

THE COX MODEL OF PREDICTING ADVERSE MATERNAL OUTCOMES OF PREECLAMPSIA / ECLAMPSIA AT THE FEDERAL TEACHING HOSPITAL, BIRNIN KEBBI, NIGERIA

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ABSTRACT

Introduction: Preeclampsia and eclampsia are the foremost reasons behind fetomaternal morbidity as well as mortality, particularly in developing nations, and are a common cause of pregnancy complications globally. The Cox regression model is utilized for the identification of adverse maternal consequences of preeclampsia/eclampsia, which is imperative in effectively managing preeclampsia/eclampsia patients. **Objective:** The study aimed to recognize the maternal adverse consequences of preeclampsia and eclampsia among women with pregnancy-induced hypertension in Northwest Nigeria using the Cox proportional hazards model. **Methods:** This retrospective research was performed among preeclampsia/eclampsia cases attending the Federal University Teaching Hospital, Birnin Kebbi, Kebbi State, Nigeria. Data were extracted from patients' charts using a proforma. Descriptive analyses were calculated, and the Cox regression model was used for the analysis to determine the adverse maternal outcomes of preeclampsia/eclampsia in the study area. **Results:** The Cox regression model results identified six maternal outcomes of preeclampsia/eclampsia: stillbirth, placenta abruption, premature birth, maternal demise, low birth weight and unconsciousness as statistically significant and clinically plausible maternal consequences behind preeclampsia or eclampsia. **Conclusion:** The findings of this research provided the unfavorable maternal consequences of preeclamptic/eclamptic cases in FTH Birnin Kebbi, which affirms that preeclampsia/eclampsia are causes of both fetomaternal morbidity as well as mortality. Employment and continuous training of healthcare professionals, especially in rural areas, should be considered a priority; creating awareness of preeclampsia and eclampsia should be raised, focusing on younger women and women of childbearing age.

INTRODUCTION

The most serious hypertensive disorders of pregnancy is pre-eclampsia having an incidence of 2–5% of gravidities in North America and Western Europe and reaching up to 18% in African countries. It is often referred to as the commonest reason behind fetomaternal morbidity and mortality in Nigeria^{1,2}. Pre-eclampsia and eclampsia (PE and E) are the most common reasons behind fetomaternal morbidity as well as demises worldwide, with hypertension complicating 10% of pregnancies³⁻⁶. PE is the 2nd most frequent etiology behind maternal death and a serious cardiometabolic complication of pregnancy, accounting for the lives of 50,000 women each year.

With the improvement in maternity care outcome of preeclampsia, it is still primary root cause of maternal death in underdeveloped countries⁸. In 2014, the International Society for the Study of Hypertension in Pregnancy (ISSHP) demarcated PE as de novo hypertension occurring after 20th week of pregnancy associated with proteinuria (>300 mg/day), along with other organ dysfunctions of mother such as, liver and kidney involvement, vascular or nervous complications, or uterus/placenta dysfunction with or without fetal growth restriction⁹. PE is a condition that affects mainly women carrying their first child, although the cause of PE differs between women, with some having placental causes and others having maternal causes. Generally, most females experience no symptoms of PE, and this placental disease is usually diagnosed through regular prenatal visits; however, PE can manifest itself in other ways^{10, 11}. Eclampsia (E) is the development of generalized tonic-clonic (grand mal) seizures in the pregnant patient with PE. A few cases will develop E after they have delivered their baby; in some females, it will happen without a diagnosis of PE having been made prior to delivery¹².

According to the WHO's report over trends on maternal mortality, there were 295,000 females passed away as a result of either pregnancy or childbirth complications in 2017-2019. It has also been reported that approximately 810 females die from pregnancy related complications every single day^{13, 14}.

A set of data analysis tools, called "survival analyses," provide insight on an event's likelihood of occurrence following a specified period through the use of regression models. The goal of a survival analysis is to estimate an exact length of time to occur for an event of interest (including, but not limited to, being diagnosed with or recovering from an illness, relapsing from an illness or dying as a result of an illness) as long as the event could occur to all persons in the study group^{15, 16}. This study was conducted for the identification of adverse maternal outcomes due to PE and E at the Federal Teaching Hospital, Birnin Kebbi using the Cox regression model.

