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Original Research Article

Determinants of adverse perinatal outcome in preeclampsia at the federal medical centre, Makurdi: a cross-sectional study

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ABSTRACT

Background: Preeclampsia currently accounts for the high burden of adverse perinatal morbidity and mortality in Nigeria. Aim of study was to determine the prevalence of preeclampsia and factors associated with adverse perinatal outcome at the Federal Medical Centre Makurdi.
Methods: This was an analytical cross-sectional study in which 170 consecutively consenting women with preeclampsia were recruited. The perinatal outcomes were identified in the antenatal period, at delivery and early puerperium. The data was analyzed using SPSS version 20.0 for windows (IBM SPSS Inc, Chicago, IL, USA). Categorical variables were analyzed using Chi-Square (x^2) test and Fisher's exact test. Bivariate analysis was used to test for association between basic characteristics of participants and adverse perinatal outcomes, while logistic regression analysis was used to determine the strength of these association. P < 0.05 and if CI does not include value 1, it was considered statistically significant.
Results: This study shows that the prevalence of preeclampsia and adverse perinatal outcome was 2.4% and 63.5% respectively. The adverse perinatal outcomes were more with the severe disease than with mild preeclampsia. The estimated gestational age at presentation (EGAP), severity of the disease and mode of delivery were the risk factors strongly associated with adverse perinatal outcomes.
Conclusions: This study had shown the high burden of preeclampsia in Makurdi, North Central Nigeria and recommends quality improvements in maternal and child care to reduce perinatal adverse outcomes.

Keywords: Adverse perinatal outcome, Makurdi, North Central Nigeria, Preeclampsia, Risk factors

INTRODUCTION

Preeclampsia is a pregnancy specific multisystemic disease which occurs after the 20th week of pregnancy characterized by the new onset of hypertension and proteinuria in a previously normotensive and non-proteinuric woman.[1-3] Preeclampsia account for 70% of hypertensive disorders of pregnancy (HDP).[2] Preeclampsia is an important public health issue contributing significantly to both maternal and perinatal morbidity and mortality world-wide.[4,5]

The prevalence of preeclampsia varies world-wide with a global prevalence of between 2-8%.[1,2] It is estimated that 8,370,000 women are affected globally.[6]

According to World Health Organization (WHO), the incidence of preeclampsia is higher in the developing

countries (2.8%) when compared to developed countries (0.4%).[6] In the developing countries the prevalence of preeclampsia ranges between 1.8% to 16.7%.[4,7] Preeclampsia accounts for 10-15% and 5-14% of maternal mortality and perinatal mortality respectively.[1,2]

Preeclampsia causes uteroplacental insufficiency resulting in adverse perinatal outcome such as birth asphyxia, low birthweight, intrauterine growth restriction (IUGR), early neonatal death, admission to NICU and stillbirth.[8-10] There are paucity of studies on this subject matter in Makurdi, North-central Nigeria. Therefore, there is the need to determine the current burden of preeclampsia and the risk factors associated with adverse perinatal outcome in Makurdi because findings from this study will contribute to the body of knowledge and guide clinicians in the management of preeclamptic patients to avert adverse perinatal outcome. Hence, the purpose of this study is to determine the prevalence and risk factors of adverse perinatal outcome in preeclampsia at the Federal Medical Centre, Makurdi.

Aim of study was to determine the prevalence and risk factors of adverse perinatal outcome in preeclampsia at the Federal Medical Centre Makurdi. Study objective were to determine the prevalence of preeclampsia, to determine the prevalence of adverse perinatal outcome in preeclampsia, to determine the adverse perinatal outcome by severity of preeclampsia and to determine the risk factors associated with adverse perinatal outcome in preeclampsia.

METHODS

Study design

This was an analytical cross-sectional study conducted in the Department of Obstetrics and Gynecology at the Federal Medical Centre, Makurdi between January 1st to August 31st 2018.

