compared planned delivery to expectant management in women with late preterm preeclampsia, and showed that earlier delivery provided a benefit for the mother in terms of not progressing to disease but that it resulted in more admissions to the neonatal unit, primarily due to prematurity (6).

The balance is harder at even earlier gestations. Expectant management of severe preeclampsia that is diagnosed before 24 weeks has recently been assessed by Cagino et al. (9), and they showed that despite the improvement in modern neonatal care, the probability of a child surviving remains limited in carefully selected pregnancies that can be prolonged for a period.The observations do not necessarily imply that routine pregnancy prolongation should be attempted in cases of severe deterioration of the mother. The safety of the mother is still the most important concern and expectant management should be undertaken in those women who are well selected and in institutions with adequate intensive maternal and foetal surveillance.Laboratory results may help in the risk assessment process. Progressive systemic disease may be suggested by thrombocytopenia, renal dysfunction, elevated liver enzymes, and hemolysis. More recently, it has been explored whether or not proteinuria contributes to prognosis. Jansen van Rensburg et al. reported associations between certain maternal and neonatal outcomes and rising proteinuria levels but the strength of these associations was inconsistent (14). We therefore believe that current management should be continued to take into consideration the whole clinical picture, and not rely solely on proteinuria to define the severity of the disease or timing of delivery.

LDH has also been investigated as a measure of cellular damage and severity of disease. Studies from LMICs from the 2025 systematic review revealed that elevated LDH levels were generally linked to HELLP syndrome, renal complications, admission to ICU, fetal growth restriction, stillbirth, low Apgar score and admission to NICU. But there are significant differences in cut-off values, which restricts its application as a single predictive test (15).The same issue is reflected in risk-prediction research in general. In a systematic review and meta-analysis published in 2024, over 500,000 women were included, revealing a wide range of potential predictors of adverse maternal and perinatal outcomes and significant variation among the studies. Several models, including fullPIERS, have shown to be useful in predicting the presence of maternal complications, but there is no single clinical or biochemical variable that can predict all the risks (16).

The local health care setting should be taken into account when making sense of these data. Hypertensive disorders have been found to be associated with poor perinatal outcomes in Pakistani studies, such as preterm delivery, low birth weight, stillbirth and neonatal mortality (10–13).Khan et al. have found that the women with preeclampsia have experienced significantly more maternal and neonatal complications in Multan (11), and Basta et al. have shown that women with hypertensive disorders have significantly more adverse perinatal outcomes of stillbirth in tertiary hospitals in Karachi (12).

Community recognition and timely referral is also relevant besides hospital management. The Pakistan Community-Level Interventions for Pre-eclampsia trial tested the effectiveness of community engagement, mobile-health supported assessment, stabilization, and referral with the use of LHWs. The intervention was not shown to significantly reduce the composite primary outcome, but did show the feasibility of community based detection strategies and a reduction in stillbirth s within the intervention arm (13).The importance of early recognition and treatment is highlighted in more recent Pakistani evidence. Preeclampsia and eclampsia were studied in Bahawalpur in 2025 and maternal risk factors, clinical presentation, treatment and neonatal outcomes were evaluated, which further supports the importance of linking severity of preeclampsia and eclampsia with neonatal outcomes (17).

New research has also started to research neonatal complications other than growth restriction and/or prematurity. More research on the extended spectrum of adverse outcomes in neonates born from complicated hypertensive pregnancies has led to a 2026 systematic review and meta-analysis that explores the link between hypertension in pregnancy and neonatal sepsis.All these data together indicate that interventions have to take place at multiple levels to improve outcomes. It is important to recognise women in an antenatal period to identify serious complications early. If the blood pressure is very high, it should be treated quickly. Magnesium sulfate should be administered judiciously for the prevention and treatment of seizures. The fetus' well-being and the functioning of the maternal organs need to be monitored over time. Antenatal corticosteroids should be given at a time when preterm delivery is expected, and clinically indicated. Most importantly, the timing of delivery needs to weigh the risks of continuing to suffer from severe maternal disease against the risks of prematurity.

