Original Article

Prevalence, Risk Factors and Foetomaternal Outcomes Associated with Pre-eclampsia among Pregnant Women in Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria

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ABSTRACT

Background: Pre-eclampsia is one of the leading causes of maternal and perinatal morbidity and mortality globally. There is a paucity of data regarding pre-eclampsia and associated risk factors in Ekiti State, Nigeria.

Objective: The aim was to assess the prevalence of pre-eclampsia, the associated risk factors and foetomaternal outcomes among women who delivered in the Teaching Hospital in Ekiti State.

Materials and Methods: Case notes of women who delivered in the hospital between 1st January, 2010, and 31st December, 2014, were retrospectively reviewed and relevant data extracted and entered into a standardised pro forma. Data were analysed using descriptive and inferential statistics in the Statistical Package for the Social Sciences for Windows version 20. Relationships between variables were determined using Pearson correlation while Student *t*-test was used to assess differences between two means. The level of statistical significance was set at $P < 0.05$.

Results: One hundred and forty-six (1.9%) of the 7709 women who delivered in the hospital during the 5-year period developed pre-eclampsia. One hundred and twenty (86.3%) of the 146 case notes were available for analysis. The mean age of respondents was 30 (5.2) years. There was a weak but significant correlation between parity and systolic blood pressure (BP) ($r = 0.20$, $P = 0.02$). A higher mean systolic and diastolic BP was recorded among unbooked women compared with booked women. The study showed that unbooked women had statistically significantly higher mean systolic ($t = 2.69$, $P = 0.01$) and diastolic ($t = 3.03$, $P = 0.01$) BP. The most common foetomaternal morbidities were birth asphyxia in 25 (19.8%), eclampsia in 23 (18.3%) and post-partum haemorrhage in 5 (3.9%). The maternal and foetal mortality were rates of 3.2% and 4.8%, respectively.

Conclusion: Pre-eclampsia was a major contributor to maternal and perinatal morbidity and mortality in Ekiti State. Interventions to address pre-eclampsia should focus on early booking and prompt identification of women at risk for appropriate management and support.

Key words: Nigeria, pre-eclampsia, pregnant women, prevalence, risk factors

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INTRODUCTION

Hypertensive disorders of pregnancy constitute an enigmatic and clinically challenging group of pregnancy complications that are responsible for a substantial burden of illness in both industrialised and non-industrialised countries.[1] They are one of the important and most common causes of severe long-term disability, morbidity and mortality among mothers and their babies.[2-5] The disorders may present as chronic hypertension (occurring before 20 weeks' gestation or persisting longer than 12 weeks after delivery), gestational hypertension (occurring after 20 weeks' gestation), preeclampsia or preeclampsia superimposed on chronic hypertension.[6]

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Pre-eclampsia has been defined as hypertension with significant proteinuria in a previously normotensive and non-proteinuric patient after the 20th week of pregnancy.[7] Pre-eclampsia has been identified as a disease of unknown aetiology. There are many risk factors and theoretical speculations.[8] Pre-eclampsia occurs primarily after the second trimester of pregnancy, posing a great danger to the foetus and the neonate.

The disorder usually starts with a placenta trigger followed by a maternal systemic response. As the systemic response is inconsistent, the clinical presentation varies in time and severity and may result in multisystem damage.[2] Although most cases of pre-eclampsia may be managed successfully, severe pre-eclampsia is a life-threatening multisystem disease associated with eclampsia, HELLP syndrome (hepatic dysfunction characterised by haemolysis [H], elevated liver enzymes [EL] and low platelets [LP]), acute kidney injury, pulmonary oedema, placental abruption and intrauterine foetal death.[2]

The trials on prevention of pre-eclampsia have been disappointing and non-rewarding, and treatment remains a great challenge to even the most experienced obstetrician. This is majorly because the aetiopathogenesis of the disease is unclear.[9] Therefore, the cornerstone of its management remains integrated antenatal care, strict and standard antepartum foetomaternal monitoring, maternal stabilisation and delivery through the safer and faster routes – all to the benefit of both the mother and baby.[2,9,10]

Anecdotal reports from Ekiti State show that health caregivers from various levels of healthcare services have always claimed that pre-eclampsia is one of the most common conditions encountered at their various centres with associated high maternal and perinatal morbidity and mortality. Despite this claim, Ekiti State remains one of the few areas in the country with little or no data on pre-eclampsia. The only available published study on pre-eclampsia in the state was that carried out by Adekanle *et al.*[11] at Federal Medical Centre, Ido-Ekiti in 2014. The study only focussed on the assessment of serum magnesium levels in healthy pregnant women and patients with pre-eclampsia. With the awareness of the possibly high burden of pre-eclampsia in the state, it becomes imperative to carry out more studies on the disease not only to appreciate the gravity of the problem but also to have a baseline that would serve as a good reference for other related studies.