Study setting

The study was conducted in the Department of Obstetrics and Gynaecology of the Federal Medical Centre, Makurdi Benue State, and a tertiary level hospital in North Central State of Nigeria which serves as a referral centre for neighbouring states.

Inclusion criteria

This include all consenting preeclamptic women with singleton fetus at a gestational age ≥28 weeks booked for antenatal care at the study hospital or referred to the hospital.

Exclusion criteria

Pregnant women were excluded from the study if preeclamptic women but <28 weeks, pregnancy considered to be normal, gestational hypertension without proteinuria, chronic hypertension, multiple gestation, fetus with congenital abnormality, history of antepartum hemorrhage, smoking, excessive alcohol drinkers, hepatic disease, renal disease, systemic lupus erythematosus, and patient who declined consent.

Sample size determination

The sample size was determined using the sample size formula for prevalence study,[11]

$n = Z^2P(1-P)/d^2$

Where,

n= minimum sample size,
Z= Standard normal variate (at 5% type I error, P< 0.05=1.96
P= Prevalence of 3.02 % for preeclampsia from previous study by Akaba *et al* in Gwagwalada, Abuja Nigeria.[10]
1-P= 1-0.0302=0.9698,
d= Precision =0.05
Therefore, $n = 1.96^2 x 0.0302 x 0.9698 / (0.05)^2 = 45$.

Using a non-response rate of 20%, N= 56. Although, the total sample size (N) calculated was 56, a total of 170 participants were used in this study.

Study protocol/enrolment

One hundred and seventy consecutive consenting pregnant women with singleton fetus at a gestational age of ≥28 weeks diagnosed of preeclampsia were recruited to participate in the study. Participants were recruited from the antenatal clinic and labor ward. They were stabilized according to the departmental protocol for the management of preeclampsia which include control of blood pressure using oral and intravenous antihypertensives, control and prevention of fits with the use of magnesium sulfate (Pritchard regimen), intravenous fluid management, correction of electrolytes and delivery through the most expedient route which depends on whether the participants presents in labor or favorability of the cervix at presentation. The perinatal outcomes were identified and documented during the antennal period, at delivery and in the immediate puerperium. The perinatal outcomes of interest included intrauterine growth restriction, intrauterine fetal death/still birth, low birth weight (birth weight <2.5kg), prematurity, emergency caesarean section for fetal distress, five minutes Apgar score <7, meconium stained liquor, requirement of special care baby unit (SCBU) admission, and early neonatal death.

Data collection

Data was collected using a proforma to obtain information from all consenting participants who fulfilled the inclusion criteria. Additional data were collected from the antenatal and labor ward records which includes meconium stained

liquor, Apgar scores, birth weight, emergency caesarean section for fetal distress, and admission of baby into SCBU.

Data analysis

The data was analyzed using statistical package for social sciences version 20.0 for windows (IBM SPSS Inc, Chicago, IL, USA). Categorical variables were analyzed using Chi-Square (x^2) test and Fisher's exact test. Bivariate analysis was used to test for association between basic characteristics of participants and adverse perinatal outcomes, while logistic regression analysis was used to determine the strength of these association. P<0.05 and CI (if the interval does not include or cross the number one) were consider statistically significant.

RESULTS

The total number of antenatal patient attendee during the study period was 7224. The total number of study participants (N) was 170.Therefore, the prevalence of preeclampsia in the obstetric population over the study period was 2.4 percent.

Table 1 shows the basic characteristics of the study participants. Most of the study participants were within the age group of 26-30 years (41.2%) and few participants were within the age group of ≤20 years (6.5%) and ≥40 years (4.1%). About 63 percent of participants were multigravida, 44.1% were multiparous and 85.9% were booked. Approximately 60% of the study participants presented at a gestational age of between 37-42. One hundred and seven (62.9%) participants had severe preeclampsia. The commonest mode of delivery among the study participants was caesarean section (50.6%). The prevalence of adverse of adverse and normal perinatal outcome were 63.50% (108) and 36.50% (62) respectively.

