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Research Article

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Obstetrics Outcome Among Pre-Eclamptic Women in North-Central Nigeria. A Comparative Case Control Study

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Abstract

Introduction : Pre-eclampsia (PE) is the commonest hypertensive disorder in pregnancy. It is a leading cause of maternal and perinatal morbidity and mortality globally, especially in developing countries, including Nigeria.
Method: This was a prospective case control study involving 83 pre-eclamptic and 83 gestational age-matched normotensive pregnant women at a tertiary hospital in north central Nigeria. They were treated and followed up till the end of the pregnancy to determine the outcome. Ethical approval was obtained.

Result: 6 of the cases and 5 of the controls were lost to follow-up, leaving 77 cases and 78 controls for data collection. Average age of the study participants was 32 ± 5.6yrs for cases and 30 ± 4.9yrs for controls. The average gestational age at booking was 32.9wks ± 3.81 for cases and 33.39wks ± 4.23 for controls. The mean SBP was 168.19 ± 14.33mmHg and DBP 108.68 ±

19.34mmHg for case group while the control had SBP 114.10 ± 7.97mmHg and DBP 73.25 ± 6.07mmHg. 96%(n=74) of pre-eclamptic had unfavourable obstetric outcomes compared with 6%(n=5) of controls with unfavourable outcomes. These include maternal mortality, intrauterine fetal death, perinatal death, Low birth weight, preterm delivery, fetal distress, Low APGAR score.

Conclusion: The late gestational age at antenatal registration is a reflection of the nationwide practice among Nigerian women. The combined effect of the high prevalence of severe pre- eclampsia and late presentation for medical intervention is probably responsible in part for the unfavourable obstetric outcomes seen among this cohort of patients in this study.

Keywords: Pre-Eclampsia, Hypertensions, Intrauterine Fetal Death (IUFD); Perinatal Death Low Birth Weight, Preterm Delivery.

Introduction

Background

Pre-eclampsia (PE) is estimated to complicate about 2-10% of pregnancies globally [1,2]. It accounts for about 18% of all maternal deaths worldwide, with an estimated 62,000 to 77,000 deaths annually, most of which occur in developing countries, especially Nigeria [3,4].

According to the World Health Organization (WHO), the incidence of PE is seven times higher in developing countries (2.8%) than in developed countries (0.4%) [5]. The maternal mortality in Nigeria is alarming; it has ranked the highest in the world; Nigeria accounted for about 28.7% of all estimated global maternal deaths in 2023 with approximately 75,000 deaths [6,7]. The MMR of Nigeria is 993 per 100,000 live births [7]. The lifetime risk of a Nigerian woman dying during pregnancy, childbirth, postpartum or post-abortion is 1in 25 [7,8]. Pre-eclampsia has been identified as the leading cause of maternal deaths [8,9].

Reports from a recent multicenter study by Oladapo et al. [10]. identified PE and eclampsia as the leading cause of maternal mortality (29%) and a significant cause of foetal deaths in Nigeria, overtaking obstetric haemorrhages and sepsis [4,8,11]. The incidence of PE in Nigeria is between 2% and 16% [11,12] with a prevalence of 5.14% in University of Ilorin Teaching Hospital (UITH) according to Olarinoye et al. [13] PE is a major underlying cause of late foetal and early neonatal death, accounting for somewhere between 1 in 10 and 1 in 4 perinatal deaths [14]. Approximately 500,000 babies die each year from PE/ eclampsia globally [15].

Classification and Complications

Pre-eclampsia can be classified into mild or severe type based on blood pressure measurements and clinical features. Mild PE is defined as blood pressure (BP) ≥ 140/90 mm Hg measured on two occasions 6 hours apart (not more than one week apart) with proteinuria ≥ 300mg/24-h sample or dipstick measurement of ≥ 1 + on two urine samples 6hours apart (not more than one week apart)[16]. Features of severe PE include at least one of the following: BP ≥ 160/110mmHg on two occasions at least 6 hours apart (not more than one week apart), proteinuria ≥ 5g/24-hour urine sample or ≥ 3+ on two urine samples 6 hours apart (not more than one week), oliguria <500mL/24-hour, thrombocytopenia <100,000/mm3, epigastric or right upper quadrant pain, pulmonary oedema, persistent cerebral or visual disturbances [16]. PE may also be classified into early and late-onset [3,17]. Early-onset PE is when clinical features occur before 33 weeks of gestation, while late-onset features occur after 34 weeks of gestational age (GA) [10]. Early onset comprises <20% of PE but is responsible for most maternal and foetal mortality and morbidity rates [10,17].

