

Assessment of Maternal and Neonatal Outcomes among Women at High-risk Pre-eclampsia and Normotensive Pregnancy

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Abstract:

Background: Preeclampsia is a prevalent gestational complication, affecting approximately 2 to 15% of pregnancies. It generally occurs near-term and is associated with various risk factors, including maternal age, nulliparity, obesity, thrombocytopenia, calcium deficiency, and chronic kidney disease. Preeclampsia leads to either severe or mild conditions in both mother and fetus.

Aim: This study aims to assess the maternal and fetal outcomes in women at high risk for preeclampsia compared to those with normotensive pregnancies.

Methodology: A prospective observational study was conducted to assess maternal and fetal outcomes in preeclamptic patients and those with normotensive pregnancies. The study included a total of 40 patients, with an equal number of preeclamptic and normotensive pregnancies. Data were collected on patient demographics, risk factors, and maternal and fetal outcomes. A risk assessment scale was employed to validate and refine the prediction of the occurrence and severity of preeclampsia.

Results: Among the 40 patients, the median age was 25 (22-29) years. The majority of the preeclamptic patients were <21 years of age (40%) and >30 years of age (10%), and most belonged to lower socioeconomic classes (90%). Nutritional deficiency (95%) was the predominant risk factor. A significant incidence of maternal and neonatal complications was observed.

Conclusion : This study revealed that risk factors exacerbate complications and adverse outcomes. Mild to severe outcomes were observed. Serious complications lead to maternal and neonatal deaths. Modifiable risk factors should be identified and reviewed regularly to reduce severe outcomes.

Keywords: Preeclampsia, proteinuria, Nutritional deficiency, Maternal and Neonatal outcomes.

Introduction

Hypertensive disorders during pregnancy present a significant risk to both maternal and fetal health⁽¹⁾. Preeclampsia is a gestational condition marked by the sudden onset of elevated blood pressure exceeding 140/90 mm Hg and proteinuria occurring after 20 weeks of pregnancy in women who previously had normal blood pressure⁽²⁾. According to World Health Organisation (WHO), preeclampsia affects 2-8% of pregnancies worldwide and accounts for 10-15% of maternal deaths⁽³⁾. Preeclampsia develops in 2 stages, which involves abnormal placentation and followed by a maternal syndrome with an excess of antiangiogenic factors⁽⁴⁾. The risk factors for developing preeclampsia include a prior history of preeclampsia, chronic hypertension, pregestational diabetes mellitus, multiple gestation, thrombocytopenia antiphospholipid syndrome,

and stress and obesity. Additional risk factors encompass advanced maternal age, nulliparity, a history of chronic kidney disease, nutritional deficiency and the use of assisted reproductive technologies⁽⁵⁾. Preeclampsia can be classified as mild or severe based on the severity of symptoms. The diagnosis of any form of PE requires the presence of both hypertension and proteinuria, and it may be accompanied by a variety of other symptoms⁽⁶⁾. Elevated blood pressure is primary diagnosis factor for preeclampsia and is associated with increased neurological and cardiovascular risks. Antihypertensives of limited choice are administered to control blood pressure. Expectant management involves prophylactic magnesium sulfate and corticosteroids⁽⁷⁾. Delivery is the definitive treatment for preeclampsia. Given the associated maternal and fetal risks, cesarean delivery is often preferred over vaginal delivery.

Optimal timing of delivery requires a careful balance of maternal and foetal risks, including the gestation of the fetus⁽⁸⁾. Preeclampsia can have life threatening effects on both mother and the fetus. Composite adverse maternal outcomes include complications such as severe preeclampsia, cerebral symptoms (like visual disturbance, headache), pedal edema, placental abruption, vaginal bleeding, pulmonary edema, postpartum hemorrhage, HELLP syndrome, and maternal death. Secondary outcomes encompass a combination of perinatal death or severe neonatal complications, mode of delivery, small or large for gestational age infants, growth restriction (IUGR), respiratory distress syndrome (RDS), low birth weight, low APGAR score, and NICU admission⁽⁹⁾.