Table 2 shows the prevalence of various adverse perinatal outcomes. The prevalence of IUFD, meconium stained liquor and neonatal death was relatively low (10.0%, 7.6% and 5.3% respectively) compared to the other adverse outcomes.

Table 3 shows the prevalence of adverse perinatal outcomes by severity of preeclampsia. The prevalence of adverse perinatal outcome was 77.6% in participants with severe preeclampsia compared to 39.7% in those with mild disease (Chi-square; p = 0.000; CI of 0.37 – 0.71). Participants with severe preeclampsia, also had significantly higher prevalence of preterm delivery, low birth weight (LBW), intra-uterine growth restriction (IUGR), emergency caesarean section for fetal distress, 5-minute Apgar score <7, and admission into special care baby unit (SCBU). There was no difference in the prevalence of IUFD, meconium stained liquor and neonatal death in both mild and severe disease.

Table 1: Basic characteristics of study participants.

Characteristic	Number (Total = 170)	Percentage
Age group (in years)		
≤20	11	6.5
21-25	17	10.0
26-30	70	41.2
31-35	46	27.1
36-40	19	11.2
≥41	7	4.1
Gravidity		
Primigravida	63	37.1
Multigravida	107	62.9
Parity		
Primipara	73	42.9
Multipara	75	44.1
Grandmultipara	22	13.0
Booking status		
Booked	146	85.9
Unbooked	24	14.1
Estimated gestational age at presentation (EGAP)		
28-<34	33	19.4
34-<37	42	24.7
37-42	95	55.9
Severity of preeclampsia		
Mild	63	37.1
Severe	107	62.9
Mode of delivery		
Spontaneous vaginal delivery	33	19.4
Induction of labour	51	30.0
Caesarean section	86	50.6
Perinatal outcomes		
Adverse	108	63.5
Normal	62	36.5

Table 2: Prevalence of various adverse perinatal outcomes.

Perinatal outcomes*	Frequency	Percentage
Preterm delivery	62	36.5
Low birth weight	71	41.8
IUGR	65	38.2
IUFD/still birth	17	10.0
Meconium stained liquor	13	7.6
Emergency CS for fetal distress	26	15.3
5 minute Apgar score ≤7	40	23.5
Admission into SCBU	78	45.9
Neonatal death	9	5.3

Key: IUGR = intrauterine growth restriction; IUFD = intrauterine fetal demise; CS = caesarean section; SCBU = special care baby unit, *Multiple response so total percentage is more than 100%

Table 3: Prevalence of adverse perinatal outcomes by severity of preeclampsia.

	Preeclampsia			
Perinatal outcomes	**Mild**	**Severe**	**p value**	**CI**
Adverse perinatal outcome; n (%)	25 (39.7)	83 (77.6)	0.000[a]	0.37 – 0.71
Preterm delivery; n (%)	8 (2.7)	54 (50.5)	0.000[a]	0.13 – 0.49
Low birth weight; n (%)	10 (15.9)	61 (57.0)	0.000[a]	0.15 – 0.50
IUGR; n (%)	10 (15.9)	55 (51.4)	0.000[a]	0.17 – 0.56
IUFD/still birth; n (%)	4 (6.3)	13 (12.1)	0.223[a]	0.18 -1.53
Meconium stained liquor; n (%)	2 (3.2)	11 (10.3)	0.135[b]	0.07 – 1.35
Emergency CS for fetal distress; n(%)	3 (4.8)	23 (21.5)	0.003[a]	0.07 – 0.71
5 minute Apgar score <7; n (%)	6 (9.5)	34 (31.8)	0.001[a]	0.13 – 0.67
Admission into SCBU; n (%)	16 (25.4)	62 (57.9)	0.000[a]	0.28- 0.69
Neonatal death; n (%)	2 (3.2)	7 (6.5)	0.487[b]	0.10 – 2.26

Key: IUGR = intrauterine growth restriction; IUFD = intrauterine fetal demise; CS = caesarean section; SCBU = special care baby unit; CI = 95% confidence interval; a = chi-square test; b = Fishers exact test. *Multiple response so total percentage is more than 100%

Table 4: Risk factors associated with adverse perinatal outcome.