Severe PE and eclampsia are associated with higher rates of morbidity and mortality, such as pre-term delivery (15%–20% of all pre-term births), IUGR (2%–25%), low birth weight, low APGAR score, birth asphyxia, intrauterine foetal death (IUFD) and early neonatal death [18,19].PE is an independent risk factor for haemorrhagic and thrombotic stroke to the offspring independent of preterm birth [3]. It also increases cardiovascular and end-stage renal disease risk later in life[15,20]. It is associated with an increased risk of abruptio placenta, cerebrovascular accident, aspiration, cardiac arrest, and death. In addition, it increases the risk for neurological disorders like dementia, cardiovascular complications, and diabetes mellitus for the mother and child later in life [21].

Clinical Outcomes

If antenatal care is started early, blood pressure screening and urinalysis facilitate early diagnosis and prompt commencement of treatment of pre-eclampsia. Although the definitive management for preeclampsia involves delivery, the use of antihypertensives and anticonvulsants such as magnesium sulfate are recommended to reduce blood pressure, prevent seizures and reduce the risk of complications [22]. This should be accompanied with close maternal and fetal surveillance to identify indications for delivery (e.g. uncontrolled hypertension, deterioration in the condition of the mother and the fetus, including organ dysfunction and fetal distress). Behavioral interventions to reduce pre-pregnancy and interpregnancy overweight or obesity, diabetes mellitus and chronic hypertension are important preventive strategies to reduce pre-eclampsia risk in subsequent pregnancy [23].

Favourable maternal and foetal outcomes are associated with such prompt and effective management.

This research aims to analyse and document obstetric outcomes of management of pre- eclampsia at tertiary health center in north-central Nigeria.

Research Goal: To Analyze the Impact of Pre-Eclampsia on Delivery Outcomes

Objectives

- Demographics and Obstetrics characteristics of women diagnosed with pre- eclampsia
- To compare delivery outcomes among cases (pre-eclamptic women) and control (normotensive women)

Materials and Method

Research Type

This is a hospital-based prospective study, conducted over a 6-month period (between October 2022 and March 2023) on pregnant women newly diagnosed with preeclampsia without any chronic medical condition.

Sample Population

The majority of the pre-eclamptic women were already on antihypertensives (methyl-dopa, Nifedipine, MgSo4 have had it for less than 12 hours). Women with single-live fetuses in vertex presentation were recruited. Gestational age-matched normotensive pregnant women were also recruited as controls. All patients were followed up till the end of the pregnancy.

Sample Size

Using the center prevalence of PE of 5.14 % [13] and an attrition rate of 10%, sample size of 83 was calculated for the study using the Leslie Fisher formula.

Sampling Method

A convenience sampling method was adopted to recruit all consenting pre-eclamptic and gestational age-matched normotensive pregnant women who met the eligibility criteria.

Stratification into Case and Control Groups

Study participants were stratified into case groups (A) and control group(B). Group A comprised the consenting patients with newly diagnosed PE, while the normotensive pregnant women (control) constituted group B.

- Group A (pre-eclamptic) = 83
- Group B (controls/ normotensives) = 83

Inclusion and Exclusion Criteria Group A (Pre-Eclamptic)
Inclusion Criteria

- Informed consent
- Pregnant women with singleton fetuses.
- Pregnant women at GA of 20 weeks with BP 140/90mmHg measured on two or more occasions 4-6 hours apart with significant proteinuria, i.e., two pluses (++) on dipstick urinalysis or 300mg in 24 hours urine sample.

Exclusion Criteria

Pre-existing chronic medical conditions including chronic hypertension, chronic renal diseases, or cardiovascular disorders.

- Pre-existing or pregnancy-induced diabetes mellitus.
- Gross obesity precluding transabdominal scanning.
- Participants with oligohydramnios or multiple gestations seen on the US scan.
- Participants with fetal or uterine anomalies seen on US scan.
- Participants with a history of alcohol, drug abuse, and chronic corticosteroid use.
- Participants with sickle cell disease or other hemoglobinopathies.
- History of other vascular disorders that may influence Doppler measurements.
- Refusal to consent.

Group B (Control) Inclusion Criteria

- Informed consent
- Pregnant women with singleton fetuses.
- Pregnant women at GA 20 weeks with BP 140/90mmHg and normal urinalysis.

Exclusion Criteria

- Pre-existing chronic medical conditions such as chronic hypertension, chronic renal diseases, or cardiovascular disorders.
- Participants on antihypertensive.
- Pre-existing or pregnancy-induced diabetes mellitus.
- Gross obesity precluding transabdominal scanning.
- Participants with oligohydramnios or multiple gestations seen on the US scan.
- Participants with fetal or uterine anomalies seen on US scan.
- Participants with a history of alcohol, drug abuse, and chronic corticosteroid use.
- Participants with sickle cell disease or other hemoglobinopathies.
- Refusal to consent.

