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Original Research Article

Risk factors, phenotypic-pattern and feto-maternal outcomes of preeclampsia with severe features in a low-resource setting: a prospective study

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ABSTRACT

Background: Preeclampsia is exclusive to pregnancy and one of the leading causes of maternal and perinatal morbidity and mortality globally. This study aims to assess the prevalence, risk factors, phenotypic pattern and feto-maternal outcomes among women managed for preeclampsia with severe features at the Federal Medical Center Asaba.
Methods: Women managed for preeclampsia with severe features between 1st June 2022 and, 31st January 2023 were recruited and relevant data extracted and entered into a standardized proforma which was subsequently analyzed using the SPSS version 26. Categorical variables were expressed in frequencies and percentages while continuous variables were expressed as mean and standard deviation. The association test between the categorical variables was via the chi-square and Fisher exact test where necessary with a $p<0.05$ considered significant.
Results: The prevalence of preeclampsia with severe features was 19.3% with the late-onset type (63.7%) being the commonest. Maternal and perinatal outcomes were comparable in both phenotypical patterns except for NICU admission which was higher and significant for early onset. Nulliparity, chronic hypertension, and previous history of preeclampsia were the most commonly identified risk factors. Neonatal intensive care unit admission (43.8%), perinatal mortality (17.8%), admission into the intensive care unit (1.4%), and development of eclampsia (0.7%) were the most frequent fetomaternal outcomes.
Conclusions: This study revealed a high burden of preeclampsia with severe features and some of its complications. Interventions such as early antenatal care booking and prompt identification of at-risk women will reduce its burden.

Keywords: Risk factors, Phenotype, Severe preeclampsia, Fetomaternal outcomes

INTRODUCTION

Preeclampsia is specific to pregnancy and it is a multi-systemic progressive disorder that is characterized by the new onset of hypertension (BP≥140/90 mmHg) and proteinuria (≥0.3g in a 24-hour urine specimen or protein/creatinine ratio ≥0.3/30 mg/mmol in a random urine specimen or dipstick ≥2+ if a quantitative measurement is unavailable) or the new onset of hypertension plus significant end-organ dysfunction with or without proteinuria, typically presenting after 20 weeks of gestation or postpartum.[1,2] Preeclampsia with severe features formerly known as severe preeclampsia refers to the subset of women with preeclampsia who have severe hypertension (BP ≥160/110 mmHg), and/or specific signs or symptoms of significant end-organ dysfunction.[1-3] With the presence of tonic-clonic seizures in the absence of other neurologic conditions, occuring in addition to these signs of preeclampsia in the absence of other neurologic conditions, it is referred to as eclampsia.[1,3]

Globally, preeclampsia complicates about 3-5% of pregnancies and can occur in the antenatal, intrapartum, or postpartum periods.[4] An incidence of 8.8% has been reported in Jos, Nigeria.[5] The pathophysiology of preeclampsia involves both maternal and fetal/placental factors. Abnormalities in the development of the placental vasculature early in pregnancy may result in placental under-perfusion, hypoxia, and ischaemia, this causes the release of antiangiogenic factors into the maternal circulation. These antiangiogenic substances released alter maternal systemic endothelial dysfunction causing hypertension, vasoconstriction and vasospasms, platelet aggregation, and other disease manifestations that can be seen in preeclampsia.[4]

Various risk factors have been identified to increase the risk of having preeclampsia. These risk factors vary in strengths of association with the disease condition and quality of evidence.[6] Some of these risk factors include; nulliparity, preeclampsia in a previous pregnancy, age>40 years or <18 years, family history of preeclampsia, chronic hypertension, chronic kidney disease, autoimmune diseases like antiphospholipid syndrome and systemic lupus erythematosus, diabetes mellitus, invitro fertilization, obesity, prolonged interpregnancy interval and male-related factors such as new male partner and limited sperm exposure.[4,6,7]

Preeclampsia has two distinct phenotypes categorized often as early and late onset which is defined as the onset of preeclampsia or delivery with preeclampsia before or after 34 weeks of gestation respectively.[8-11] The early-onset type is generally regarded to be more severe and is associated with abnormal placentation, fetal growth restriction, and systemic endothelial dysfunction while the late-onset disease on the other hand is often associated with normal fetal growth and maternal metabolic or inflammatory factors.[8,11] Hence even though the presenting features may overlap, there are differences in maternal and perinatal outcome, also differences exists in their prognosis and complications.[12]

Delivering the fetus via the most expedient route is the definitive treatment of this condition. This is in addition to prompt commencement of prophylactic anticonvulsant therapy to prevent seizures, control of hypertension, early detection and correction of haematologic and electrolyte abnormalities, early detection and management of end-organ damage such as acute kidney injury.[13,14] All these will help to prevent the fetal and maternal complications that may arise from this condition.

