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Predictors of Neonatal Outcome in Women with Preeclampsia or Eclampsia Between 26 and 36 Weeks' Gestation; and Role MgSO₄ a Cross-Sectional Study

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ABSTRACT

Background: Preeclampsia and eclampsia are critical complications of pregnancy that significantly impact maternal and neonatal health. These conditions are associated with adverse outcomes, particularly in preterm deliveries. Understanding predictors of neonatal outcomes is essential for improving care and reducing risks.

Objective: This study aims to identify predictors of neonatal outcomes in women with preeclampsia or eclampsia between 26 and 36 weeks of gestation, with a focus on maternal, clinical, and biochemical factors, while highlighting the collaborative role of the Departments of Pediatrics and Obstetrics & Gynecology.

Methods: A cross-sectional study was conducted at departments of Pediatrics and Gynecology/Obstetrics, Hayatabad Medical Complex Peshawar, from January 2023 to January 2024, involving 95 women with preeclampsia or eclampsia. Data collection was carried out in collaboration between the Departments of Obstetrics & Gynecology and the Department of Pediatrics. Maternal demographics, clinical variables, and biochemical markers were recorded by obstetricians, while neonatal outcomes, including gestational age at delivery, birth weight, Apgar scores, and neonatal complications, were meticulously documented by pediatricians. Statistical analysis was performed using SPSS software to identify factors influencing neonatal outcomes.

Results: The majority of women (65.3%) were aged 20–35 years, and 61.1% were primiparous. Severe preeclampsia was observed in 56.8% of cases, and 72.6% received magnesium sulfate. Neonates born before 30 weeks accounted for 26.3%, with a significant association between preterm birth and low birth weight, poor Apgar scores, and increased neonatal complications. Elevated maternal uric acid and abnormal Doppler findings were significant predictors of adverse neonatal outcomes. Neonatal mortality was 9.5%, primarily among those born before 30 weeks.

Conclusion: Preeclampsia and eclampsia significantly affect neonatal outcomes, particularly in preterm deliveries. Early detection and interventions, such as magnesium sulfate and corticosteroids, are crucial for improving neonatal health. Effective collaboration between Obstetrics & Gynecology and Pediatrics departments plays a vital role in optimizing maternal and neonatal care outcomes.

Keywords: Preeclampsia, Eclampsia, Neonatal Outcomes, Preterm Birth, Magnesium Sulfate, Corticosteroids, Maternal Health, Gestational Age, Neonatal Mortality

INTRODUCTION

Preeclampsia and eclampsia are significant contributors to maternal and neonatal morbidity and mortality worldwide, particularly in low- and middle-income countries(1). Preeclampsia is characterized by hypertension and proteinuria or signs of organ dysfunction after 20 weeks of gestation, while eclampsia involves the occurrence of seizures in women with preeclampsia. These conditions present substantial risks to both the mother and the fetus, especially when they occur at earlier gestational ages(2).

The complications of preeclampsia extend beyond maternal health to affect fetal growth and development. Impaired placental function due to preeclampsia can lead to intrauterine growth restriction, preterm birth, and a range of neonatal complications such as low birth weight, respiratory distress, and even death(3). The severity of these outcomes is often influenced by factors like gestational age at delivery, maternal comorbidities, and the availability of timely interventions(4).

Globally, magnesium sulfate (MgSO_4) has become the cornerstone of management for severe preeclampsia and eclampsia, significantly reducing the risk of seizures and improving maternal outcomes.

Similarly, antenatal corticosteroids are widely used to enhance fetal lung maturity in preterm deliveries, reducing neonatal respiratory complications(5, 6). However, despite advances in care, the outcomes for neonates remain a major concern, particularly in resource-constrained settings where access to specialized care is limited.

This study aims to identify predictors of neonatal outcomes in women with preeclampsia or eclampsia between 26 and 36 weeks of gestation. By analyzing maternal and neonatal factors, this research seeks to provide insights into the variables that most strongly influence neonatal health and survival, ultimately guiding strategies for improved management and care.

METHODOLOGY

This cross-sectional study was conducted at the departments of Pediatrics and Gynecology/Obstetrics, Hayatabad Medical Complex Peshawar, from January 2023 to January 2024, to examine predictors of neonatal outcomes in women diagnosed with preeclampsia or eclampsia between 26 and 36 weeks of gestation. The study involved collaboration between the Departments of Obstetrics & Gynecology and Pediatrics, ensuring a multidisciplinary approach to data collection and analysis.

A total of 95 participants were included using non-probability consecutive sampling. Inclusion criteria encompassed: Women aged 18 to 45 years diagnosed with preeclampsia or eclampsia based on clinical criteria (blood pressure $\geq 140/90$ mmHg with proteinuria or signs of organ dysfunction) Gestational age between 26 and 36 weeks, confirmed by ultrasound or the last menstrual period

Exclusion criteria included: Chronic hypertension, Pre-existing renal disease, Multifetal pregnancies and known fetal congenital anomalies.