Data Analysis

The biodata, and obstetric parameters of the hypertensive and normotensive pregnant women were entered into the computer spreadsheet of the IBM SPSS Statistics, Armonk NY version 25. The findings were analyzed using IBM SPSS Statistics 25 software for Windows. Results were presented in appropriate tables, charts, and graphs. The relationship between statistical variables of interest was established using Pearson chi-square. The correlation coefficient and student's t- test were used for continuous variables where appropriate. The significance level was set at $p < 0.05$ at a 95% confidence level.

Ethical Considerations

Ethical approval was obtained from the University of Ilorin Teaching Hospital's Health Research Ethical Committee before the research commenced. The approval ID number UITH/REU/PAN/21b .

Written informed consent was obtained. The privacy of each participant was ensured. All information obtained was treated with the utmost confidentiality and used strictly for research to benefit humanity. Participants were allowed to withdraw from the study at any stage without interfering with their management.

Results

Sociodemographic and Anthropometrics Characteristics A total of 83 pre-eclamptic (cases) and 83 gestational age-matched normotensive pregnant women (controls) were recruited for this study; however, 6 of the cases and 5 of the controls were lost to follow-up. Hence data from 77 cases and 78 controls were used in the outcome analysis.

Based on Table 1, the mean age of the cases was 32 ± 5.6, with n= 57 (68.7%) being below 35 years and n = 26 (31.3%) above 35 years. A similar age distribution was also observed among the controls (mean= 30 ± 4.9) with no statistically significant difference in their mean (p= 0.073). There was also no statistical significance in ethnicity (p= 0.038), religion (p=0.436), marital status (p=0.699), alcohol intake (p=0.699), and smoking (p=0.080). However, there was a statistical difference in the level of education of both groups; n=56 (67.5%) of cases had a tertiary level of education, while n=77(92.8%) of the controls had same level of education (p=0.001).

Table 1: Socio-Demographic Characteristics of Study Participants

	Preeclampsia	Control	χ^2/t	p-value
Variables	**n (%)**	**n (%)**		
Age group			9.196	0.048f*
20 – 25	17 (20.50	13 (15.7)		
26 – 30	20 (24.1)	34 (41.0)		
31 – 35	20 (24.1)	21 (25.3)		
36 – 40	22 (26.5)	15 (18.1)		
≥ 41	4 (4.8)	0 (0.0)		
Mean ± SD	32 ± 5.6	30 ± 4.9	1.806	0.073

Ethnicity			6.814	0.038f*
Yoruba	74 (89.2)	80 (95.4)		
Igbo	3 (3.6)	0 (0.0)		
Nupe	4 (4.8)	0 (0.0)		
Others	2 (2.4)	3 (3.6)		
Religion			0.608	0.436
Christianity	40 (48.20	35 (42.2)		
Islam	43 (51.8)	48 (57.8)		
Occupation		27.639	0.001f*	
Civil servant	30 (36.1)	53 (63.9)		
Trader	30 (36.1)	5 (6.0)		
Self employed	4 (4.8)	9 (10.8)		
Unemployed	19 (22.9)	16 (19.3)		
Marital Status		0.149	0.699	
Single	3 (3.6)	4 (4.8)		
Married	80 (96.4)	79 (95.2)		
Smokers		3.055	0.08	
Yes	0 (0.0)	3 (3.6)		
No	83 (100.0)	80 (96.4)		
Alcohol		0.149	0.699	
Yes	4 (4.8)	3 (3.60		
No	79 (95.2)	80 (96.4)		
Level of education		17.004	0.001f*	
Primary	2 (2.4)	0 (0.0)		
Secondary	25 (30.1)	6 (7.2)		
Tertiary	56 (67.5)	77 (92.8)		

f- Fishers Exact Test. χ^2: Chi square; t: independent sample T test; *: p value < 0.05 (i.e., statistically significant); n: number; % percentage; SD: standard deviation

Obstetric Characteristics of Study Participants

Table 2 summarizes the anthropometrics, obstetric and clinical information of the study groups. The mean body mass index (BMI) of 28.69 ± 4.77 Kg/m2 in the preeclamptic group was significantly higher than 25.77 ± 3.73 in the controls, with most of the cases being obese in contrast to the controls that were normal to overweight (p=0.001). No statistical difference was observed in the gravidity of both groups (p=0.238). The gestational age (GA) of the preeclamptic was matched with the normotensives. The mean GA of the participants in the preeclamptic group was 32.39 ± 3.81, like the normotensives, which was 33.39 ± 4.23 with no statistically significant difference between both groups (p=0.116). The mean systolic BP of 168.19 ± 14.33 and diastolic BP of 108.67 ± 9.34 in the preeclamptic group were also significantly higher than in the control with 114.10 ± 7.97 and 73.25 ± 6.07 systolic and diastolic respectively.