MATERIALS and METHODS

Study design: it was retrospective cohort that included 520 preeclampsia/eclampsia (PE/E) cases in Federal Teaching Hospital (FTH), Birnin Kebbi; from the hospital data of all cases diagnosed between 2009 January and 2019 December and the STROBE guidelines were adhered to.

Setting and Duration: The study was conducted at the FTH Birnin Kebbi, Kebbi state, Nigeria. The hospital was chosen purposely due to the fact that it is the main tertiary health facility in Kebbi state, and all primary and other health centres of the state got referral from this centre. The research was conducted between January 2009 and December 2019.

Sampling Technique: The purposive sampling approach was observed in this study. The hospital records of diagnosed cases of preeclampsia and eclampsia were retrieved and utilized.

Sample size: Sample size calculation was done by PS software using the two mean proportions since the variables were categorical variables; $\alpha=0.05$, $1-\beta=0.8$, $P_0=0.36$, $P_1=0.28$, $m=1$ which gives a result of 110, 32, and 156, respectively. Largest outcome $156 \times 3 = 468$. $468 \div (1-0.1=0.9 \text{ for missing data}) = 520$.

The sample size was measured as 520 patients. Time to event is the dependent variable of the study, with time measured from the time of conception to the time preeclampsia and eclampsia were diagnosed. GIH patient who were diagnosed with PE/E was the event. Time of entry (T0) was the date of conception, while (T1) was set as the date the disease was diagnosed. The follow-up time was between the T1 and T0. This analysis censored patients lost to follow-up and death of patients due to causes other than preeclampsia/eclampsia.

Sample Selection Criteria:

Inclusion Criteria: All diagnosed cases of preeclampsia/eclampsia (PE/E), without any history of hypertension from 2009 till 2019.

Exclusion Criteria: All other cases of hypertension without PE/E and PE/E, and the cases who expired prior to hospital arrival.

Data Collection Procedure:

Ethics Approval: Ethics approval for the conduct of this study was granted by the Federal Teaching Hospital (FTH), Birnin Kebbi the ethics committee and the Universiti Zainal Abidin Human Research Ethics Committee (UHREC). The patient permission was not compulsory as the study was non-interventional and data collection was secondary.

Data Extraction: Data of all patients diagnosed between Jan 2009 and Dec 2019 were retrieved and demographic data, booking status, medical presentation, diagnosis, received treatment, method and feto-maternal outcome, and date of discharge were collected. Data collection was done anonymously.

Data Analysis: After data extraction, the accuracy and completeness of data was checked. The summary of demographic data was done using percentages for categorical data, whereas numerical data presentation was done by using mean and standard deviation. The Cox proportional hazards regression model was exercised to accomplish the variables' univariable analysis which was applied to select statistically significant and clinically important variables, confounding factors in predicting the risk for the disease were eliminated by choosing variables having $p\text{-values} \leq 0.25$ in the univariable investigation. This was followed by the preliminary main effect model for the multivariable Cox regression model for additional valuation. Statistical analysis was done utilizing SPSS version 22 and STATA SE version 14.0. Statistical results were reported as crude hazard ratios (HRs), adjusted hazard ratios (AHRs) and corresponding 95% confidence intervals (CIs). A significant $p\text{-value}$ was defined as less than 0.05.

RESULTS

Participants' socio-demographic profile and preeclampsia/eclampsia diagnosis in FTH, Birnin Kebbi. Table 1 shows the PE/E patients demographic characteristics in FTH, Birnin Kebbi it is observed that the 240 subjects, had a mean (SD) age of 23.45 (5.42) years. Only 99 (19%) were booked for antenatal clinic, 448 (86.1%) belonged from Hausas tribe, 452 (87%) had poor socioeconomic status, 78 (15%) had never got any education, and 348 (67%) did not have children. The results from Table 2 present the simple Cox proportional hazard regression model of the adverse outcomes of PE/E. The unfavourable PE/E outcomes included in the simple Cox proportional hazard regression model are; PPH, stillbirth, placental abruption, low birth weight (LBW), induced labour, maternal death, convulsion and preterm delivery.