Materials and Methods

Study Design: Prospective Observational Study.

Place of Study: MNR Hospital, Sangareddy.

Period of Study: November 2023 to April 2024.

Study population: The study population includes selected pregnant women.

Population: Total 40 patients who fulfilled the criteria were included in this study.

Inclusion Criteria.

- Patients not taking calcium supplementation.
- Patients with hypertension ranging from 140/90mmHg to 160/95 mmHg.
- Eclampsia patients.
- Patients with hemolysis, increased liver enzymes, low platelet count.
- Presence of ankle edema and pedal edema.
- Proteinuria.
- Hypertension in third trimester.

Exclusion Criteria.

- Patient with severe hypertension.
- Ectopic pregnancy.
- IVF pregnancy.
- Patient with pre-existing health conditions (eg. HIV, Hepatitis, Autoimmune disorders, Diabetes, PCOD, Renal disease, organ transplant recipients, sickle cell trait).



Figure -1: Pedal edema in preeclampsia.

Procedure

All the participants are explained about the aim, importance and purpose of the study. A written informed consent was taken from the participants and data was collected ([ICF.docx](#)). The diagnosis of pregnancy, preeclampsia was based on ACOG guidelines and ISSHP recommendations. All the pregnant women are evaluated using the criteria and divided into two groups. Group A included normotensive pregnant patients and Group B included preeclamptic patients only with the clinical features of raised blood pressure and proteinuria or other clinical presentation of preeclampsia. Data related to patient's demographics, obstetric and family history, risk factors, clinical presentation, clinical examinations, maternal and fetal outcomes were documented in the patient data collection form ([CRF.docx](#)). The patients were regularly followed up and specific investigations, abdominal ultrasonography were done to check the developmental status of baby. Treatment was given according to the symptoms of the patient. The risk factors, clinical symptoms and the nutritional supplementation was observed and compared between the two groups. Correlation between the risk factors and the outcomes was observed. A risk and severity assessment scale was designed and employed to validate and refine the prediction of the occurrence and severity of preeclampsia ([ASSESSMENT SCALE.docx](#))⁽¹⁰⁾.

Results

The study enrolled 40 patients of which 20 (50%) were preeclamptic patients and 20 (50%) were normotensive pregnancy patients. Figure -1 shows age distribution of patients included in the study. Women of age 19-38 years were present in the

study. Most of the women 25 (62.5%) were aged between 22-29 years. In the study 30 (75%) patients are from rural area and 10 (25%) patients are from urban area. A high percentage of low-income patients (n= 31, 77.5%) were observed.

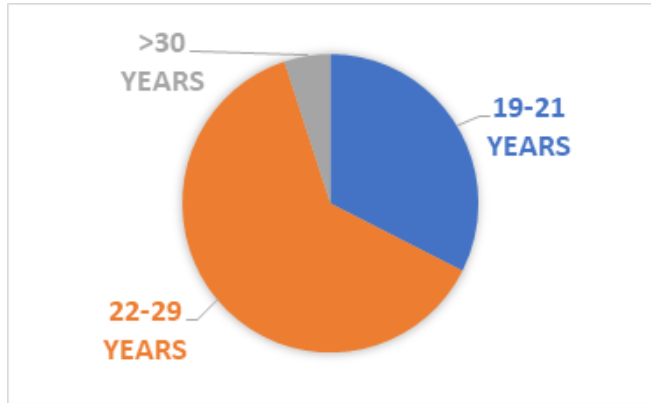


Figure -2 : Age distribution in patients.

The predominant clinical features among the participants were elevated blood pressure and proteinuria levels. The risk factors were compared between the normotensive and preeclampsia patients.

Table -1 : Risk factors among preeclampsia and normotensive pregnant women.