Distribution of primigravity between the two groups is almost equal at n=40 (48.2%) for case group and n=30 (36.1%) for the control group. However, the control group had more multigravida (n=45; 54.2%) and grand multigravida (n=8 ;9.6%) than the cases with n=39(47%) multigravida and n=4 (4.8%) grand multigravida. These differences were not statistically significant(p=0.238)

Table 2: Anthropometrics, Obstetric and Clinical Information of the Study Groups.

Variables	Preeclamptic	Control	χ^2/t	p-value
	n (%)	n (%)		
BMI (Kg/m2)			23.864	0.001*
Normal	16 (19.3)	40 (48.2)		
Overweight	36 (43.4)	35 (42.2)		
Obese	31 (37.3)	8 (9.6)		
Mean ± SD	28.69 ± 4.77	25.77 ± 3.73	19.307	0.001*

Gravidity			3.190	0.238
Primigravida	40 (48.2)	30 (36.1)		
Multi-gravida	39 (47.0)	45 (54.2)		
Grand multigravida	4 (4.8)	8 (9.6)		
Gestational age (weeks)			11.221	0.001*
≤ 25	4 (4.8)	3 (3.6)		
26 – 30	38 (45.8)	21 (25.3)		
31 – 35	33 (39.8)	38 (45.8)		
36 – 40	8 (9.6)	21 (25.3)		
Mean ± SD	32.39 ± 3.81	33.39 ± 4.23	-1.581	0.116
Systolic BP (mmHg)			217.421	0.001f*
< 140	0 (0.0)	83 (100.0)		
140 – 159	15 (18.1)	0 (0.0)		
≥ 160	68 (81.9)	0 (0.0)		
Mean ± SD	168.19 ± 14.33	114.10 ± 7.97	30.06	0.001*
Diastolic BP (mmHg)			216.977	0.001f*
< 90	0 (0.0)	83 (100.0)		
90 – 109	30 (36.1)	0 (0.0)		
≥ 110	53 (63.9)	0 (0.0)		
Mean ± SD	108.67 ± 9.34	73.25 ± 6.07	28.97	0.001*
Clinical information			217.951	0.001f*
Mild pre-eclampsia	8 (9.6)	0 (0.0)		
Severe pre-eclampsia	75 (90.4)	0 (0.0)		
Normotensive	0 (0.0)	83 (100.0)		

f- Fisher's exact test. χ^2: Chi-square; t: independent sample T-test; *: p-value < 0.05 (i.e. statistically significant); n: number; % percentage; SD: standard deviation; BP: Blood pressure

Obstetrics Outcome

Table 3: Obstetric Outcome Among Pre-Eclamptic and Normotensives.

	Cases n (%)	Control n (%)	Total n (%)	χ2	p-value
Favorable outcome	3 (3.9)	73 (93.6)	76 (49.0)	124.738	0.001
Unfavorable outcome	74 (96.1)	5 (6.4)	79 (51.0)		

Unfavorable obstetric outcome was defined as a participant with one or more of the following: Maternal mortality; intrauterine fetal death (IUFD); perinatal death; Low birth weight (<2.5kg); preterm delivery (<37 completed weeks) Emergency Caesarean section (EMCS) due to fetal distress and Low APGAR score (<7) at 5mins.

According to table 3, about 96%(n=74) of women with pre-eclampsia had unfavourable obstetric outcomes compared with 6%(n=5) of controls with unfavourable outcomes.

Conversely, 94% (n= 73) of controls with normotensive blood pressure had higher favourable obstetric outcomes compared with 4%(n=3) of cases with PE. This difference in obstetrics outcomes based on maternal blood pressure is statistically significant. (p value = 0.001)

Discussion

Sociodemographic Anthropometry

Consistent with the observations of Adekanmi et al [24] and Ayyuba et al [16] who reported a mean age of 31.33±5.92 years, the mean age of the PE participants in this study was 32 ± 5.6 and controls was 30 ± 4.9years, with no statistically significant difference in both groups.

(p= 0.073). This differed from Konwar et al [25] which had a mean age and range of 29.1 (15–42) and Moawad et al [26] with a mean of 29.7 ±6.2.

