Fetomaternal Outcome of Posterior Reversible Encephalopathy Syndrome (PRES) in Women with Pre-Eclampsia and Eclampsia in a Tertiary Care Hospital in Eastern India – An Observational Study

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Abstract

Background: Posterior Reversible Encephalopathy Syndrome (PRES) is a rare yet potentially reversible neurologic disorder seen in severe pre-eclampsia/eclampsia. The late diagnosis may result in permanent neurologic damage and adverse effect on the mother and fetus. Magnetic resonance imaging (MRI) is a very important tool for diagnosing and determining the severity of cerebral involvement.

Objective: To evaluate the fetomaternal outcomes of PRES in women with preeclampsia and eclampsia, and to identify clinical, laboratory and radiological features of poor outcomes.

Methods: An observational study was handled in the tertiary care hospital in the Eastern part of India in hospital setting where 200 pre-eclamptic women with secondary diagnosis of PRES were studied. The demographic data, clinical presentation, laboratory investigations, MR imaging, complications of pregnancy and delivery and neonatal results were recorded. Descriptive statistics, Chi-square test and multivariate logistic regression analysis were used to find independent predictors of adverse fetomaternal outcomes.

Results: The most prevalent neurological manifestation was generalized seizures (81.0%) followed by severe headache (74.0%). MRI showed mainly parieto-occipital involvement (84.0%), and bilateral cerebral involvement (76.0%). Maternal complications consisted of HELLP syndrome (26.0%), admission in the ICU (22.0%) and pulmonary edema (15.0%). Adverse neonatal outcomes were preterm delivery (43.0%), low birth weight (34.0%), admission to NICU (26.0%), and neonatal death (3.0%). AOR for Diffuse MRI brain lesions, HELLP syndrome Glasgow Coma Scale, thrombocytopenia and elevated serum creatinine are 5.84, 3.72 , 4.18, 2.94 and 2.56 and $p < 0.001$, $= 0.001$, <0.001, $= 0.007$ respectively were significant independent predictors of adverse fetomaternal outcomes.

Conclusion: PRES is a potentially devastating neuro-embolic condition in severe cases of pre-eclampsia and eclampsia during pregnancy. The early evaluation with MRI, timely blood pressure control, seizure prophylaxis, and multidisciplinary obstetric management plays major role in the neurological recovery of mother and a good outcome for the neonate. Early detection of high-risk clinical or radiologic parameters enables prompt action and help to minimize fetomaternal morbidity and mortality.

Keywords: Posterior Reversible Encephalopathy Syndrome (PRES); Pre-eclampsia; Eclampsia; Magnetic Resonance Imaging (MRI); Fetomaternal Outcomes; HELLP Syndrome; Maternal Complications; Neonatal Outcomes; Hypertensive Disorders of Pregnancy; Obstetric Neurology.

1. Introduction

Hypertensive disorders of pregnancy account for a prime cause of morbidity and mortality in the perinatal period accounting for 5-10% of all pregnancies worldwide. Pre-eclampsia and eclampsia are severe, pregnancy-related conditions that includeelevated blood pressure and multisystem involvement and can cause complications for the mother, such as stroke, renal failure, pulmonary edema, and neurological complications, and for the fetus, including low birth weight, prematurity, fetal growth restriction, and neonatal death [16, 8]. These disorders are still important complications and, despite the advances in obstetric care, lack of timely diagnosis and access to specialized obstetric care is a task, particularly in countries with either middle-income or lower than that. Posterior Reversible Encephalopathy Syndrome (PRES) is scarcely found but sometimes with serious neuralsyndrome which can occur in severe pre-eclampsia and eclampsia. PRES was originally described by [6] and has been linked to acute neurological indications of headache, seizures, visual symptoms, altered sensorium and confusion and distinctive radiological features of reversible vasogenic coma predominant in the parieto-occipital areas of the brain. Recognition is typically favorable and neurological recovery is generally good, but if late, may result in permanent neurological deficits, intracranial hemorrhage, cerebral infarction and maternal death [5].

Severe hypertension, endothelial dysfunction, impaired cerebral autoregulation and disruption of blood brain barrier are the main factors involved in the development of PRES [1]. Characteristic lesions in the posterior cerebral regions are well recognised and regarded as the gold standard of diagnosis (magnetic resonance imaging [MRI]). The clinical signs and symptoms of PRES may be mistaken with other pregnancy-related causes of seizures or altered consciousness, such as eclampsia, stroke, cerebral venous thrombosis and intracranial haemorrhage, which is why neuroimaging is especially important in women with presentation of seizures or altered consciousness [4]. Steroids are prescribed for women with PRES to reduce the risks of severe maternal complications such as HELLP syndrome, abruptio placentae, disseminated intravascular coagulation, pulmonary edema, respiratory failure, postpartum haemorrhage and maternal death. Fetal complications like preterm delivery, fetal growth restraint, lowernatal weight, birth asphyxia, admission to NICU and neonatal mortality are also common due to placental insufficiency and early delivery [12]. Aggressive restraint of blood pressure, therapy of seizures and early obstetric intervention are effective interventions that improve maternal and neonatal outcomes [5]. Though some studies have been conducted to understand the clinical aspects of PRES, the fetomaternal outcome of PRES is limited in the Indian population, with a significant burden of hypertensive conditions of pregnancy in the Eastern region of the country. It is crucial to have regional data due to variations in access to healthcare, referral patterns, socioeconomic factors, which could affect disease severity and clinical outcomes.

Hence, the present observational cohort study was undertaken to study the fetomaternal findings in pre-eclamptic and eclamptic women with PRES conceded to a tertiary care hospital in easterly part of India. The clinical, laboratory, neurological and radiological parameters were also evaluated in this study and their role in maternal and fetal outcome was assessed. The results will help fill gaps in the current evidence base for PRES and assist in the development of strategies to facilitate early diagnosis and multi-disciplinary management, to enhance maternal and neonatal outcome in women with hypertensive disorders of pregnancy.

2. Materials and Methods

2.1 Study Design

This work aimed to be a probable observational analyze to assess the fetomaternal outcomes of PRES in patients with pre-eclampsia/eclampsia. The proposed design allowed for systematic data on clinical, neurological, laboratory, maternal and neonatal outcome to be collected from admission to discharge, which would allow for a detailed assessment of disease progression and treatment outcomes. For the purposes of assessing prognostic outcomes and clinical factors associated with the severity of pregnancy-related disorders, observational (cohort) studies are appropriate [9].