Another implication of the high NICU need illustrated in the data set is the implications for organization of care across participating hospitals. There is a need for close collaboration among obstetric, anesthetic, maternal critical-care, pediatric and neonatal teams at participating facilities that admit women with early severe preeclampsia. Ideally, referral systems should be in place to move high-risk women prior to delivery if it is safe to do so, but do not move neonates after birth if they are premature or critically ill.
Strengths and Limitations

The proposed study targets clinically relevant maternal and neonatal outcomes in women with severe disease and employs outcomes that are easily assessed by the routine care of the hospital. Gestational age stratification is a clinically useful way to identify pregnancies at highest risk of neonatal mortality.A few restrictions must be taken into account for the concluding study. Although the multicenter design improves generalizability, differences in referral patterns, case mix, documentation, and available maternal and neonatal services across centers may introduce inter-center heterogeneity. Only disproportionately severe cases may be referred to hospitals and these may have higher complication rates than community hospitals. Information from the medical records may be incomplete and retrospective. Socio-economic status, timing of referral, quality of antenatal care, completion of corticosteroids and treatment capacity for neonates are factors that may not be fully captured as they are important confounding variables or may be assessed with imperfect measurement.

In addition, maternal and neonatal outcomes are not mutually exclusive. For instance, the deterioration of the mother may cause early medically indicated delivery and the resulting morbidity in the child may be more a reflection of the prematurity. Therefore, the use of multivariable analysis should be considered where the real sample size and event frequencies allow.The following numerical data is exemplary only. This manuscript can portray true patient-level clinical research only if all estimates, confidence intervals, p-values and frequencies of outcomes are recalculated with patient-level data.

CONCLUSION

Preeclampsia is a serious cause of maternal and neonatal morbidity, especially if it occurs in the first half of pregnancy. Maternal complications are eclampsia, HELLP syndrome, acute kidney injury, placental abruption, pulmonary edema, hemorrhage, the need for intensive care. Premature delivery, low birth weight, foetal growth restriction, respiratory morbidity, NICU admission, stillbirth and neonatal mortality are likely to be the most significant factors affecting neonatal outcome. Women who need to deliver before 34 weeks are thus a very high-risk group that are best managed in a coordinated manner with the mother and her baby.

The best outcomes would occur if mothers are diagnosed in time for the birth, severe hypertension is treated promptly, magnesium sulphite is used appropriately, mothers and babies are monitored well, delivery is timed appropriately, mothers are referred on time and neonatal intensive care is available. Local outcome surveillance could help to detect institutional shortcomings and aid to drive targeted improvement in obstetric and neonatal services.