Risk factors	Preeclampsia (n=20)	Percentage %	Normal (n=20)	Percentage %
Age				
19-21 years	8	40%	5	25%
22-29 years	10	50%	15	75%
30-38 years	2	10%	0	0%
Gravida				
Nulli	5	25%	3	15%
Primi	9	45%	9	45%
Multi	6	30%	8	40%
History of preeclampsia	5	25%	0	0%
Multiple gestation	0	0%	1	5%
Nutritional deficiency	19	95%	6	30%
Gestational DM	1	5%	5	25%
Thrombocytopenia	16	80%	6	30%
Abnormal AFI index	14	70%	4	20%

Obesity	6	30%	2	10%
Stress	8	40%	3	15%

Table -1 represents the major risk factors for the development of preeclampsia. Nutritional deficiency 19 (95%) was present in most cases and is the major risk factor for preeclampsia followed by thrombocytopenia, abnormal AFI index, obesity, stress etc. Thrombocytopenia 16 (80%), abnormal AFI index 14 (70%) were also found to be much weighted risk factors for development of preeclampsia when compared to normotensive pregnancies. And the incidence of thrombocytopenia is found to be more in preeclampsia women than in normotensive women.

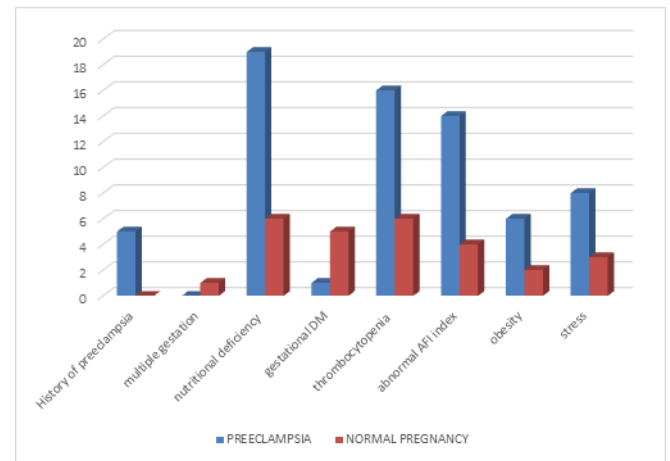


Figure -3 : Risk factors among preeclampsia and normotensive pregnancies.

Maternal outcomes like proteinuria, pedal edema and clinical complications like HELLP syndrome, cerebral disturbances, vaginal bleeding and eclampsia were reported. When compared to normotensive women, preeclamptic patients had more number and more severe maternal complications. Proteinuria was reported only in preeclamptic patients (n=18, 90%) as a clinical feature. Cerebral disturbances like headache and visual disturbances were seen in preeclamptic patients and also in normotensive patients but the incidence were differed with higher in preeclampsia women.

Table -2 : Maternal outcomes among patients.

Maternal outcome	Preeclampsia	Percentage %	Normal	Percentage %
Proteinuria	18	90%	0	0%
Pedal edema	17	85%	5	25%
HELLP	13	65%	6	30%
Placental abruption	3	15%	0	0%
Vaginal bleeding	8	40%	5	25%
Headache	16	80%	5	25%
Visual disturbance	11	55%	2	10%
Eclampsia	1	5%	1	5%

HELLP syndrome is another diagnostic feature for severity of preeclampsia along with elevated blood pressure and proteinuria. It is observed that the occurrence of HELLP syndrome is more in preeclampsia patients (n=13, 65%), but it is also observed in normotensive pregnancy. Vaginal bleeding (n=8, 40%) is more seen in preeclampsia than in normotensive pregnancy

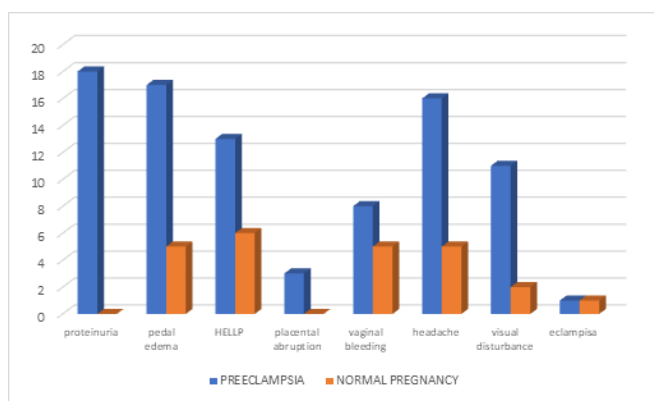


Figure-4 : Maternal outcomes among patients.