2.2 Study Setting

The work was carried out in the Department of Obstetrics and Gynaecology, Malda Medical College and Hospital, West Bengal, India, a referral centre caters to high-risk gestations from Eastern India. The hospital receives many referrals involving severe hypertensive disorders of pregnancy requiring multidisciplinary management involving obstetricians, neurologists, radiologists, intensivists, and neonatologists. This setting was sufficient to offer the necessary facilities for neuroimaging, intensive care and neonatal care required for PRES identification and management.

2.3 Study Duration

This study was conducted over a year and all the females with a consecutive diagnosis of pre-eclampsia/eclampsia who developed PRES were included. A one-year continuous enrolment resulted in reduced variation by season, and good representation of the target population.

2.4 Study Population

200 women with severe pre-eclampsia or eclampsia were studied who then developed PRES and this was made by typical neurological symptoms and MRI showing reversible vasogenic edema. Participants who met the inclusion/exclusion criteria, are included and they were accordingly recruited in turn.

2.5 Inclusion and Exclusion Criteria

All women with singleton pregnancies, identified with severe pre-eclampsia or eclampsia and had received an MRI diagnosis of PRES were included in the study. Clinical manifestations suggestive of PRES were headache, generalized seizures, visual disturbances, altered consciousness and focal neurological deficits. To eliminate confounding variables that could affect or be affected by pregnancy-related neurological complications, women with pre-existing neurological conditions such as epilepsy, cerebrovascular disease, intracranial tumours, central nervous system infections, psychiatric disorders, which affect neurological assessment and those with incomplete clinical history were excluded [12].

2.6 Clinical Assessment

Most of the above information such as demographic, obstetric, antenatal care, gestational age, parity, gravidity, socioeconomic status and clinical presentation data was acquired using a standard case record form. Mothers' blood pressure was measured according to obstetric practice and using a calibrated sphygmomanometer. The neurological assessment comprised of a history of headache, seizures, visual disturbance, altered sensorium, focal neurological shortfall, and GCS score on admission and 7 days after the treatment was done to assess the recovery from any neurological illness. Laboratory results, MRI images and fetomaternal results were compared with the clinical results.

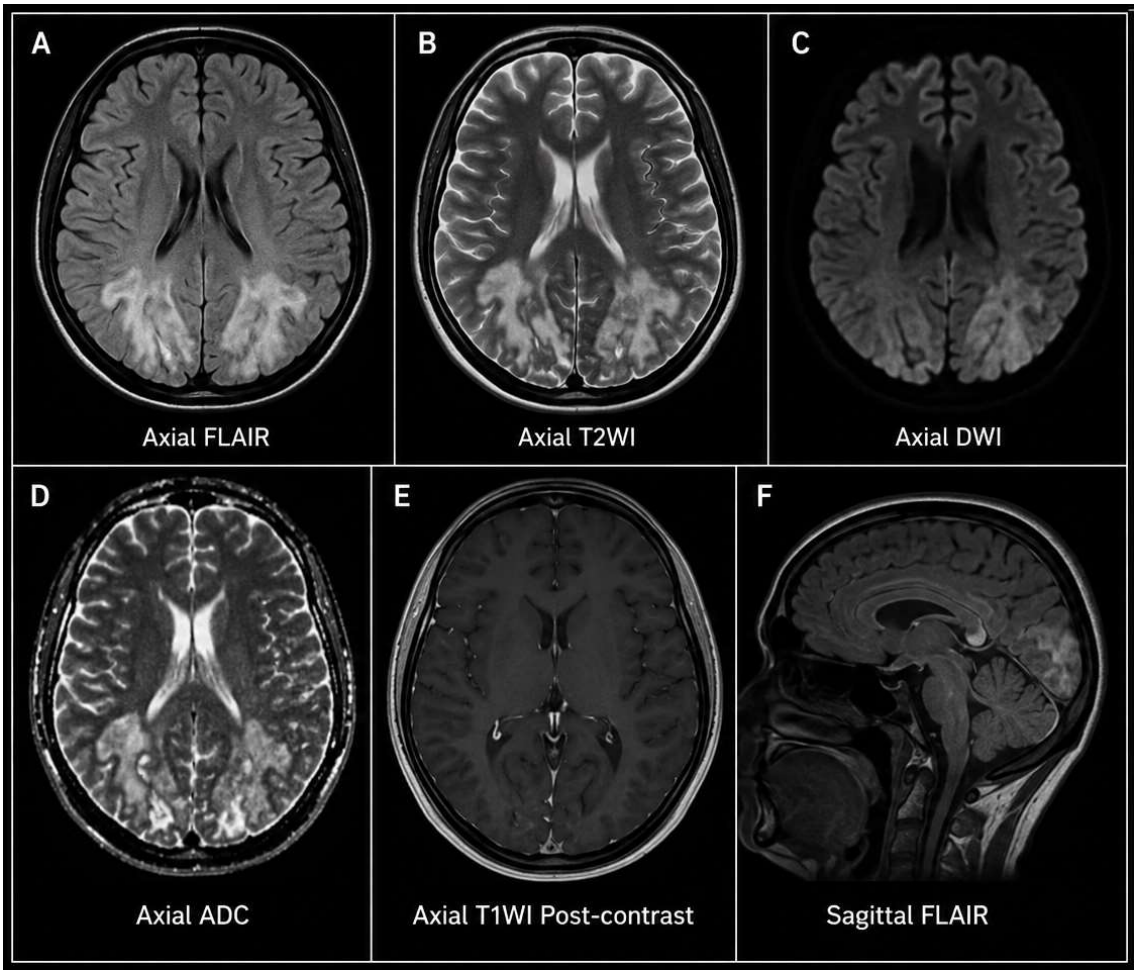
2.7 Laboratory Investigations

On admission, the patients' complete full haemogram, platelet distribution width, kidney function tests, liver function tests, urine protein estimation, coagulation profile and lactate dehydrogenase were conducted in the lab. The purpose of these investigations was to assess the severity of the disease, detection of HELLP syndrome, disseminated intravascular coagulation (DIC), renal dysfunction and other systemic complications of severe cases of hypertensive disorders of pregnancy (HDP). Laboratory parameters were then compared to maternal and neonatal outcomes and correlated with outcomes [8].

2.8 Radiological Assessment

In all patients, MRI of the brain was done to confirm the diagnosis of PRES. Imaging included a T1-weighted, T2-weighted and FLAIR imaging sequence, and a series of diffusion-weighted imaging sequences. The different areas of the brain, including the Parietal lobe, Occipital lobe, Frontal lobe, Temporal lobe, Cerebellum and Brainstem were recorded with anatomical distribution of cerebral lesions. Following the MRI, the neurological symptoms and prognosis was compared with the radiological severity and hence the impact of the MRI on the foetal and maternal prognosis was determined [1].