While there have been studies on the prevalence and risk factors of preeclampsia and eclampsia in Delta State, none of these have researched the phenotypic pattern of preeclampsia in this oil-rich state in South-South Nigeria. Also, there has been no study on the subject matter in the Federal Medical Centre, Asaba despite its huge contribution to maternal morbidity and mortality in our facility.[15] The aim of this study, therefore, is to determine the prevalence, risk factors, phenotypic pattern, and feto-maternal outcomes among women managed for preeclampsia with severe features at the Federal Medical Centre, Asaba.

METHODS

Study area

This study was carried out at the Federal Medical Centre, Asaba, Delta State which is located in Oshimili South local government area of Delta State in the South-South geopolitical zone of Nigeria. It is one of the tertiary hospitals in southern Nigeria that provides 24-hour primary, secondary and tertiary care to residents of the state and its environs and serves as a referral centre.

Study design

A descriptive, prospective cross-sectional study was carried out to determine the prevalence, risk factors, phenotypic pattern and fetomaternal outcomes of women managed for preeclampsia with severe features over eight months.

Study participants

This included all consenting women who presented with preeclampsia with severe features at the Federal Medical Centre Asaba between 1st June 2022 and 31st January 2023.

Eligibility criteria

All patients booked and unbooked above 20 weeks gestation with preeclampsia with severe features as indicated by any of the following; blood pressure elevation of ≥160/110, symptoms of CNS dysfunction, hepatic abnormality, thrombocytopenia (with platelet count <100,000 platelets/microliter), renal impairment and

pulmonary oedema. Patients without contraindication to using MgSO4, e.g., drug hypersensitivity, myasthenia gravis, anuria, oliguria (<0.5 ml/kg/hour of urine).

Data collection and analysis

A standardized proforma was used in collecting relevant data, which included the socio-demographic data, obstetrics and medical history, and delivery outcomes relating to the study population from all patients with preeclampsia with severe features seen during the period of 1st June 2022 to 31st January 2023. The data were subsequently analyzed using the statistical product and service solutions (SPSS) IBM version 26. Categorical variables were expressed in frequencies and percentages while continuous variables were expressed as mean and standard deviation. The test of association between the categorical variables was via the chi-square and Fisher exact test where necessary with a $p<0.05$ considered statistically significant.

Ethical consideration

Institutional ethical clearance was obtained from the research and ethics committee of the Federal Medical Centre Asaba with reference number FMC/ASB/A81VOL.XIII/241 before the commencement of the study in conformity with the Helsinki declaration with emphasis on the core ethical principles of autonomy, beneficence, non-maleficence and justice.

RESULTS

During the eight months of this study, there were a total of 798 deliveries, of which 146 had severe preeclampsia, giving a prevalence of 19.3%. The mean age of the women was 30.48±5.79 years, while the mean gestational age was 34.54±4.28 weeks. About 74.0% of the study population were unbooked in our facility, while caesarean section (76.7%) accounted for the commonest route of delivery among the study participants (Table 1).

Figure 1 shows the phenotypic pattern of preeclampsia with severe features among the study participants with late-onset preeclampsia accounting for 63.70% while 36.30% had early-onset preeclampsia.

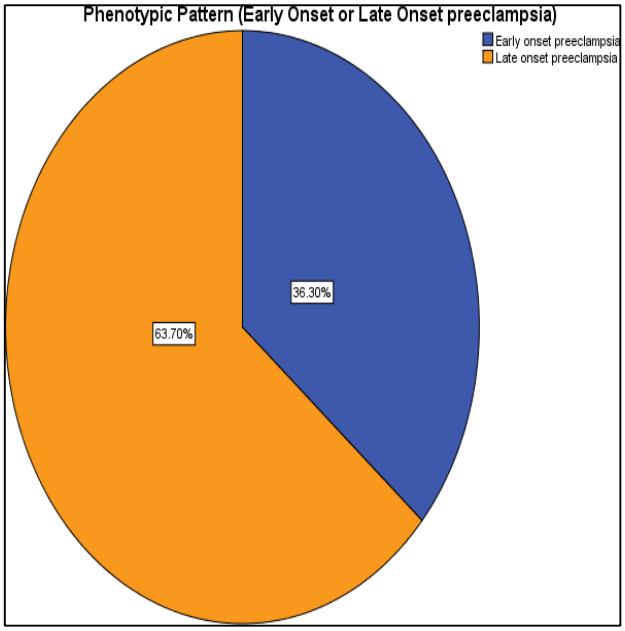

Figure 1: Phenotypic pattern of pre-eclampsia amongst subjects.