The adverse maternal outcome of PE/E by simple Cox proportional hazard regression model found that patients with PPH had a 1.95 times higher chance of being a PE/E patient than patients who did not have PPH. Patients who have stillbirth had a 1.55 times higher chance of being PE/E patients than patients who did not have stillbirth. Patients who have placental abruption have a 70% higher chance of being PE/E patients than patients who did not have placenta abruptio. Patients who have babies with LBW have a 64% higher chance of being PE/E patients than patients who do not have babies with LBW. Patients who had induced labour had a 31% higher chance of being a PE/E patient than patients who did not have induced labour. Maternal death patients have a 14% higher chance of being PE/E patients than patients who did not have maternal death. Pregnant women who had convulsions had a 69% higher chance of being a PE/E than pregnant women who did not have convulsions. Patients that had preterm delivery had a 25% higher chance of being a PE/E patient than patients that did not have preterm delivery. Results from the multivariable Cox Proportional hazard regression model for unfavourable motherly consequences of PE/E are displayed in Table 3. Adjusted hazard ratios (AHRs), corresponding 95% confidence intervals (CIs), and p-values are displayed in the table.

All the factors in the simple Cox proportional hazard regression model that had p-values < 0.25 and are relevant according to the literature were incorporated in multivariable Cox proportional hazard regression model for statistical analysis. In the multivariable Cox proportional hazard regression model, there were 6 adverse maternal outcomes were found statistically significant.

Patients who had stillbirth babies had a 1.46 higher chance of being a PE/E patient than patients who did not have stillbirth (AHR =1.46, 95% CI=1.03, 2.08, $p=0.034$). The cases who had placental abruption had a 50% higher chance of being a PE/E patient than cases without any placental abruption (adjusted HR= 0.50, 95% CI = 0.31, 0.80, $p=0.004$). Females who delivered LBW babies had 2.76% higher times of being a PE/E patient than patients who do not have babies with LBW (AHR = 2.76, 95% CI=1.53, 5.00, $p=0.001$). Cases who had convulsions had a 56% higher chance of being PE/E patients than cases without convulsions (AHR = 0.69, 95% CI= 0.56, 0.84, p

=0.000). Female who delivered preterm babies have a 42% higher chance of being PE/E patients than patients who do not have preterm babies (AHR = 0.42, 95% CI = 0.34, 0.51, p = 0.000). The cases who died had 26% higher chance of being PE/E than patients who did not experience maternal death (AHR =0.26 95% CI 0.18 – 0.36, p=0.000).

Table -1. Demographic Characteristics of Preeclamptic/Eclamptic Patients

Demographic variables		Frequency (n)	Percentage (%)	Mean (SD)
Age* (years)				23.45 (5.42)
Tribe / Ethnicity	HAUSA	448	86.1	
	IBO	18	3.5	
	YORUBA	22	4.2	
	OTHERS	32	6.2	
Socio-economic status	Low	452	87	
	Medium	68	13	
Education level	Illiterate	442	85	
	Literate	78	15	
Booking status	Booked	99	19	
	Un booked	421	81	
Parity	Nulliparous	348	67	
	Multiparous	172	33	

SD = standard deviation, *normally distributed

Table 2: Unfavourable maternal outcome of Preeclampsia/eclampsia in FTH Birnin Kebbi by univariable and multivariable Cox proportional hazards models

Variable	Simple Cox regression			Multiple Cox regression		
	Regression coefficient (β)	Crude HR (95% CI)	P value	Regression coefficient (β)	Adjusted HR (95% CI)	P value
Stillbirth						
No	0.00			0.00	1	
Yes	0.43	1.55 (1.21 – 1.98)	<0.001	0.38	1.46 (1.03 – 2.08)	0.034
Placental abruption						
No	0.00			0.00	1	
Yes	0.35	0.70 (0.57 -0.86)	0.001	0.70	0.50 (0.31 – 0.80)	0.004