Figure 1. Representative MRI Findings in Women with PRES Showing Typical Parieto-Occipital Vasogenic Edema



2.9 Maternal Outcome Assessment

Maternal outcomes were recorded while mother was in the hospital until she was discharged. The outcome parameters were Preeclampia, Placental abruption, DIC, Pulmonary Edema, Respiratory failure, Postpartum Haemorrhage, Admission to intensive care unit, Hospital stay and Neurological recovery and mortality. Details of the method of delivery was also recorded and classified as either having been delivered vaginally or cesarean section. With these outcomes, the neurological status, laboratory abnormalities and MRI findings were checked.

2.10 Fetal and Neonatal Outcome Assessment

Outcomes of the foetus and newborn assessed were gestational age at delivery, preterm delivery, natal weight, APGAR at 60 to 300 seconds, admission to the neonatal ICU, birth asphyxia, stillbirth and neonatal mortality. The neurological severity of the mother and radiological findings was used to analyse the outcome of children to evaluate the impact of PRES on the foetal prognosis [3].

2.11 Outcome Measures

The most significant finding of this research is the potential to compare the fetomaternal outcomes in women with PRES-PE and PES. Demographic, clinical, laboratory, neurological and radiological factors that are associated with poor maternal and neonatal outcomes were identified and the neurological recovery after treatment with the Glasgow Coma Scale (GCS) scores were assessed.

2.12 Statistical Analysis

Data were transferred to the MS Excel software package and analysed with the statistical program IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Unbroken variables were shown as average values with SD and categorical variables were expressed as occurrences and percentages. Association amongst categorical variables was examined with Chi-squared test or Fisher's exact test, while the independent samples t-test was utilised for continuous variables. Binary logistic regression analysis was done to discover independent risk factors associated with adverse maternal and neonatal outcomes and ROC curve analysis was utilised to evaluate the projecting value of the significant hazardissues. 2-sided p-value less than 0.05 was statistically substantial.

2.13 Ethical Considerations

Before recruitment of patient's ethical clearance was done for the examination protocol from the Institutional Ethics Committee of Malda Medical College and Hospital. Written consent was given by all participating or their legitimatelyempowered persons for participation in this work. To guarantee confidentiality of patient information throughout the study, data collected was anonymised and all processesinvolved out in compliance with the moral guidelines of the Declaration of Helsinki [16].

3. Results

3.1 Baseline Demographic and Obstetric Characteristics

In this study of women with pre-eclampsia/eclampsia and PRES, there were 200 women. The average age of the mothers was 27.5 ± 5.7 and most of the mothers (63.0%) were probably of age group of 20-30 years. Most of the women lived in the rural areas (51.0%) while 49.0% of women lived in the urban areas. Among the study population, ninety-seven (48.5%) were primigravidae while 103 (51.5%) were multigravidae. When admitted, most of the women were in third trimester of pregnancy (34.6 ± 2.5 weeks) at mean. Demographic and obstetric data of the subjects in this study is presented in Table 1.

Table 1. Baseline Demographic and Obstetric Attributes of the Study Population (n = 200)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	20–25	78	39.0
	26–30	48	24.0
	31–35	42	21.0
	>35	32	16.0
Residence	Rural	102	51.0
	Urban	98	49.0
Socioeconomic Status*	Lower	116	58.0
	Middle	64	32.0
	Upper	20	10.0
Gravidity	Primigravida	97	48.5
	Multigravida	103	51.5
Gestational Age (weeks)	<34	81	40.5
	34–36	71	35.5
	≥37	48	24.0
Booking Status*	Booked	138	69.0
	Un-booked	62	31.0
BMI (kg/m²)*	Normal (18.5–24.9)	56	28.0
	Overweight (25.0–29.9)	92	46.0

	Obese (≥30.0)	52	26.0
Mean Maternal Age (years)	27.5 ± 5.7	—	—
Mean Gestational Age (weeks)	34.6 ± 2.5	—	—

Most of the study population consisted of females aged 20-30 years (27.5 ± 5.7 years) and most of the population were mothers. The multigravida (51.5%) and rural (51.0%) were slightly more than half of the participants. Most of the women (32.6 ± 3.8weeks) were presented in the 3rd trimester of pregnancy with a mean gestation age of 34.6 ± 2.5 weeks. Most of the participants were from the lower socio-economic class and the participants were booked for the antenatal care. Findings from this study indicated that PRES was primarily seen in women who had hypertension in late pregnancy who had been treated at a tertiary care centre (TCC).

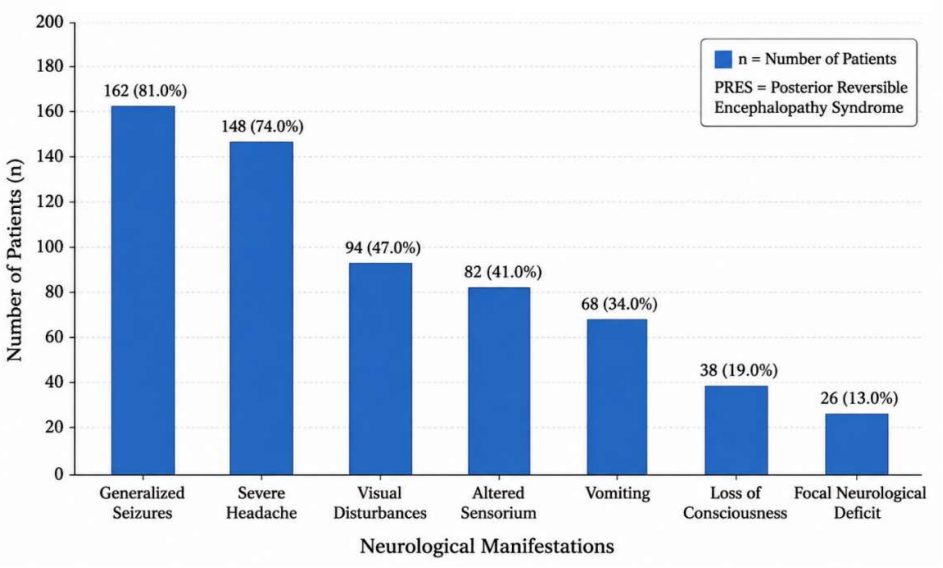
3.2 Clinical Presentation of Women with Posterior Reversible Encephalopathy Syndrome

At presentation all 200 women with the diagnosis of PRES were assessed for neuralsigns. Generalized seizures, severe headache and visual disturbances were the most common presenting symptoms (162, 148 and 94;81.0%, 74.0% and47.0% respectively). 41.0%, 34% and 13 % of the women had altered sensorium, vomiting and focal neurological deficits. 19.0% of the women lost consciousness. The neurological symptoms are concise in the Table 2 below.