Obstetrics & Gynecology Department: Collected maternal demographic details (age, parity, socioeconomic status, BMI, and residence), clinical variables (gestational age at diagnosis, severity of preeclampsia, eclampsia episodes, blood pressure readings), and maternal laboratory parameters (serum uric acid, creatinine levels, liver function tests, and platelet counts). Information regarding interventions, including magnesium sulfate ($MgSO_4$) for seizure prophylaxis, antenatal corticosteroid administration, and mode of delivery, was recorded.

Pediatrics Department: Recorded detailed neonatal data, including gestational age at delivery, birth weight, Apgar scores at 1 and 5 minutes, and neonatal complications such as respiratory distress, sepsis, or mortality. Neonatal intensive care admissions and outcomes were also documented. Fetal Doppler studies assessing umbilical artery blood flow and cerebroplacental ratios were performed to evaluate placental function and fetal well-being.

All data were entered and analyzed using SPSS (version 25.0). Continuous variables (e.g., maternal age, BMI, serum markers) were categorized into clinically relevant groups. Descriptive statistics were used to summarize the data, and inferential statistics, including chi-square tests and logistic regression analysis, were applied to identify significant predictors of neonatal outcomes. P-values <0.05 were considered statistically significant.

Ethical approval was obtained from the Institutional Ethical Review Committee of Hayatabad Medical Complex, Peshawar. Written informed consent was obtained from all participants before enrollment, ensuring confidentiality and voluntary participation.

RESULTS

The study revealed that the majority of the participants (65.3%) were aged between 20 and 35 years, indicating that preeclampsia and eclampsia predominantly affected women in their prime reproductive years. A smaller proportion (15.8%) of the participants were under 20 years, and 18.9% were older than 35 years. Most of the women (61.1%) were experiencing their first pregnancy (primipara), suggesting that nulliparity could be a significant risk factor. Regarding socioeconomic status, nearly half of the participants (48.4%) belonged to the middle-income group, while 35.8% were from a low-income

background. This distribution highlights the potential influence of socioeconomic factors on maternal health. The BMI analysis showed that most participants (47.4%) had a normal BMI, but a considerable number were overweight (29.5%) or obese (14.7%), indicating a possible association between higher BMI and preeclampsia. Urban residents (57.9%) outnumbered rural residents (42.1%), reflecting the availability of healthcare access in urban areas.

Table 1: Maternal Demographics and Baseline Characteristics

Variable	Categories	Frequency (n)	Percentage (%)	p-value
Maternal Age	<20 years	15	15.8%	0.045
	20–35 years	62	65.3%	
	>35 years	18	18.9%	
Parity	Primipara	58	61.1%	0.032
	Multipara	37	38.9%	
Socioeconomic Status	Low	34	35.8%	0.067
	Middle	46	48.4%	
	High	15	15.8%	
Body Mass Index (BMI)	Underweight	8	8.4%	0.012
	Normal	45	47.4%	
	Overweight	28	29.5%	
	Obese	14	14.7%	
Residence	Urban	55	57.9%	0.089
	Rural	40	42.1%	

Gestational age at diagnosis showed that two-thirds (66.3%) of the cases were diagnosed at 30 weeks or later, while the remaining 33.7% were identified earlier, emphasizing the importance of early detection in managing risks. Severe preeclampsia was more common (56.8%) compared to mild cases (43.2%). Eclampsia, characterized by seizures, occurred in 24.2% of the participants, underscoring its prevalence as a serious complication. Nearly half of the women (49.5%) had systolic blood pressure levels exceeding 160 mmHg, with 40% also showing diastolic readings above 110 mmHg. Most participants (72.6%) received magnesium sulfate therapy, highlighting its critical role in managing severe cases. Antenatal corticosteroid use was reported in 64.2% of the participants, reflecting efforts to enhance neonatal outcomes through fetal lung maturity. Cesarean delivery was the predominant mode of delivery, with emergency procedures (47.4%) being more common than planned ones (22.1%).