\Low birth weight (LBW) babies						
No	0.00			0.00	1.00	
Yes	0.44	0.64 (0.52 – 0.80)	<0.001	1.02	2.76 (1.53 – 5.00)	0.001
Convulsion						
No	0.00			0.00	1.00	
Yes	0.40	0.69 (0.56 – 0.84)	<0.001	0.58	0.56 (0.42 – 0.74)	0.000
Preterm delivery						
No	0.00				1.00	
Yes	1.34	0.26 (0.22 – 0.30)	<0.001	0.87	0.42 (0.34 – 0.51)	0.000
Maternal death						
No	0.00			0.00	1.00	
Yes	2.00	0.14 (0.10 -0.19)	<0.001	1.36	0.26 (0.18 – 0.36)	0.000

Note; Simple Cox regression model, Multiple Cox regression model, HR= hazard ratio, CI = confidence interval, ; b: Regression coefficient; Adjusted HR= Adjusted Hazard Ratio.

DISCUSSION

The research was performed for the identification of unfavourable motherly consequences of PE/E cases in FTH, Birnin Kebbi, Kebbi state, Nigeria, using the Cox proportional hazard model. The results obtained from the descriptive statistics table above shows that majority of cases belong to Hausa's tribe (82.25%). About 88.75% of female had low income status and 81.7% of mother did not have any had booking in antenatal care due to poor financial status. Approximately 85.4% of women did not had any formal education. This suggests that the majority of women in Kebbi state who are at a high risk of developing preeclampsia or eclampsia are young, illiterate Indigenous women from rural regions who are either self-referrals or hospital referrals to FTH Birnin Kebbi^{17, 18}. Also from the descriptive statistics table it is observed that 81.7% of the patient were unbooked and nulliparous just as^{19, 20} indicated that most patients are nulliparous and they arrive the hospital for the first time in their lives with high-risk pregnancy complications as observed in other countries findings.

Stillbirth was found as an adverse maternal outcome which gave an increased risk of a 1.46 times higher chance of being a PE/E patient (AHR =1.46, 95% CI=1.03, 2.08, p=0.034), fresh and macerated stillbirth is very pronounced with PE/E patients as a result of inflammatory cytokines and thromboplastins that are released by blood clots and damaged placentas^{20, 21}.²² observed that stillbirth could be as a result of retro-placental clot. Placenta abruptio was also found to be highly significant with PE/E patients having 50% higher risk than non PE/E patients an adverse maternal outcome (AHR= 0.50, 95% CI = 0.31, 0.80, p=0.004), because of the number of severe preeclampsia and seizure patients presenting in the hospitals^{23, 24}. Patients with LBW babies had 2.76% higher times of being PE/E patient (AHR = 2.76, 95% CI=1.53, 5.00, p =0.001), LBW results from preterm birth, IUGR because of placental abruptio and placental insufficiency in PE/E patients^{21, 25, 26}.

Patients who had convulsion had a 56% higher risk of being PE/E patients (adjusted HR = 0.69, 95% CI= 0.56, 0.84, p =0.000), convulsion is an eclamptic disorder which occurs unexpectedly and could predispose the patient to morbidities and mortality^{21, 27}. Patients who had preterm delivery had a 42% higher risk of being PE/E patients (adjusted HR = 0.42, 95% CI = 0.34, 0.51, p = 0.000).²⁸ defined preterm delivery/birth as delivery/birth less than 37 weeks' gestation. According to²⁹ preterm delivery was one of the causes of high perinatal mortality recorded in their study.^{30, 31} noted in their study that preterm delivery increases the risk of chronic kidney disease. Patients who had maternal death had a 26% higher risk of being PE/E patients (AHR =0.26 95% CI 0.18 – 0.36, p=0.000). Preeclampsia is considered as 2nd second main reason behind maternal death which is one of the top three adverse outcome of PE/E. The study recorded that deaths of mothers were considerably higher in female with multiparty and eclampsia (23.3%) as compared to females having their 1st child (16%); the chances of death were also higher among eclamptic females receiving no prenatal visit (18.7%) as compared to those receiving it.