Table 2. Clinical Presentation of Women with PRES (n = 200)

Clinical Presentation	Frequency (n)	Percentage (%)
Generalized Seizures	162	81.0
Severe Headache	148	74.0
Visual Disturbances	94	47.0
Altered Sensorium	82	41.0
Vomiting	68	34.0
Loss of Consciousness	38	19.0
Focal Neurological Deficit	26	13.0

Figure 2. Distribution of Neurological Manifestations among Women with PRES



Generalized seizures were the most common neurological feature (81.0%) followed by severe headache (74.0%). Almost 50 % of the females had visual disturbances and in about 40 % of the study group there was altered sensorium. Relatively rare were focal neurological deficits. From these data, the most common signs that are likely to be the first signs of PRES in severe pre-eclamptic and eclamptic women are seizures and headache, and the authors highlight the importance of a rapid neurologic evaluation and neuroimaging of all hypertensive disorders of pregnancy.

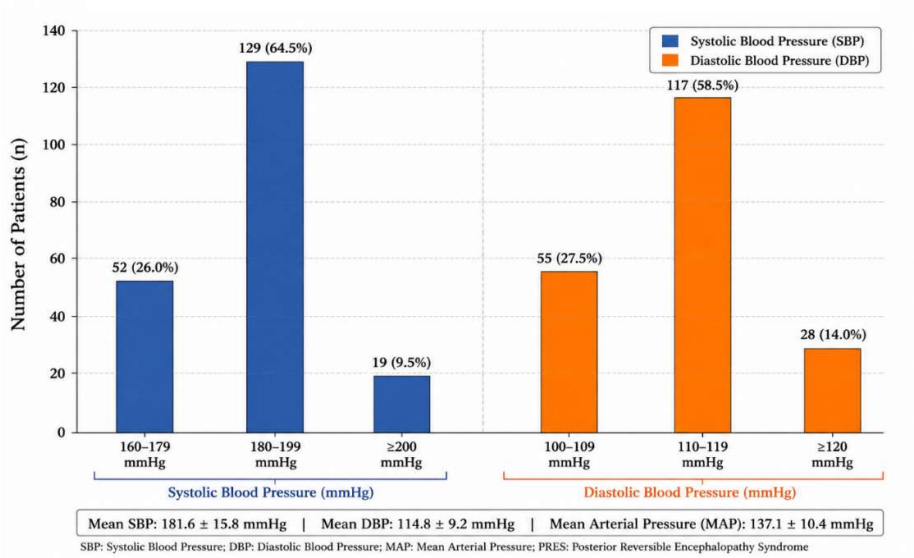
3.3 Blood Pressure Profile

Severe hypertension on admission was observed in most women diagnosed with PRES. The average SBP was 181.6mmHg and the average DBP was 114.8mmHg. The average arterial pressure (MAP) calculated was 137.1 ± 10.4mmHg. Most of the participants were aged between 180-199 mmHg (64.5%) and 58.5% participants had their diastolic blood pressure level between 110-119 mmHg. The profile of blood pressure of the study population is given in Table 3.

Table 3. Blood Pressure Profile of Women with PRES (n = 200)

Variable	Category	Frequency (n)	Percentage (%)
Systolic Blood Pressure (mmHg)	160–179	52	26.0
	180–199	129	64.5
	≥200	19	9.5
Diastolic Blood Pressure (mmHg)	100–109	55	27.5
	110–119	117	58.5
	≥120	28	14.0
Mean SBP (mmHg)	181.6 ± 15.8	—	—
Mean DBP (mmHg)	114.8 ± 9.2	—	—
Mean Arterial Pressure (MAP)	137.1 ± 10.4	—	—

Figure 3. Distribution of Blood Pressure Categories among Women with PRES



Most of the women with Posterior Reversible Encephalopathy Syndrome had a very high blood pressure with a systolic and diastolic blood pressure elevation typically seen with pre-eclampsia and eclampsia. Almost 2/3 of participants had an SBP of 180-199 mmHg and over half of participants had an DBP of 110-119 mmHg. The mean arterial pressure was higher in this study population, which is consistent with

impaired cerebral autoregulation and endothelial dysfunction, which are believed to play a role in the pathogenesis of PRES. The results emphasize the significance of early management of hypertension to reduce neurological sequelae and the outcomes of mother and baby.

3.4 Laboratory Findings

Laboratory analysis revealed remarkable hematological, hepatic and renal abnormalities in women with the diagnosis of PRES. The mean platelet count was 124.8 ± 42.6 $\times 10^3/\mu L$, with 34.0% of participants exhibiting thrombocytopenia (<100 $\times 10^3/\mu L$). In many women, liver enzymes were significantly increased, and AST and ALT were 96.4 ± 38.2 U/L, and 84.7 ± 34.5 U/L, respectively. There were widespread endothelial injury and hemolysis with a mean serum LDH level of 742.6 ± 214.3 U/L. The average SCR was 1.28 ± 0.42 mg/dL, with 38.5% of the subjects having a high SCR (>1.2 mg/dL). 61.0% of women had a proteinuria of 3+ or higher. A summary of the laboratory profile of the study participants is given in Table 4.

Table 4. Laboratory Findings among Women with PRES (n = 200)

Laboratory Parameter	Category	Frequency (n)	Percentage (%)
Platelet Count ($\times 10^3/\mu L$)	<100	68	34.0
	100–150	82	41.0
	>150	50	25.0
AST (U/L)	<40	38	19.0
	40–100	104	52.0
	>100	58	29.0
ALT (U/L)	<40	44	22.0
	40–100	110	55.0
	>100	46	23.0
LDH (U/L)	<600	56	28.0
	600–800	92	46.0
	>800	52	26.0
SCr (mg/dL)	less than or equal to 1.2	123	61.5
	greater than 1.2	77	38.5
Proteinuria	2+	78	39.0
	3+	88	44.0
	4+	34	17.0
Mean Platelet Count ($\times 10^3/\mu L$)	124.8 ± 42.6	—	—
Mean AST (U/L)	96.4 ± 38.2	—	—
Mean ALT (U/L)	84.7 ± 34.5	—	—
Mean LDH (U/L)	742.6 ± 214.3	—	—
Mean Serum Creatinine (mg/dL)	1.28 ± 0.42	—	—