This is probably due to the smaller sample size used in their study. The mean body mass index (BMI) of 28.69 ± 4.77 Kg/m2 in the preeclamptic group was significantly higher than 25.77 ± 3.73 in the controls. This is like the observation of Aremu et al [27] in their research on optic nerve sheath diameter in pre- eclamptic and normotensive pregnancies in Ilorin, Nigeria. This is probably because obesity is a risk factor for PE

Obstetric Characteristics of Study Participants

The pre-eclamptic gestational age (GA) was matched with the normotensives. The mean GA of 32.9 ± 3.81 in the PE group was not statistically different from the normotensive with a mean of 33.39 ± 4.23. This is like the observations of Dahiru et al [17] and Aremu et al [27] but at variance with the 37.1 ±1.5 mean GA of Moawad et al [26] possibly because they studied late- onset PE, which focused on GA of 34 weeks and above. The finding of an average mid trimester GA among our study participants is also related to late antenatal registration common among Nigerian parturient.[28].

Systolic and Diastolic Blood Pressures

The mean SBP of 168.19 ± 14.33 and DBP of 108.68 ± 19.34 in the PE group were significantly higher than the control with 114.10 ± 7.97 and 73.25 ± 6.07 systolic and diastolic, respectively. This is consistent with Adekanmi et al [24] and Aremu et al [27] but differs from Lopez-Mendez et al [29] presumably because of the higher proportion of mild PE in their study.

Most of the pre-eclamptic group in this study (over 90%) had severe PE, while less than 10% had PE with mild features. This is like the observations of Adekanmi et al [24] and Aremu et al [27] but at variance with Lopez-Mendez et al [29] who reported less than half the PE population being severe. This is probably due to a younger population of PE subjects, as studies have revealed that older subjects are more predisposed to severe PE [24].

Obstetrics Outcome

Regarding obstetric outcomes, the majority (96%) of the 77 PE participants whose data was available for analysis at follow-up had unfavourable outcomes, with less than 4% being favourable. Same findings were reported in a study by Moawad et al [26].

Although most of their participants (68%) also had unfavourable outcomes, the proportion is slightly less than what was obtained in this study, likely because the maternal outcome was not evaluated as they only assessed the fetal outcome. The high incidence of severe pre-eclampsia (82%) in this study could also be the reason for the high prevalence of unfavourable obstetrics outcomes among cases despite adequate medical intervention. This has been proven in several studies [18,19].

Conclusions

Our work showed a prevalence of 90% for severe pre-eclampsia and 10% for mild pre-eclampsia among women in the case group. The average age of the study participants was 32 ± 5.6yrs for cases and 30 ± 4.9yrs for controls. The mean gestational age at booking was 32.9yrs ± 3.81 in the PE and 33.39yrs ± 4.23 among the controls. This study showed a 96% incidence of unfavourable obstetrics outcomes among women with pre-eclampsia. Unfavourable obstetrics outcome include maternal mortality, intrauterine fetal death (IUFD), perinatal death, Low birth weight (<2.5kg), preterm delivery (<37 completed weeks), fetal distress and Low APGAR score (<7) at 5mins. The mean body mass index (BMI) in the preeclamptic group was significantly higher than in the controls (28.69 Kg/m2 vs 25.77 kg/m2). The differences in BMI, blood pressures and obstetric outcomes between the case and controls were statistically significant. There was no statistical significance in gravidity and gestational age of both groups, probably due to the smaller sample size used in their study.

The late gestational age at antenatal care registration reflects the nationwide late registration practice among Nigerian women. The combined effect of the high prevalence of severe pre-eclampsia and late presentation for medical intervention was probably responsible in part for the high incidence of unfavourable obstetric outcomes seen among the cohort of patients in this study. The findings underscore the devastating complications associated with late presentation in women with severe eclampsia. Therefore more efforts need to be engaged at blood pressure screening for all women in reproductive age group and pregnant women in particular.

Author Contributions

- Temidayo Abiodun Alabi - design, planning, conduct, data analysis, manuscript writing
- Abayomi Joseph Afe - planning, data analysis, and manuscript writing
- Kikelomo Temilola Adesina - design, planning, data analysis
- Olufemi S. Ogunyemi - data analysis and manuscript writing
- Halima Jumai Akande - design, planning, conduct
- Sulyman Biodun Alabi- design, planning, conduct
- Aremu Latifat Titilope - design, planning, data

Conflicts of Interest

The authors declare that they have no known conflict of interests associated with this work and no significant financial support that could influence the work reported in this paper.

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