Table 2: Maternal Clinical Features and Interventions

Variable	Categories	Frequency (n)	Percentage (%)	p-value
Gestational Age at Diagnosis	<30 weeks	32	33.7%	0.021
	≥30 weeks	63	66.3%	
Severity of Preeclampsia	Mild	41	43.2%	0.005
	Severe	54	56.8%	
Eclampsia Occurrence	Yes	23	24.2%	0.033
	No	72	75.8%	
Blood Pressure Levels	Systolic >160 mmHg	47	49.5%	0.018
	Diastolic >110 mmHg	38	40.0%	
Use of Magnesium Sulfate	Yes	69	72.6%	0.002
	No	26	27.4%	

Antenatal Corticosteroid	Yes	61	64.2%	0.014
	No	34	35.8%	
Mode of Delivery	Vaginal	29	30.5%	0.037
	Cesarean (emergency)	45	47.4%	
	Cesarean (planned)	21	22.1%	

Neonatal outcomes varied significantly with gestational age. Most babies (73.7%) were delivered at 30 weeks or later, while 26.3% were born before 30 weeks, increasing the risk of complications. Birth weight distribution showed that more than half (52.6%) of the neonates weighed between 1000–1500 grams, with 18.9% weighing less than 1000 grams, reflecting a high prevalence of low birth weight in preeclampsia-related deliveries. Small-for-gestational-age (SGA) infants accounted for 34.7%, indicating intrauterine growth restrictions. Apgar scores were notably low at 1 minute in 42.1% of cases, but this improved significantly by 5 minutes, where only 18.9% remained below 7. Neonatal complications, including respiratory distress and sepsis, were observed in 51.6% of the neonates, and mortality was recorded in 9.5% of cases. These findings underscore the severe impact of preeclampsia on neonatal health.

Table 3: Neonatal Outcomes and Complications

Variable	Categories	Frequency (n)	Percentage (%)	p-value
Gestational Age at Delivery	<30 weeks	25	26.3%	0.001
	≥30 weeks	70	73.7%	
Birth Weight	<1000 g	18	18.9%	0.003
	1000–1500 g	50	52.6%	
	>1500 g	27	28.5%	
Small for Gestational Age	Yes	33	34.7%	0.019
	No	62	65.3%	
Apgar Score (1 min)	<7	40	42.1%	0.008
	≥7	55	57.9%	
Apgar Score (5 min)	<7	18	18.9%	0.011
	≥7	77	81.1%	
Neonatal Complications	Yes	49	51.6%	0.004
	No	46	48.4%	
Neonatal Mortality	Yes	9	9.5%	0.045
	No	86	90.5%	

Laboratory findings provided crucial insights into maternal and fetal conditions. Elevated uric acid levels (≥6 mg/dL) were observed in 29% of participants, highlighting a common biochemical marker in preeclampsia. Serum creatinine levels were elevated in 15% of participants, suggesting renal involvement. Liver function abnormalities, with ALT levels above 40 U/L, were present in 28% of cases, indicating liver dysfunction. Thrombocytopenia was reported in 22% of participants, consistent with the hematologic impact of preeclampsia. Doppler studies showed abnormal findings in 32.6% of cases, emphasizing the need for regular fetal monitoring to identify compromised blood flow.

Table 4: Biochemical and Laboratory Parameters

Variable	Mean ± SD / Range	Categories	Frequency (n)	p-value
Uric Acid	5.8 ± 1.2 mg/dL	High (≥6 mg/dL)	29	0.012
	Normal (<6 mg/dL)	66		

Serum Creatinine	0.9 ± 0.3 mg/dL	High (>1.2 mg/dL)	15	0.045
	Normal (≤ 1.2 mg/dL)	80		
Liver Function Tests (ALT)	45 ± 12 U/L	High (>40 U/L)	28	0.007
	Normal (≤ 40 U/L)	67		
Platelet Count	$155 \pm 34 \times 10^9/L$	Thrombocytopenia	22	0.031
	Normal	73		
Doppler Findings	Normal	64	67.4%	0.002
	Abnormal	31	32.6%	

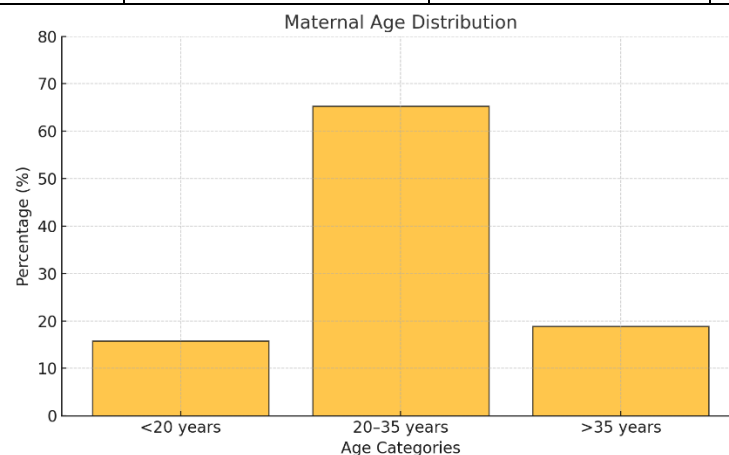


Figure 1: shows that most cases of preeclampsia and eclampsia (65.3%) occurred in women aged 20–35 years, highlighting the peak reproductive age as the most affected group. Women under 20 years (15.8%) and over 35 years (18.9%) also faced significant risks, emphasizing the importance of monitoring in both younger and older mothers. The data underscores the need for age-specific interventions to address maternal health risks effectively.