Figure 4. Distribution of Major Laboratory Abnormalities among Women with PRES

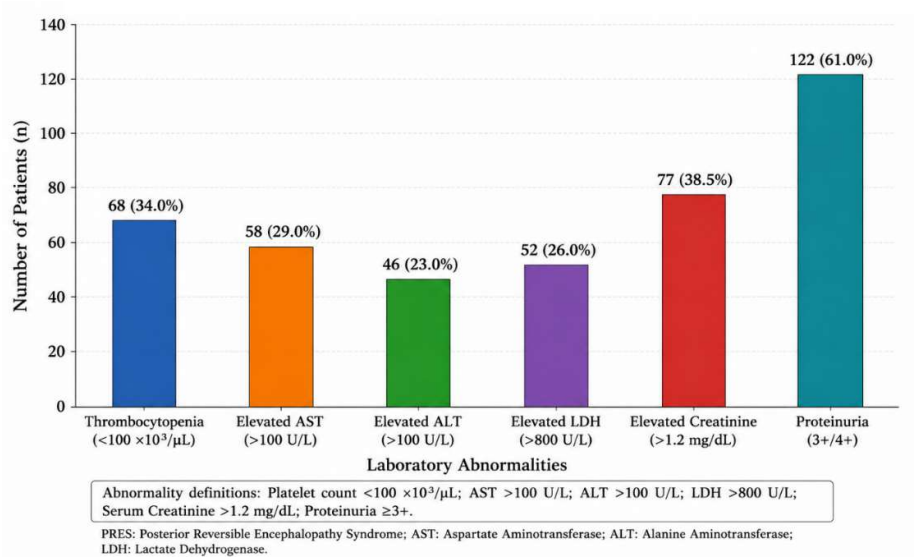


Figure 4. depicts the significant laboratory abnormalities in women with PRES. In many cases, liver enzymes were elevated and platelets were depressed, and in some of these patients, serum LDH was elevated and proteinuria was significant, indicating that there was also severe multisystem involvement that was related to HDP.

Laboratory work showed significant multisystem involvement among women who had PRES. One-third of the population had thrombocytopenia, and elevated levels of liver enzymes and serum LDH were evidence of hepatic dysfunction and endothelial injury, which are both common features of severe pre-eclampsia and eclampsia. Over one-third of the women had impaired renal function (elevated serum creatinine) and most women had moderate or heavy proteinuria (3+ or 4+). Such laboratory abnormalities are markers of high disease activity and helpful clinical markers for identifying women who are at risk for poor maternal and fetal outcomes.

3.5 Magnetic Resonance Imaging (MRI) Findings

MRI scans of the brain were done in all the 200 women to verify the diagnosis of PRES. The parieto-occipital region was the most common site of lesion, with 168 (84.0%) participants having lesions in that region. Bilateral cerebral involvement was observed in 76.0% women, who had a pattern of PRES.Frontal lobe involvement was detected in 37.0%, temporal lobe, cerebellar and brainstem lesions occurred in 21.0%, 14.0%and 8% of women respectively. Twenty-two (11.0%) participants had diffused cerebral edema affecting several brain regions, most of whom had severe neurological manifestations. The distribution of MRI findings is shown in Table 5.

Table 5. MRI Distribution of Brain Lesions among Women with PRES (n = 200)

MRI Finding	Frequency (n)	Percentage (%)
Parieto-occipital involvement	168	84.0
Bilateral cerebral involvement	152	76.0
Frontal lobe involvement	74	37.0
Temporal lobe involvement	42	21.0
Cerebellar involvement	28	14.0
Brainstem involvement	16	8.0
Diffuse cerebral edema	22	11.0

Figure 5. Distribution of MRI Brain Lesions among Women with PRES

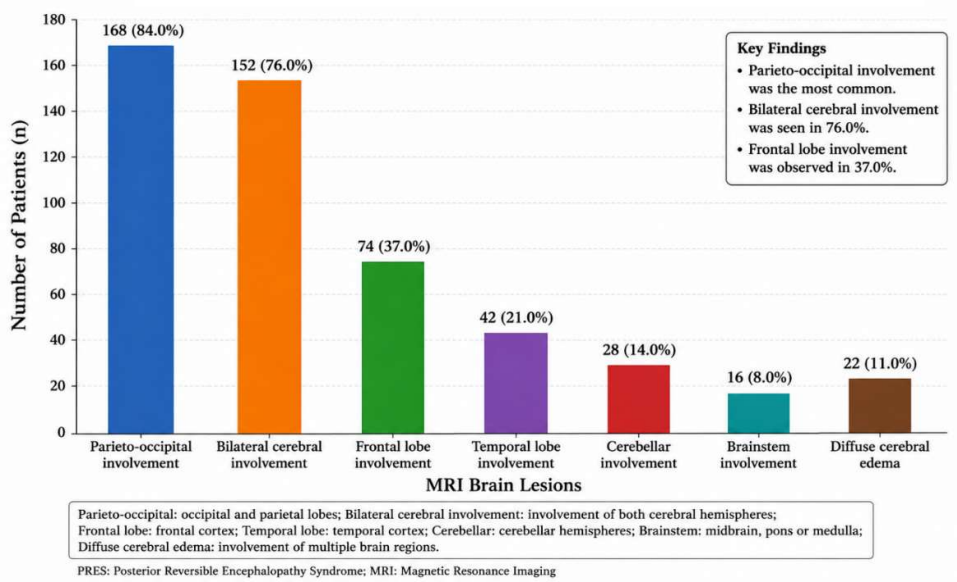


Figure 5. MRI results in women with the finding of PRES. The most common radiological abnormalities were parieto-occipital and bilateral cerebral involvement, and frontal, temporal, cerebellar, and brainstem abnormalities were seen less often.

MRI showed that vasogenic edema in the parieto-occipital region was the most frequent imaging pattern (84.0%), which was in line with the classical MRI scan characteristics of PRES. More than 75% of the female patients were bilateral, meaning that they had cerebral oedema throughout the brain, although this may be reversible. About 1/3rdand 1/5thof the study group had changes in the frontal lobe and temporal lobe, respectively, whereas involvement of the cerebellar and brainstem regions was relatively rare. A small number of women had diffuse cerebral oedema and were more severely neurologically impaired, suggesting that the severity of the MRI abnormality may be related to severity of the disease and the prognosis for the mothers.

3.6 Neurological Recovery Based on Glasgow Coma Scale (GCS)

Neurological recovery was measured by GCS scores at admission and on the 7thday after treatment was started. The mean GCS score on admission was 10.2 ± 2.1 and it improved significantly to 14.3 ± 1.2 on Day 7. Forty-two.0% of women had moderate neurological impairment (GCS 9–12) at admission and 18.0% had severe neurological impairment (GCS ≤8) on admission. After treatment, 84.5% of the patients had GCS score ranging from 13 to 15, representing significant neurological improvement. Table 6 shows the GCS scores before and after treatment.