The goal of nursing care in the maternity cycle is to ensure optimum health for both mother and child. Thus, the present study was of importance in the institution of appropriate nursing care spanning prevention, management and rehabilitation of women affected by pre-eclampsia. The knowledge of the burden of pre-eclampsia and associated risk factors will not only assist in the early identification of women at risk of developing the disease but also in giving appropriate timely intervention for good foetomaternal outcome.

MATERIALS AND METHODS

Study design and setting

The study was a 5-year retrospective study in which the authors set out to determine the prevalence of pre-eclampsia and its risk factors among pregnant women who delivered at Ekiti State University Teaching Hospital (EKSUTH), Ado-Ekiti. The study was carried out in the Department of Obstetrics and Gynaecology of the Hospital. Ado-Ekiti is located in southwestern Nigeria. The hospital is well equipped with modern facilities and human resources in various specialities of medicine. The total average delivery conducted in a year is about 2000. This hospital serves as a referral centre for primary and secondary healthcare facilities in Ekiti and parts of Ondo, Kogi, Osun and Kwara States of Nigeria.

Study population

The participants were pregnant women that received care or delivered in the hospital during the period covered by the study. All pregnant women after 20 weeks of pregnancy that attended antenatal clinic or presented in labour with the diagnosis of pre-eclampsia using the following standard criteria: (i) occurrence of hypertension in combination with proteinuria; (ii) hypertension and proteinuria developing after 20-week gestation in a previously normotensive, non-proteinuric patient and (iii) the diagnosis of hypertension in pregnancy was made by either one measurement of diastolic blood pressure (BP) ≥110 mmHg or two consecutive measurement of diastolic blood pressure ≥90 mmHg 4 or more h apart. Korotkoff sound V was used as a measure of diastolic pressure.[12] Significant proteinuria was defined as one 24-h collection with a total protein excretion of 300 mg or more or two random clean-catch or catheter specimen urine specimens with 2+ (1 g albumin/L) or more on reagent strip or 1+ (0.3 g albumin/L) if specific gravity is <1.030 or pH is <8.[13]

Patient with the following conditions was excluded from the study: medical complications such as essential hypertension, renal disorder and cardiovascular disorder; medical complications with superimposed pre-eclampsia; molar pregnancy and women with features of eclampsia. Patients whose case notes did not have sufficient information required for the study were also excluded from the study.

Data collection

A standardised pro forma was used in collecting relevant data, which included the social and demographic data, medical history, medical investigations undertaken and delivery outcomes relating to the study population. The study pro forma was subjected to scrutiny by experts in the fields of Nursing and Obstetrics and Gynaecology. The case folders of all patients with pre-eclampsia seen during the period of 1st January 2010–31st December, 2014, were identified and retrieved by record personnel. Each of the folders was subsequently examined to extract the relevant information including age, parity and gestational age at delivery, mode of delivery, family or personal

history of hypertension, personal history of pre-eclampsia, systolic and diastolic BP and proteinuria at presentation.

Data analysis

The data were analysed using the Statistical Package for the Social Sciences (IBM Corp., Armonk, New York) for Window version 20.[14] Frequency distribution tables, line graph and box-and-whisker plot were used for data presentation. Continuous variables were summarised with mean and standard deviations, while discrete variables were summarised using numbers and percentages. Pearson correlation was used to assess relationships between two continuous variables whereas Student *t*-test was used to assess differences between two means. Statistically significant level was set at $P < 0.05$.

Ethical consideration

Ethical approval for the study was obtained from Health Research and Ethics Committee of EKSUTH. All information, including history, physical findings and results obtained from patients case notes were kept strictly confidential.

RESULTS

There were a total of 7709 deliveries in the hospital during the study period, with 146 (1.9%) cases of pre-eclampsia recorded, giving the prevalence of pre-eclampsia as 19 per 1000 pregnancies. Table I shows the details of the characteristics of the distribution of ages, parity, levels of education of the women and gestational ages of their babies. A total of 126 (86.3%) of the 146 case notes were available for analysis (86.3% retrieval rate). Seventy-three (57.9%) of the women were booked, while 53 (42.1%) were not booked. A total of 119 (94.4%) of the women were married while 7 (5.6%) were single. The age range of the women was 15–42, with the mean of 30.0 (4.7) years. Forty-eight (38.1%) of the women were in the age group of 30–34 years. The mean parity of the women was 2 (1.2), with 79 (62.7%) of the women being primipara. Eighty-eight (69.8%) of the women delivered their babies between 34 and 38 weeks of pregnancy.