Conclusion

The findings of this study provided the unfavourable maternal consequences of preeclamptic/eclamptic cases in FTH Birnin Kebbi. These findings can signify Kebbi state as it is the main tertiary health centre in state of Kebbi. Stillbirths, placental abruptio, low birth weight, convulsion, preterm delivery and maternal death where the adverse maternal outcomes identified, which affirms that preeclampsia/eclampsia are reasons behind both maternal and prenatal mortality as well as morbidity which will have a negative impact on the immediate families concerned and the population of the nation as a whole. In order to minimise the negative effect of preeclampsia/eclampsia in our environment and nation, employment and continuous training of healthcare professionals especially in rural areas should be seen as priority. Creating awareness of preeclampsia and eclampsia should be raised centring young females, antenatal clinics, low socioeconomic

strata and resides in rural regions over all media platforms. Policy makers should make policies that would encourage ANC booking and consistent attendance especially in rural areas.

REFERENCES

1. Lie RT, Rasmussen S, Brunborg H, Gjessing HK, Lie-Nielsen E, Irgens LM. Fetal and maternal contributions to risk of pre-eclampsia: population based study. *Bmj*. 1998;316(7141):1343.
2. USAID. A systematic review of the treatment and management of pre-eclampsia and eclampsia in Nigeria. In: Council P, editor. *Ending Eclampsia*. Washington DC2016.
3. Palacios C, Pena-Rosas J. Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems: RHL commentary. *The WHO Reproductive Health Library*. 2010;1.
4. Ganiyu AO, Ayebatonyo CDM, Abioye OO, Jaye O. Maternal and neonatal outcomes of pre-eclampsia in African black women, South West Nigeria. *GJMS*. 2015;5:674-6.
5. Meazaw MW, Chojenta C, Taddele T, Loxton D. Audit of Clinical Care for Women with Preeclampsia or Eclampsia and Perinatal Outcome in Ethiopia: Second National EmONC Survey. *International Journal of Women's Health*. 2022:297-310.
6. Noubiap JJ, Bigna JJ, Nyaga UF, Jingi AM, Kaze AD, Nansseu JR, et al. The burden of hypertensive disorders of pregnancy in Africa: a systematic review and meta-analysis. *The Journal of Clinical Hypertension*. 2019;21(4):479-88.
7. Adokiye EA, Isreal J, Tubotonye H, Levi W. Factors influencing the prevalence of preeclampsia–eclampsia in booked and unbooked patients: 3 years retrospective study in NDUTH, Okolobiri. *World Journal of Medicine and Medical Science*. 2015;3(1):1-14.
8. Jikamo B, Adefris M, Azale T, Alemu K. The effect of preeclampsia on adverse maternal outcomes in Sidama region, Ethiopia: a prospective open cohort study. *Scientific Reports*. 2022;12(1):19300.
9. Mooij R, Lugumila J, Mwashambwa MY, Mwampagatwa IH, Dillen J, Stekelenburg J. Characteristics and outcomes of patients with eclampsia and severe pre-eclampsia in a rural hospital in Western Tanzania: a retrospective medical record study. *BMC pregnancy and childbirth*. 2015;15(1):213.
10. Burton GJ, Redman CW, Roberts JM, Moffett A. Pre-eclampsia: pathophysiology and clinical implications. *Bmj*. 2019;366:l2381.
11. Ghojazadeh M, Azami-Aghdash S, Mohammadi M, Vosoogh S, Mohammadi S, Naghavi-Behzad M. Prognostic risk factors for early diagnosing of Preeclampsia in Nulliparas. *Nigerian medical journal: journal of the Nigeria Medical Association*. 2013;54(5):344.
12. Magee LA, Pels A, Helewa M, Rey E, von Dadelszen P, Audibert F, et al. The hypertensive disorders of pregnancy (29.3). *Best practice & research Clinical obstetrics & gynaecology*. 2015;29(5):643-57.