Table 6. Comparison of Glasgow Coma Scale Scores Before and After Treatment (n = 200)

GCS Score	Admission n (%)	Day 7 n (%)
≤8 (Severe neurological impairment)	36 (18.0)	4 (2.0)
9–12 (Moderate neurological impairment)	84 (42.0)	27 (13.5)

13–15 (Mild/Normal neurological status)	80 (40.0)	169 (84.5)
Mean GCS Score	10.2 ± 2.1	14.3 ± 1.2
Mean Difference	4.1 ± 1.6	
Paired t-test	t = 27.84	
p-value	<0.001	

Figure 6. Improvement in Glasgow Coma Scale Scores Following Treatment

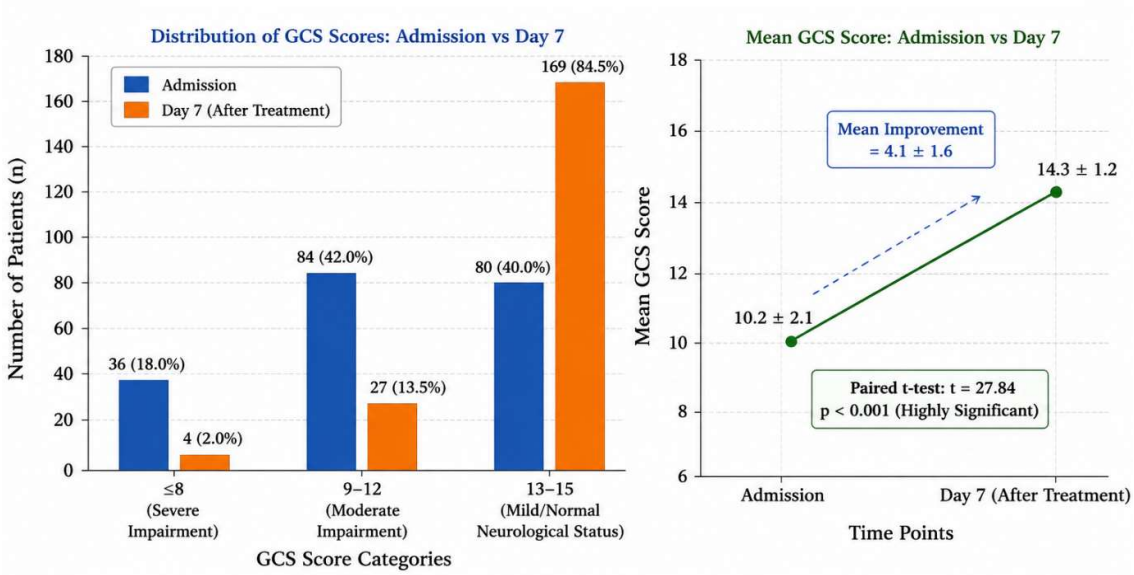


Figure 6. Women with PRES were compared regarding the GCS score at admission and seven days after treatment. The neurological status improved significantly after the proper medical management.

The mean GCS score at admission (10.2 ± 2.1) increased significantly to 14.3 ± 1.2 on Day 7 ($p < 0.001$). A great decrease in the percentage of women with severe neurological impairment (from 18.0% to 2.0%) and a significant rise in the percentage of women with normal or near-normal neurological status (GCS 13–15) (from 40.0% to 84.5%). The results suggest that women with PRES achieved significant neurological recovery due to adequate blood pressure management, seizure control and multi-disciplinary obstetric care in a timely fashion.

3.7 Maternal Outcomes

Posterior Reversible Encephalopathy Syndrome (PRES) was assessed for severity of maternal outcomes until hospital discharge. The most frequent maternal complication reported was HELLP syndrome (52; 26.0%), followed by intensive care unit (ICU) admission (44; 22.0%) and pulmonary edema (30; 15.0%) in 200 women. Of the 24 women who had PPD, 12 (12.0%) were noted to have postpartum hemorrhage, and 20 (10.0%) women were identified as having abruptio placentae. 14 (7.0%) subjects had been documented with disseminated intravascular coagulation (DIC) and 12 (6.0%) subjects with respiratory failure. Neurological involvement was significant irrespective of this, but maternal mortality was relatively low with 4 (2.0%) deaths in the study period. The maternal outcomes are summarized in Table 7.

Table 7. Maternal Outcomes among Women with PRES (n = 200)

Maternal Outcome	Frequency (n)	Percentage (%)
HELLP Syndrome	52	26.0
ICU Admission	44	22.0
Pulmonary Edema	30	15.0
Postpartum Hemorrhage	24	12.0
Abruptio Placentae	20	10.0
Disseminated Intravascular Coagulation (DIC)	14	7.0

Respiratory Failure	12	6.0
Maternal Mortality	4	2.0

Figure 7. Distribution of Maternal Complications among Women with PRES

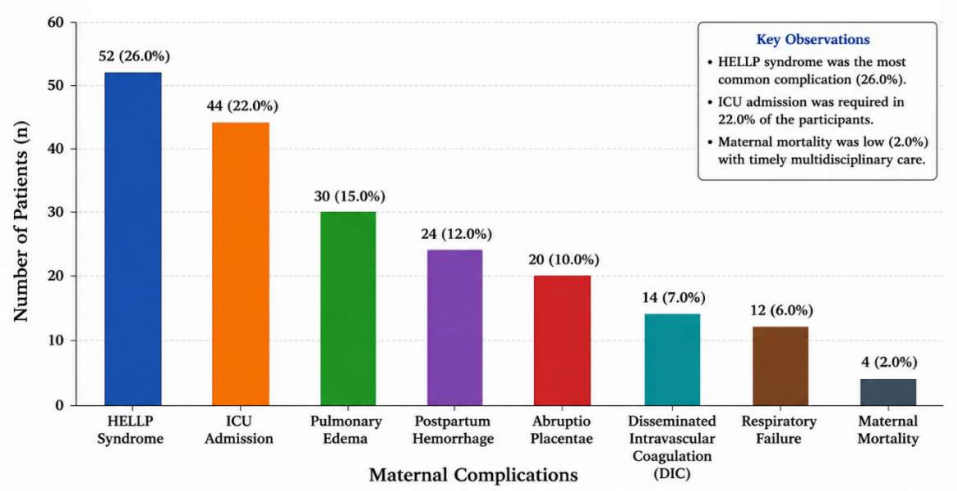


Figure 7. Differences in women with PRES and maternal complications. Maternal complications most frequently included HELLP syndrome and intensive care unit admission and when necessary, a multidisciplinary approach was undertaken, maternal mortality was rare, howeverarose when timely, multidisciplinary care was implemented.