Nulliparity (40.1%), chronic hypertension (30.5%), and previous history of preeclampsia (9.6%) were the commonest risk factors for preeclampsia with severe features identified in the study participants (Table 2).

There was no identifiable risk factor in 1.1% of the study participants who developed preeclampsia with severe features in this study.

Table 3 showed the maternal outcomes of women with preeclampsia with severe features in this study while Table 4 revealed the fetal outcomes.

Perinatal mortality was found in about 17.8% of babies delivered to the study participants while 43.8% of these babies were admitted to the neonatal intensive care unit. There was no maternal mortality recorded.

Table 5 showed some statistically significant differences in the fetal outcome of neonatal intensive care unit admission and perinatal mortality between the early-onset and late-onset phenotypes of preeclampsia.

Table 1: Sociodemographic and clinical parameters.

Variables	N	Percentage (%)
Age (in years)		
≤20	7	4.8
21-30	70	47.9
31-40	63	43.2
>40	6	4.1
Mean age=30.48 (±5.79)		
Marital status		
Married	138	94.5
Single	8	5.5

Continued.

Variables	N	Percentage (%)
Level of education		
Primary	2	1.4
Secondary	68	46.6
Tertiary	76	52.1
Occupation		
Unskilled	100	68.5
Skilled	46	31.5
Parity		
Nullipara	71	48.6
P1-2	44	30.1
P3-4	21	14.4
P≥5	10	6.8
Booking status		
Booked	38	26.0
Unbooked	108	74.0
Mode of delivery		
C/S	112	76.7
SVD	33	22.6
IVD (Vacuum)	1	0.7
Gestational age (in weeks)		
Mean=34.54 (±4.28)		
Systolic blood pressure (mmHg)		
Mean=177.71 (±21.76)		
Diastolic blood pressure (mmHg)		
Mean=115.10 (±15.07)		

Table 2: Risk factors of preeclampsia amongst the study participants (Multiple options entertained).

Risk factors for preeclampsia	N	Percentage (%)
Nulliparity	71	40.1
Chronic hypertension	54	30.5
Previous history of preeclampsia	17	9.6
Multiple pregnancy	8	4.5
Age>40 years	6	3.4
Previous history of pregnancy induced hypertension	5	2.8
IVF achieved pregnancy	4	2.3
Diabetes in pregnancy	4	2.3
Change of spouse	3	1.7
Age <20 years	2	1.1
No identifiable risk factor	2	1.1
Sickle cell disease	1	0.6

Table 3: Maternal outcome.

Variables	Yes, N (%)	No, N (%)
Eclampsia	1 (0.7)	145 (99.3)
Need to recommence $MgSO_4$	1 (0.7)	145 (99.3)
Admission into ICU	2 (1.4)	144 (98.6)
Maternal mortality	0 (0.0)	146 (100.0)

Table 4: Fetal outcome.

Variables	Yes, N (%)	No, N (%)
Neonatal intensive care unit admission	64 (43.8)	82 (56.2)
Perinatal mortality	26 (17.8)	120 (82.2)

Table 5: Association between phenotypic pattern of preeclampsia and maternal and fetal outcomes.

Variables	Phenotypic pattern, N (%)		χ2	P value
	Early onset	Late onset		
Maternal outcome				
Eclampsia				
Yes	0 (0.0)	1 (100.0)	0.574[F]	>0.999
No	53 (36.6)	92 (63.4)		
Need to commence $MgSO_4$				
Yes	0 (0.0)	1 (100.0)	0.574[F]	>0.999
No	53 (36.6)	92 (63.4)		
Admission into ICU				
Yes	1 (50.0)	1 (50.0)	0.165[F]	>0.999
No	52 (36.1)	92 (63.9)		
Maternal mortality				
Yes	0 (0.0)	0 (0.0)	-	-
No	53 (36.3)	93 (63.7)		
Fetal outcome				
Neonatal ICU admission				
Yes	53 (82.8)	11 (17.2)	106.606	0.000*
No	0 (0.0)	82 (100.0)		
Perinatal mortality				
Yes	15 (57.7)	11 (42.3)	6.260	0.012*
No	38 (31.7)	82 (68.3)		

*Statistically significant, F=Fisher's exact test used.