REFERENCES

1. Magee LA, Nicolaides KH, von Dadelszen P. Preeclampsia. N Engl J Med. 2022;386(19):1817–1832. doi:10.1056/NEJMra2109523.
2. Magee LA, Brown MA, Hall DR, Gupte S, Hennessy A, Karumanchi SA, et al. The 2021 International Society for the Study of Hypertension in Pregnancy classification, diagnosis and management recommendations for international practice. Pregnancy Hypertens. 2022;27:148–169. doi:10.1016/j.preghy.2021.09.008.
3. American College of Obstetricians and Gynecologists. Gestational hypertension and preeclampsia: ACOG Practice Bulletin, Number 222. Obstet Gynecol. 2020;135(6)–e260. doi:10.1097/AOG.0000000000003891.
4. Garovic VD, Dechend R, Easterling T, Karumanchi SA, Baird SM, Magee LA, et al. Hypertension in pregnancy: diagnosis, blood pressure goals, and pharmacotherapy: a scientific statement from the American Heart Association. Hypertension. 2022;79(2)–e41. doi:10.1161/HYP.0000000000000208.
5. Poon LC, Magee LA, Verlohren S, Shennan A, von Dadelszen P, Sheiner E, et al. A literature review and best practice advice for second and third trimester risk stratification, monitoring, and management of pre-eclampsia. Int J Gynaecol Obstet. 2021;154 Suppl 1:3–31. doi:10.1002/ijgo.13763.
6. Chappell LC, Brocklehurst P, Green ME, Hunter R, Hardy P, Juszczak E, et al. Planned early delivery or expectant management for late preterm pre-eclampsia (PHOENIX): a randomised controlled trial. Lancet. 2019;394(10204):1181–1190. doi:10.1016/S0140-6736(19)31963-4.
7. Atamamen TF, Naing NN, Oyetunji JA, Wan-Arfah N. Systematic literature review on the neonatal outcome of preeclampsia. Pan Afr Med J. 2022;41:82. doi:10.11604/pamj.2022.41.82.31413.
8. Nisly G, Dillon JL, Darling A, Myers S, Al Shibli N, Gatta LA, et al. Risk factors for adverse maternal outcomes among patients with severe preeclampsia before 34 weeks. Am J Perinatol. 2024;41(Suppl 1)–e2173. doi:10.1055/a-2099-3912.
9. Cagino KA, Trotter RD, Lambert KE, Kumar SC, Sibai BM. Expectant management of preeclampsia with severe features diagnosed at less than 24 weeks. Am J Obstet Gynecol. 2025;232(2):212.e1–212.e8. doi:10.1016/j.ajog.2024.04.031.
10. Islam Z, Aziz A, Najmi N, Raza A, Masheer S. Preeclampsia and prematurity: implications for maternal and perinatal outcomes in a low-middle income country. Oman Med J. 2025;40(3). doi:10.5001/omj.2025.77.
11. Khan B, Allah Yar R, Khakwani AK, Karim S, Ali HA. Preeclampsia incidence and its maternal and neonatal outcomes with associated risk factors. Cureus. 2022;14(11). doi:10.7759/cureus.31143.
12. Basta M, Hanif K, Zafar S, et al. Impact of hypertensive disorders of pregnancy on stillbirth and other perinatal outcomes: a multi-center retrospective study. Cureus. 2022;14(3). doi:10.7759/cureus.22788.
13. Qureshi RN, Sheikh S, Hoodbhoy Z, Sharma S, Vidler M, Payne BA, et al. Community-level interventions for pre-eclampsia (CLIP) in Pakistan: a cluster randomised controlled trial. Pregnancy Hypertens. 2020;22:109–118. doi:10.1016/j.preghy.2020.07.011.
14. Jansen van Rensburg E, Seopela LB, Snyman LC. Determining the relationship between severity of proteinuria and adverse maternal and neonatal outcomes in patients with preeclampsia. Pregnancy Hypertens. 2024;38:101155. doi:10.1016/j.preghy.2024.101155.
15. Nguyen KD, Khuc ATN, Tran VA, Nguyen HS, Nguyen PH, Nguyen ATH. Antepartum serum lactate dehydrogenase and adverse obstetric outcomes in preeclampsia: a systematic review of prognostic evidence from low- and middle-income countries. Cureus. 2025;17(6). doi:10.7759/cureus.86496.
16. Bucher V, Mitchell AR, Gudmundsson P, Atkinson J, Wallin N, Asp J, et al. Prediction of adverse maternal and perinatal outcomes associated with pre-eclampsia and hypertensive disorders of pregnancy: a systematic review and meta-analysis. EClinicalMedicine. 2024;76:102861. doi:10.1016/j.eclinm.2024.102861.
17. Bukhari SN, Jamil Q, Ihsan B, Jamil MN, Bukhsh A, Hayat K, et al. Association of risk factors, clinical presentation, and treatment with neonatal outcomes among pre-eclamptic and eclamptic women: a cross-sectional study. Front Glob Womens Health. 2025;6:1523375. doi:10.3389/fgwh.2025.1523375.
18. Zhou C, Liu D, Wang J. Association between maternal preeclampsia and the risk of neonatal sepsis: a systematic review and meta-analysis. Front Pediatr. 2026. doi:10.3389/fped.2026.1813564.