13. Bisson C, Dautel S, Patel E, Suresh S, Dauer P, Rana S. Preeclampsia pathophysiology and adverse outcomes during pregnancy and postpartum. *Frontiers in Medicine*. 2023;10:485.
14. Organization WH. Maternal mortality: evidence brief. 2019.
15. Suárez EL, Pérez CM, Nogueras GM, Moreno-Gorrín C. *Biostatistics in public health using STATA*: CRC Press; 2016.
16. Tabachnick BG, Fidell LS, Osterlind SJ. *Using multivariate statistics*. 2001.
17. Ngwenya S. Severe preeclampsia and eclampsia: incidence, complications, and perinatal outcomes at a low-resource setting, Mpilo Central Hospital, Bulawayo, Zimbabwe. *International journal of women's health*. 2017;9:353.
18. Okogbenin S, Eigbefoh J, Omorogbe F, Okogbo F, Okonta P, Ohihoin A. Eclampsia in Irrua Specialist Teaching Hospital: a five-year review. *Nigerian journal of clinical practice*. 2010;13(2).
19. Ade-Ojo I, Loto O. Outcome Of Eclampsia At The Obafemi Awolowo University Teaching Hospital Complex, Ile-ife. *Nigerian journal of clinical practice*. 2008;11(3):279-84.
20. Agida E, Adeka B, Jibril K. Pregnancy outcome in eclamptics at the University of Abuja Teaching Hospital, Gwagwalada, Abuja: a 3 year review. *Nigerian journal of clinical practice*. 2010;13(4).
21. Getaneh Y, Fekadu E, Jemere AT, Mengistu Z, Tarekegn GE, Oumer M. Incidence and determinants of adverse outcomes among women who were managed for eclampsia in the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia. *BMC Pregnancy and Childbirth*. 2021;21:1-12.
22. Kanonge TI, Chamunyonga F, Zakazaka N, Chidakwa C, Madziyire MG. Hepatic rupture from haematomas in patients with pre-eclampsia/eclampsia: a case series. *The Pan African medical journal*. 2018;31.
23. Olotu FI, Mahande MJ, Renju J, Obure J. Prevalence and risk factors for pre-eclampsia/eclampsia in Northern Tanzania. *Journal of Public Health and Epidemiology*. 2020;12(2):78-85.
24. Godana A, Dessalegn D, Adem F, Edessa D. Treatment outcomes and determinants of eclampsia and severe preeclampsia among pregnant women admitted to selected tertiary hospitals in ethiopia: A cohort study. *International Journal of Women's Health*. 2021:781-91.
25. Alemie T, Abebe A, Adal O, Azazh A, Endeshaw D. Clinical features and outcomes of patients with preeclampsia and eclampsia at Gondar University hospital, Amhara, Ethiopia 2021. *European Journal of Obstetrics & Gynecology and Reproductive Biology*: X. 2023;20:100254.
26. Belay Tolu L, Yigezu E, Urgie T, Feyissa GT. Maternal and perinatal outcome of preeclampsia without severe feature among pregnant women managed at a tertiary referral hospital in urban Ethiopia. *Plos one*. 2020;15(4):e0230638.

27. Wassie AY, Anmut W. Prevalence of eclampsia and its maternal-fetal outcomes at Gandhi Memorial Hospital, Addis Ababa Ethiopia, 2019: retrospective study. *International Journal of Women's Health*. 2021;231-7.
28. Bridwell M, Handzel E, Hynes M, Jean-Louis R, Fitter D, Hogue C, et al. Hypertensive disorders in pregnancy and maternal and neonatal outcomes in Haiti: the importance of surveillance and data collection. *BMC pregnancy and childbirth*. 2019;19(1):208.
29. Nwafor J. Pattern and determinants of mortality among eclamptic women that presented in the Federal Teaching Hospital Abakaliki, Southeast, Nigeria. *Tropical Journal of Obstetrics and Gynaecology*. 2019;36(1):67-72.
30. Mol BW, Roberts CT, Thangaratinam S, Magee LA, De Groot CJ, Hofmeyr GJ. Pre-eclampsia. *The Lancet*. 2016;387(10022):999-1011.
31. van Balen VAL, Spaan JJ, Cornelis T, Spaanderman MEA. Prevalence of chronic kidney disease after preeclampsia. *Journal of nephrology*. 2017;30(3):403-9.
32. Akaba GO, Anyang UI, Ekele BA. Prevalence and materno-fetal outcomes of preeclampsia/eclampsia amongst pregnant women at a teaching hospital in north-central Nigeria: a retrospective cross-sectional study. *Clinical Hypertension*. 2021;27(1):20.
33. Adamu A, Ekele B, Ahmed Y, Mohammed B, Isezuo S, Abdullahi A. Pregnancy outcome in women with eclampsia at a tertiary centre in northern Nigeria. *Afr J Med Med Sci*. 2012;41(2):211-9.