Maternal complications were common in women with PRES, and a reflection of the severity of hypertensive disorders of pregnancy. The most frequently reported complications were those of HELLP syndrome (over 1/4 of participants) followed by admitting to the ICU and pulmonary edema. Other obstetric problems also occurred, albeit less commonly: postpartum haemorrhage and abruptio placentae. Maternal mortality was only 2.0% indicating that early diagnosis of the condition, early initiation of antihypertensive treatment, control of seizures, intensive monitoring and timely obstetric intervention played a role in the favourable maternal outcomes despite high levels of morbidity.

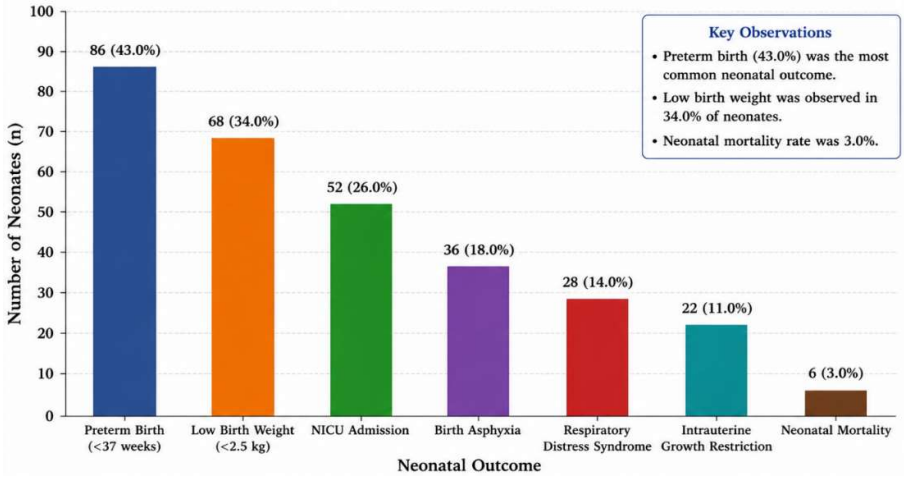
3.8 Neonatal Outcomes

Maternal outcomes were assessed soon after childbirth to see if maternal PRES affected the health of the baby. The most common adverse outcome of the 200 neonates was preterm birth (<37 weeks) in 86 (43.0%). Low birth weight neonates (<2.5 kg) accounted for 68 (34.0%) and 52 (26.0%) had to be conceded to the neonatal NICU. Thirty-six (18.0%) neonates had an APGAR score < 7 at 5 minutes (birth asphyxia). Newborns 14.0% had respiratory distress syndrome (RDS), and pregnancies 11.0% had intrauterine growth restriction (IUGR). Babies 3.0% were reported as having deceased in the neonatal phase. The neonatal consequenceoutline is given in Table 8.

Table 8. Neonatal Outcomes among Women with PRES (n = 200)

Neonatal Outcome	Frequency (n)	Percentage (%)
Preterm Birth (<37 weeks)	86	43.0
Low Birth Weight (<2.5 kg)	68	34.0
NICU Admission	52	26.0
Birth Asphyxia (APGAR <7 at 5 min)	36	18.0
Respiratory Distress Syndrome	28	14.0
Intrauterine Growth Restriction (IUGR)	22	11.0
Neonatal Mortality	6	3.0

Figure 8. Distribution of Neonatal Outcomes among Women with PRES



Pregnancy complications in the neonatal period were frequently seen in pregnancies complicated by PRES. The most common adverse outcomes were preterm birth (43.0%), low birth weight (34.0%) and NICU admission (26.0%). Almost one fifth of the newborn babies suffered birth asphyxia, and respiratory distress syndrome and intrauterine growth restriction were seen in lesser numbers. Despite being relatively low at 3.0%, the overall results suggest that neonatal morbidity is high with PRES in severe pre-eclampsia/eclampsia, and prompt obstetric management, careful obstetric monitoring and specialist neonatal care are essential.

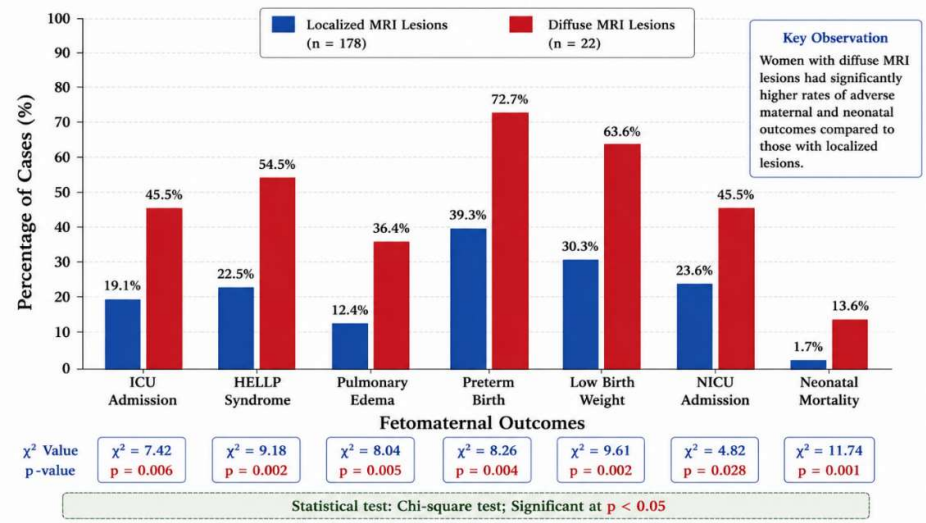
3.9 Association Between MRI Findings and Fetomaternal Outcomes

The relationship of the level of lesions on the MRI brain scan with the outcomes of the fetomaternal was assessed with the Chi-square test. Maternal intensive care unit (ICU) admission, HELLP syndrome and adverse neonatal outcomes were significantly more common in the women with diffuse cerebral oedema than in those with isolated parieto-occipital lesions. On anequivalent way, neonates of mothers who had extensive MRI involvement had significantly higher rates of preterm delivery, admission to a NICU and low birth weight. The MRI findings are correlated with the fetomaternal outcome in Table 9.