Variables	Perinatal Outcome		χ^2	Df	P value
	Normal N (%)	**Abnormal N (%)**			
Age (in years)			13.51**		0.016*
≤20	0 (0.0)	11 (100.0)			
21-25	8 (47.1)	9 (52.9)			
26-30	26 (37.1)	44 (62.9)			
31-35	20 (43.5)	26 (56.5)			
36-40	8 (42.1)	11 (57.9)			
≥41	0 (0.0)	7 (100.0)			
Gravidity			0.96	1	0.326
Primigravidae	20 (31.7)	43 (68.3)			
Multigravida	42 (39.3)	65 (60.7)			
Parity			2.45	2	0.293
Primipara	24 (32.9)	49 (67.1)			
Multipara	32 (42.7)	43 (57.3)			
Grandmultipara	6 (27.3)	16 (72.7)			
Booking status			4.73	1	0.030*
Booked	58 (39.7)	88 (60.3)			
Unbooked	4 (16.7)	20 (83.3)			
EGAP			41.74**		<0.01*
28-<34	2 (6.1)	31 (93.9)			
34-<37	6 (14.3)	36 (85.7)			
37-42	54 (56.8)	41 (43.2)			
Severity of preeclampsia			24.56	1	<0.01*
Mild preeclampsia	38 (60.3)	25 (39.7)			
Severe preeclampsia	24 (22.4)	83 (77.6)			
Mode of delivery			11.87		0.003*
Spontaneous vaginal delivery	12 (36.4)	21 (63.6)			
Induction of labour	28 (54.9)	23 (45.1)			
Caesarean section	22 (25.6)	64 (74.4)			

Table 4 shows the risk factors associated with adverse perinatal outcome in preeclampsia. Age group, the booking status, EGAP, severity of preeclampsia, and mode of delivery were significantly associated with adverse perinatal outcome (P<0.05). Table 5 shows multivariate logistic analysis of risk factors associated with adverse perinatal outcome. The participants presenting at gestational age of between 28-<34(aOR =34.17, CI=6.16-

189.49, P<0.01) and 34--<37(aOR =7.61, CI=2.43-23.78, P<0.01) were significantly associated with adverse perinatal outcome. The study participants with mild preeclampsia was significantly associated with adverse perinatal outcome (aOR =0.19, CI=0.10-0.38, P=0.001). The study participants who had induction of labour were significantly associated with adverse perinatal outcome (aOR =0.28, CI=0.14-0.59, P=0.001).

Table 5: Multivarate logistic analysis of risk factors associated with adverse perinatal outcome in preeclampsia.

Variables	aOR	95% confidence interval	p-value
Age			
≤20	0.20	-	1.000
21-25	0.00	-	0.999
26-30	0.00	-	0.999
31-35	0.00	-	0.999
36-40	0.00	-	0.999
≥41(RC)	1		
Booking status			
Booked	0.30	0.10 – 0.93	0.100
Unbooked (RC)	1		
EGAP			
28-<34	34.17	6.16 – 189.49	<0.01*
34-<37	7.61	2.43 – 23.78	<0.01*
37-42(RC)	1		
Severity of preeclampsia			
Mild preeclampsia	0.19	0.10 – 0.38	0.001*
Severe preeclampsia (RC)	1		
Mode of delivery			
Spontaneous vaginal delivery	0.60	0.26 -1.42	0.23
Induction of labour	0.28	0.14 – 0.59	0.001*
Caesarean section (RC)	1		