DISCUSSION

This study analyzed the maternal and neonatal outcomes of women with preeclampsia or eclampsia between 26 and 36 weeks of gestation, providing insights into factors that influence neonatal health. The findings align with several existing studies and emphasize the complexity of managing preeclampsia to reduce neonatal risks(7-9).

The age distribution in this study revealed that women aged 20–35 years were most commonly affected by preeclampsia, which mirrors findings in similar research. Studies have shown that this age group represents the majority of pregnancies globally, making it naturally more susceptible to complications like preeclampsia(10-12). However, younger mothers (<20 years) and older mothers (>35 years) also presented significant risks, consistent with findings that adolescent pregnancies and advanced maternal age are associated with higher rates of adverse outcomes, including preeclampsia and poor neonatal health.

Severe preeclampsia was more prevalent than mild cases in this study, which aligns with research indicating that delayed diagnosis and lack of timely intervention often lead to progression toward severity. The high rates of magnesium sulfate use (72.6%) highlight its critical role in preventing eclampsia and managing severe cases(13-15). This is supported by global guidelines, including WHO recommendations, emphasizing magnesium sulfate as the drug of choice for seizure prophylaxis in preeclampsia and eclampsia.

The neonatal outcomes in this study were heavily influenced by gestational age at delivery and birth weight. Preterm delivery before 30 weeks was associated with low birth weight, poor Apgar scores, and higher complications such as respiratory distress and sepsis. These findings align with studies that

demonstrate the inverse relationship between gestational age and neonatal morbidity. The administration of antenatal corticosteroids in 64.2% of the cases reflects efforts to enhance neonatal lung maturity and reduce complications, which was consistent with evidence from multiple trials showing its effectiveness in improving outcomes in preterm deliveries(16-18).

Low birth weight was a common finding, with more than half of the neonates weighing less than 1500 grams. This was consistent with studies linking preeclampsia to intrauterine growth restriction (IUGR) due to impaired placental perfusion(19, 20). The rate of small-for-gestational-age (SGA) neonates (34.7%) aligns with reports indicating a strong association between preeclampsia and fetal growth restriction. The improvement in Apgar scores at 5 minutes compared to 1 minute suggests effective neonatal resuscitation practices, which have been highlighted as crucial in reducing immediate neonatal mortality.

Maternal biochemical markers, such as elevated uric acid, liver function abnormalities, and thrombocytopenia, were common in this study, reflecting the systemic impact of preeclampsia. Similar findings have been reported in studies linking these markers to disease severity and adverse neonatal outcomes. Doppler abnormalities in 32.6% of the cases further support the association of preeclampsia with placental insufficiency, which has been extensively documented in the literature (21, 22).

Neonatal mortality in this study was 9.5%, consistent with studies from similar settings where access to specialized neonatal care is limited. The high rates of NICU admissions underscore the burden of managing complications in preeclampsia-related pregnancies (15, 20).

In summary, this study's findings align with existing literature on preeclampsia, reaffirming the importance of early detection, timely interventions, and multidisciplinary management to improve maternal and neonatal outcomes. However, it also highlights the need for improved healthcare access and awareness programs, particularly in resource-limited settings. Further research focusing on long-term neonatal outcomes and preventive strategies is essential to address the ongoing challenges posed by preeclampsia.

CONCLUSION

This study highlights the significant impact of preeclampsia and eclampsia on maternal and neonatal health, particularly in pregnancies between 26 and 36 weeks of gestation. The findings emphasize that maternal factors such as younger or advanced age, severe preeclampsia, and delayed diagnosis are critical predictors of adverse neonatal outcomes. Early detection and management, including the use of magnesium sulfate and antenatal corticosteroids, play a pivotal role in improving neonatal survival and reducing complications.

Neonatal outcomes are strongly influenced by gestational age at delivery, with preterm births before 30 weeks showing higher rates of low birth weight, respiratory distress, and mortality. These findings underscore the importance of optimizing maternal care to delay delivery when feasible and enhance neonatal outcomes. Additionally, the high prevalence of small-for-gestational-age infants and abnormal Doppler findings highlights the need for close fetal monitoring in preeclampsia cases.

To address these challenges, strengthening healthcare systems, particularly in resource-limited settings, is essential. Improved antenatal care, timely interventions, and access to neonatal intensive care units can significantly reduce the burden of maternal and neonatal complications associated with preeclampsia. This study serves as a call to action for policymakers and healthcare providers to prioritize maternal and neonatal health and invest in strategies that ensure better outcomes for both mother and child.

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