Neonatal complications like mode of delivery and gestational age at time of delivery were also observed. Comparative analysis shows that elevated blood pressure increases the chances of

caesarean deliveries and preterm births. Caesarean deliveries (n=20, 100%) and pre term deliveries (n=10, 50%) are more in preeclamptic patients than to normotensive pregnancies.

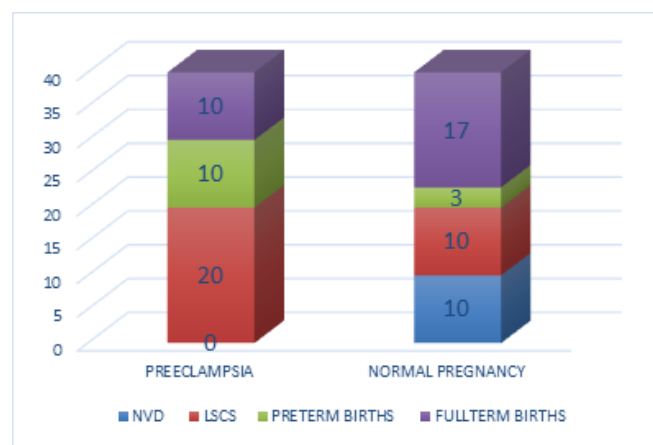


Figure-5: Mode of delivery and gestational age.

There were higher neonatal complications like low birth weight 17(85%), low APGAR score 6(30%), growth retardation 9(45%), respiratory distress 14(70%) etc in preeclamptic patients. And in normotensive pregnancies, low birth weight 8 (40%), low APGAR score 2(10%), growth retardation 1(5%), respiratory distress 3(15%) were observed.

Table-3: Neonatal outcomes among preeclamptic and normal pregnancies.

Neonatal outcome	Pre-eclampsia	Percentage %	Normal	Percentage %
NVD	0	0%	10	50%
LSCS	20	100%	10	50%
Preterm birth	10	50%	3	15%
Full term birth	10	50%	17	85%
Low birth weight	17	85%	8	40%
Cord around neck	4	20%	2	10%
Low APGAR score	6	30%	2	10%
Growth retardation	9	45%	1	5%

Respiratory distress	14	70%	3	15%
Neonatal death	2	10%	1	5%
NICU admission	13	65%	6	30%

normotensive pregnancies neonatal death 1(5%) and NICU admissions 6(30%).

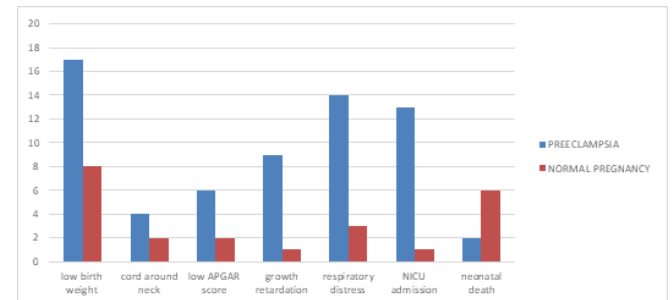


Figure -8 : Neonatal outcomes among preeclamptic and normal pregnancies.



Figure 6: Sonograph showing prominent cisterna magna.



Figure 7: Sonograph showing fetal growth restriction (stage-2).

There were 2 (10%) neonatal deaths and higher NICU admissions 13 (65%) in preeclamptic patients. Which is higher when compared to

Discussion :

This study focused on assessing the maternal and fetal outcomes in women at high risk for preeclampsia compared to those with normotensive pregnancies. During pregnancy, hypertensive disorders are associated with higher incidence of maternal and fetal mortality.

The study represents a partial segment of a major project and data collected till date within the duration of 6 months is assessed.

In a study conducted in Multan, Pakistan by Bisma khan et al, reported higher incidence of preeclampsia cases in urban areas (62.2%) than in rural areas (37.8%). The present study revealed a higher incidence in rural areas (65%) than in urban areas (35%).