DISCUSSION

The prevalence of preeclampsia in this study was 2.4%. This was within the prevalence range of preeclampsia in the developing countries of 1.8%-16.7%.[4,7] This finding was similar to that of several authors, except in the study by Kooffreh et al, who found a lower prevalence of 1.2%.[1-3,7,8,10,13] The difference in prevalence rates could be due to differences in the study sample size, study design or study setting. This high burden of the disease shown in this study may be due to the fact that most antenatal attendees in Makurdi metropolis are of low socioeconomic status because preeclampsia is more prevalent in this category of patients. This fact was corroborated by Silver et al, Mattson et al and Youssef et al who in their independent studies concluded that low socioeconomic status is strongly associated with preeclampsia.[14-16] This study, though hospital-based contributes to the knowledge of prevalence of preeclampsia in Nigeria.

The prevalence of adverse perinatal outcome was 63.5% and the most common adverse outcome was admission into Special Care Baby Unit (45.9%) and least was neonatal death (5.3%). The age group, booking status, estimated gestational age at presentation, severity of preeclampsia and mode of delivery were the risk factors identified to be significantly associated with adverse perinatal outcome in this study. However, on multivariate logistic analysis only participants who presented at a gestational age of 28-<34 and 34-<37, with mild preeclampsia and had induction of labor were significantly associated with adverse perinatal outcome. This was similar to the study by Jikamo et al, who reported a prevalence of adverse perinatal outcome of 61.7%.[17] They also reported low birth weight rate (27%) and still birth rate (5.8%) as the most common and the least individual adverse perinatal outcomes respectively. The significant risk factors identified in their study for adverse perinatal outcomes were women with severe features of preeclampsia, those admitted to hospital at <34 weeks, women without severity features of preeclampsia, maternal age, women with no formal education or with only primary school education and women with systolic blood pressure. Also, Belay et al, reported an overall adverse perinatal outcome of 40.9%.[1] Neonatal Intensive Care Unit (NICU) admission (36.5%) and still birth (2.27%) as the commonest and least individual adverse perinatal outcomes respectively. This high burden of perinatal complications was attributed in their study to early onset preeclampsia without severe features, maternal age < 20 years and gestational age of 28-<34 weeks. This was similar to the findings in this present study. Akaba et al, however reported low birth weight (69.5%) and still birth (10.7%) as commonest and least individual adverse perinatal outcomes.[10] They only identify birth weight to be significantly associated with primary fetal outcome.

The high prevalence of adverse perinatal outcomes in preeclampsia in this study emphasizes the need for quality improvements in maternal and child care services across hospitals and health care centres looking after the obstetric population in Nigeria. This may involve screening and identification of those at risk of preeclampsia, prevention and prompt treatment of those with the disease, close antepartum and intrapartum fetal surveillance of women with preeclampsia, training and retraining of manpower to care for this group of patients and other high risk pregnancies, provision of standard equipment as well as adequate funding of hospitals by the various tiers of government.

The major strength of this study is that it was an analytical and cross-sectional study in which the exposure and the outcomes were determined. In addition, the large sample size is also a strength in this study. However, been a hospital-based study, the generalizability of findings is

limited to other tertiary centres with similar study site. The major limitation was that the time of delivery was not under the control of the researcher as this was mostly determined by the managing team.

CONCLUSION

This present study had shown that the prevalence of preeclampsia was 2.4% and there was a high prevalence of adverse perinatal outcomes which worsen with severity of the disease. This study had demonstrated that the determinants of adverse perinatal outcomes are the EGAP, severity of preeclampsia and mode of delivery.

Recommendations

This study had shown that there is a high burden of preeclampsia and adverse perinatal outcome in our environment and the need for both private and public health system to be strengthened across the country to reduce the complications associated with the disease especially aimed at reducing adverse perinatal outcomes.

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