DISCUSSION

The prevalence of preeclampsia with severe features in this study was 19.3%, which was higher than the 8.8% found in Jos,[5] and the 9.2% recorded in Abuja.[11] This may have been due to the short duration of this study and the associated seasonal variation[16] in the incidence of preeclampsia, as reported by some authors.

Nulliparity, chronic hypertension, and a previous history of preeclampsia were the most common risk factors identified for developing preeclampsia in this study. This was similar to the findings by Musa et al in Jos, Njelita et al in Awka, Ayogu et al in Abuja, Anorlu et al in Lagos, other risk factors for preeclampsia in this study were multiple pregnancies, age >40 years and <20 years, previous history of gestational hypertension, IVF achieved pregnancy, diabetes in pregnancy, new spouse, and sickle cell disease.[5,7,17,18] These have been well documented as risk factors for preeclampsia in the literature and apply to both early-onset and late-onset disease.[4,6]

The late-onset preeclampsia accounted for 63.7% of the preeclampsia phenotype encountered in this study. This finding is similar to those reported by Otalike et al. in Abuja, where late-onset preeclampsia accounted for 70% of the cases of preeclampsia studied.[11] A similar finding was also noted in a multi-centre study by Onwusulu et al where late onset phenotype accounted for 54.1% of cases.[19] This was also similar to findings in Ethiopia where late-onset preeclampsia accounted for 72.9%, also in Nepal, where late-onset preeclampsia accounted for 66.2% and in India where it accounted for 72.4% of cases.[20-22]

These findings support literature that has suggested that the late-onset type of preeclampsia is common than the early-onset type.

While there was no maternal mortality recorded in this study, perhaps due to the prompt measures with multidisciplinary management instituted in our centre which was similar to the finding by Ugwu et al in Enugu, 1.4% of study participants required ICU admission, and 0.7% developed eclampsia requiring recommencement of magnesium sulphate and other care.[23] There was no statistically significant difference between these maternal outcomes among women who had early-onset and late-onset disease, except for NICU admission, which was high for the early-onset phenotype. This was similar to the finding by Otalike et al in Abuja.[11]

About 43.8% of the neonates delivered in this study required admission into the neonatal intensive care unit for various reasons, ranging from prematurity to birth asphyxia, amongst other conditions, while a perinatal mortality of 17.8% was recorded in this study. The perinatal mortality rate was lower than the finding of 48.8% by Otalike et al in Abuja, perhaps because their study was carried out in secondary health facilities in Abuja.[11] It was, however, similar to the finding of 22.7% by Ajah et al in Abakiliki, 14.4% by Awoyesuku et al in Rivers, 19.1% by Teka et al in Ethiopia, and 18.2% by Gomathy et al in India.[3,13,20,22] These findings buttress the significant contribution of preeclampsia to perinatal death. All the babies delivered to mothers with early-onset preeclampsia in this study were admitted to the NICU. This could be explained by the gestational age cut-off of

34 weeks for these babies, as they were delivered before term. The early-onset phenotype also recorded more perinatal mortality compared with the late-onset. These findings were statistically significant. This finding was similar to the findings by Otalike et al in Abuja, and Shrestha et al in Nepal.[11,21]

The limitation of this study was the short duration of the study which may not be a true picture of the findings if taken over a longer period. Hence, more studies with a longer time frame will be necessary to compare with our findings.

CONCLUSION

The common risk factors for preeclampsia with severe features observed in this study are nulliparity, chronic hypertension, and a previous history of preeclampsia. Thus, necessitating the creation of public awareness on proper blood pressure control before pregnancy and the role of preconception care in this group of women. Also, the majority of women who had preeclampsia in this study were unbooked; hence, early booking of antenatal care, identifying at-risk women and commencing long-proven preventive measures during antenatal care will go a long way in preventing the development of preeclampsia and the many complications that can follow. Finally, there is a need for the government to properly equip the NICU units in the health care facilities and employ adequate manpower to improve the salvage rate of these neonates if they are delivered prematurely.

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