In the present study the age range of the patients was 19-38 years, with maximum patients are in the age group of 22-29 years. Maternal age of <21 years and >30 years is a predominant risk factor of preeclampsia which accounted 50% of the cases of preeclampsia and only 25% of normal pregnancy cases were seen in this age group. Jean Ju Sheen et al, also reported women aged 15-17 and 45-54 are at higher risk than to women at 25-29 years⁽¹¹⁾.

In preeclamptic patients, blood pressure levels ranged from 140/90 mm Hg to 160/110 mm Hg, while in normotensive patients, the levels were between 100/80 mm Hg and 120/80 mm Hg. Proteinuria was observed in 18 patients (90%) with preeclampsia, whereas no proteinuria was found in patients with normotensive pregnancies.

Mai leiwoo kinshella, conducted a review study which describes the association between nutritional inadequacies and higher risk of preeclampsia⁽¹²⁾. Many studies revealed that low range of calcium, magnesium, zinc during pregnancy might be possible risk for development of preeclampsia⁽¹³⁾. In this study according to the risk factors of preeclampsia, Nutritional deficiency (95%) was reported greater than other risk factors like history of preeclampsia (25%), multiple gestation (0%), gestational Diabetes mellitus (5%), Thrombocytopenia (80%), Abnormal AFI index (70%), Obesity (30%), stress (40%). These risk factors were reported low in normal pregnancies when compared to preeclamptic patients.

Delivery of the fetus remains the ultimate treatment for preeclampsia. Considering the risk factors and maternal complications, mode of delivery was primarily LSCS (100%) than NVD (0%) in preeclamptic patients whereas the mode of delivery was primarily NVD (50%) than LSCS (50%) in normotensive pregnancies. Xia xu et al, in a study reported that based on the risk factors and the complications, caesarean section is more beneficial to prevent severity of the outcomes⁽¹⁴⁾.

In this study maternal complications like progression to severe preeclampsia(40%), placental abruption(15%), pedal edema(85%), HELLP syndrome(65%), Cerebral disturbances (headache-80%, visual disturbance-55%) and Eclampsia(5%) were seen, whereas these complications were reported low in normotensive pregnancies. These complications are higher when compared to the study done at SPHM Medical College, Ethiopia.

Neonatal outcomes showed higher preterm births in preeclampsia (50%) than normotensive pregnancies (15%). Full term births (85%) were more seen in normotensive pregnancies than preeclampsia (50%). This finding is comparable to other study findings revealing preterm births as common perinatal complications.

Low birth weight (85%) and Respiratory distress (70%) were also reported as major neonatal complications which led to higher NICU admissions(65%). This study also reported Perinatal mortality (10%) due to still births and low gestational age.

These complications were relatively low in normotensive pregnancies(5-40%). Attiya ayaz et al also reported that preeclampsia has greater implication on adverse neonatal outcomes⁽¹⁵⁾. Consistent with other studies the current study also shown that risk factors are associated with increased risk of developing adverse maternal fetal outcomes.

Conclusion

This study established that there is a significant relationship between risk factors, maternal and neonatal outcomes. Through modifying the underlying risks associated with maternal complications can reduce the severity of preeclampsia.

This study revealed that preeclamptic patients were identified with abnormal factors like high blood pressure, pedal edema, headache, visual disturbances, proteinuria mostly. This led to the occurrence of severe maternal and neonatal outcomes like placental abruption, vaginal bleeding, HELLP syndrome, eclampsia, preterm births, low APGAR scores, low birth weight, growth retardation and respiratory distress. It can also worsen with severity to maternal and neonatal death.

The modifiable risk factors are age, obesity, stress, nutritional deficiency. These factors can be modified by providing patient counselling, regular checkups, BP monitoring. Nutritional supplementations like calcium, magnesium, zinc intake can reduce the risk of development of preeclampsia.

The scale taken in the study is used to assess the severity of preeclampsia compared with normotensive pregnancies. By providing relevant information regarding the severity of the preeclampsia and suggestions to reduce the severity it helps is producing better maternal and neonatal outcomes.

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