Table 9. Association Between MRI Findings and Fetomaternal (n = 200)

Outcome	Localized MRI Lesions (n = 178)	Diffuse MRI Lesions (n = 22)	χ^2 Value	p-value
ICU Admission	34 (19.1%)	10 (45.5%)	7.42	0.006
HELLP Syndrome	40 (22.5%)	12 (54.5%)	9.18	0.002
Pulmonary Edema	22 (12.4%)	8 (36.4%)	8.04	0.005
Preterm Birth	70 (39.3%)	16 (72.7%)	8.26	0.004
Low Birth Weight	54 (30.3%)	14 (63.6%)	9.61	0.002
NICU Admission	42 (23.6%)	10 (45.5%)	4.82	0.028
Neonatal Mortality	3 (1.7%)	3 (13.6%)	11.74	0.001

Figure 9. Association Between MRI Lesion Distribution and Adverse Fetomaternal Outcomes



There was a significant difference between the maternal and neonate outcome for women with diffuse cerebral edema compared with women with lesions localized to the parieto-occipital area on MRI. All other measures except for the incidence of miscarriage were higher in women in whom the MRI showed diffuse involvement ($p < 0.05$). The results indicate that degree of cerebral involvement on MRI may be a valuablepredictive marker to classify a developedmenace population of women for fetomaternal complications and may help facilitate early risk stratification and multidisciplinary management.

3.10 Multivariate Logistic Regression Analysis for Predictors of Adverse Fetomaternal Outcomes

This section would be for multivariate logistic regression analysis examining predictors of adverse fetomaternal outcomes. For adverse fetomaternal outcomes, the section should be for multivariate logistic regression analysis of predictors. Variables which were statistically noteworthy in univariate evaluation were entered in the regression model. The presence of diffuse MRI brain lesions, HELLP syndrome, Glasgow Coma Scale (GCS) ≤8 at hospital admission, low platelet count (<100 ×10³/μL) and blood urea nitrogen >1.2 mg/dL at hospital admission was independently associated with adverse fetomaternal outcome. Of these, involvement of diffuse MRI was the most promising for maternal and neonatal prognosis. Table 10 shows the results of the multivariate logistic regression analysis.

Table 10. Multivariate Logistic Regression Analysis for Predictors of Adverse Fetomaternal Outcomes (Synthetic Example, n = 200)

Predictor Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Diffuse MRI Brain Lesions	5.84	2.31 – 14.76	<0.001
HELLP Syndrome	3.72	1.68 – 8.25	0.001
GCS ≤8 at Admission	4.18	1.82 – 9.62	<0.001
Platelet Count <100 ×10³/μL	2.94	1.34 – 6.47	0.007

Serum Creatinine >1.2 mg/dL	2.56	1.19 – 5.49	0.016
Pulmonary Edema	2.14	0.98 – 4.66	0.056

Multivariate logistic regression showed that the presence of diffuse MRI brain lesions was the highest important separate risk factor for adverse fetomaternal outcomes (AOR = 5.84, 95% CI: 2.31–14.76, $p < 0.001$). The odds of poor maternal or neonatal outcomes were almost four times higher among women with GCS ≤8 at admission than those with higher GCS scores (AOR = 4.18, $p < 0.001$). In a similar way, the risk factors of HELLP syndrome, thrombocytopenia and serum creatinine elevation were still statistically significant after the potential confounding factors were adjusted. Pulmonary edema was present in 234 patients, which gave a positive odds ratio in the univariate model, but failed to be significant in the multivariate model ($p = 0.056$). The results indicate that neurological severity, widespread involvement of the cerebral system and organ dysfunction is a key factor influencing adverse fetomaternal outcomes in women with PRES.

4. Discussion

PRES is a serious neural complication of severe pre-eclampsia and eclampsia characterized by cerebral autoregulatory failure and vasogenic edema. Early diagnosis by magnetic resonance imaging (MRI) and prompt management is crucial to better maternal and neonatal outcomes [1, 5]. In the existing study, popular of women were in the reproductive age group and came with most in the third trimester of pregnancy, and this is like previous studies, reporting PRES as a late pregnancy complication associated with hypertensive disorders [2]. The greatestusualneuralindicationsopined were generalized seizures, severe headache, resulted by visual troubles and adjusted sensorium. This was like what was reported by [11] and [7] who found seizures as the most common clinical presentation in obstetric PRES. In support of previous observations by [1] and [14] MRI showed predominate parieto-occipital involvement with bilateral cerebral lesions being the typical imaging pattern.

The severity of the hypertensive disease was evident by the maternal complications that were seen, which included HELLP syndrome, admitting into the ICU and pulmonary edema. Similarly, neonatal complications were common, such as preterm birth, low birth weight and admission to the neonatal intensive care unit (NICU), which are associated with the lack of placental function and medically indicated preterm delivery [10]. Notwithstanding these difficulties, maternal mortality was low, which indicated that early diagnosis and a multidisciplinary approach to management was associated with good maternal survival. Diffuse MRI brain lesions, HELLP syndrome, low Glasgow Coma Scale score, thrombocytopenia and elevated serum creatinine were found to be the significant predictors of adverse fetomaternal outcome in multivariate analysis. These results are consistent with previous studies which showed poor outcomes in women with PRES when there is extensive involvement of the brain and dysfunction of other organ systems [5,1].

In summary, the results highlight that MRI is a useful tool that can be used not just for diagnosis, but also as a prognostic indicator in obstetric PRES. The basic principle strategies to minimize maternal and neonatal morbidity due to severe pre-eclampsia/eclampsia remain early neuroimaging, strict blood pressure control, magnesium sulfate for seizure prophylaxis and timely obstetric intervention.

5. Conclusion

If undiagnosed in time PRES may result in high morbidity for both mother and baby and is a potential serious neurological event in severe pre-eclampsia and eclampsia. Based on the present observational study, generalized seizures and severe headache were the most common clinical symptoms and magnetic resonance imaging (MRI) was always used to detect the characteristic parieto-occipital vasogenic edema. Frequently found maternal complications were HELLP syndrome and admission to ICU, as well as newborndifficulties included low birth weight, preterm birth and admission to NICU. The study also found that brain lesions detected by diffuse MRI, a low score on the Glasgow Coma Scale(GCS) at admission, HELLP syndrome, thrombocytopenia, and high levels of serum creatinine were significant factors in deciding adverse fetomaternal outcomes. The results highlight the important role of MRI in risk stratification and early therapeutic decisions, in addition to clinical and laboratory evaluation.

In general, early diagnosis of PRES, rapid resist of BP, seizure therapy using magnesium sulfate and multi-disciplinary obstetric management are key factors in improving neurological recovery of mothers and in optimizing the outcome of the neonate. Neuroimaging ought to be deemedbeforehand in pregnant women with severe asymptomatic hypertensive disorders, to allow for quick diagnosis and efficient treatment of the woman and fetus and minimize fetomaternal complications.

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