Table I: Distribution of ages, parity, levels of education of the women and gestational ages of their babies

The variables	Total (*n*)=126, *n* (%)
Age (years)	
15-19	4 (3.2)
20-24	12 (9.5)
25-29	40 (31.7)
30-34	48 (38.1)
35-39	17 (13.5)
40-44	5 (4.0)
Parity	
1	79 (62.7)
2	26 (20.6)
3	8 (6.3)
4	9 (7.1)
≥5	4 (3.2)
Educational status	
No formal education	4 (3.2)
Primary	31 (24.6)
Secondary	36 (28.6)
Tertiary	55 (43.7)
Gestational age at delivery	
29-33	8 (6.4)
34-38	88 (69.8)
39-43	30 (23.8)

Figure 1 summarises the yearly trend of pre-eclampsia among women who delivered in the hospital during the 5-year study period. In 2010 and 2011, 24 (2.1%) of the 1696 deliveries and 26 (1.5%) of 1160 were complicated by pre-eclampsia, respectively, while in 2012, 31 (1.8%) of 1689 deliveries were complicated by pre-eclampsia. In 2013 and 2014, 27 (1.3%) of 1094 deliveries and 19 cases (1.7%) of 2070 were complicated by pre-eclampsia, respectively.

The mean of systolic BPs was 158 (23.9) while the mean diastolic BPs was 101 (15.6) mmHg. The proteinuria recorded with dipstick ranged between 1+ and 3+ (0.3 g/L − 3 g/L) with an average of 2+ which corresponds to a concentration of 1 g/L.

Figure 2 shows the box-and-whisker plot showing systolic and diastolic BPs for the women. The systolic BP for the women with pre-eclampsia ranged between 130 and 260 mmHg with median systolic BP value of 150 mmHg (95% confidence interval [CI] =153.6–162.0). The diastolic BP for the women with pre-eclampsia ranged between 70 and 180 mmHg with median diastolic BP value of 100 mmHg (95% CI = 98.6–104.6). The box-and-whisker plot also revealed an extreme systolic BP of 260 mmHg and diastolic BP of 180 mmHg.

Fifty-three (42.1%) of the women were obese with body mass index (BMI) above 30.0. The mean weight of the babies was 2.8 kg (0.67). Forty-two (33.5%) had babies with low birth weight (birth weight below 2.5 kg) and 65 (51.6%) had babies with birth weights of 2.5–3.5 kg while 19 (15.1%) had babies

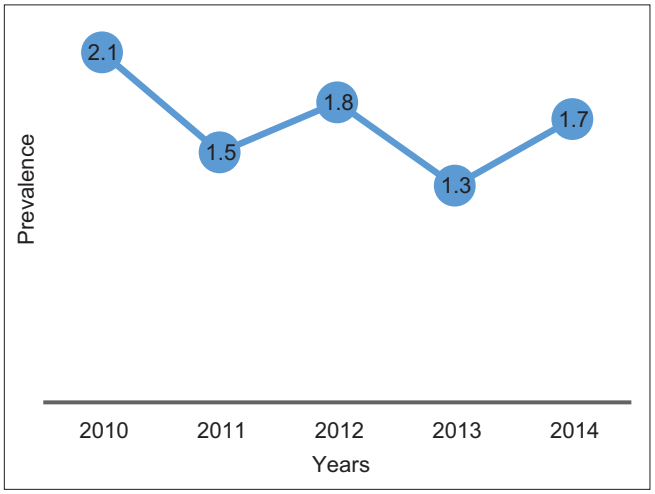

Figure 1: Yearly prevalence of pre-eclampsia among women who delivered during the study period

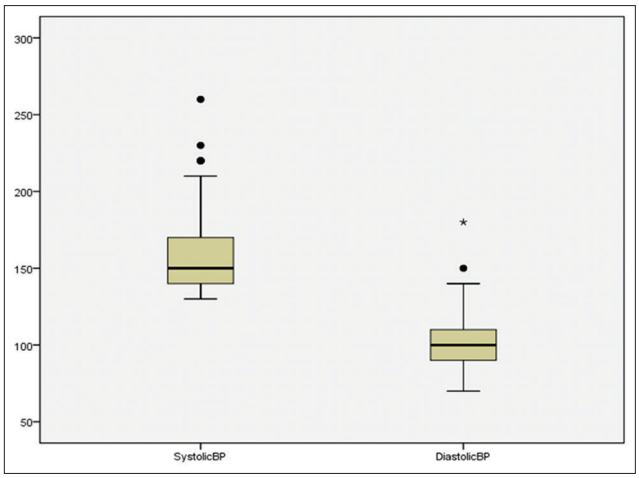

Figure 2: Box-and-whisker plot of systolic and diastolic blood pressure of the respondents

with birth weights above 3.5 kg. The result also showed that 41 (32.5%) of the respondents had had the previous history of pre-eclampsia. Six (4.8%) and 3 (2.4%) of the women had had a history of hypertension and diabetes, respectively. None of the respondents had a history of renal disease while 6 (4.8%) had sickle cell disease.

Table II shows the Pearson's correlation coefficient (r) and the corresponding P values between the ages and systolic BPs and diastolic BPs; parity and systolic BPs and diastolic BPs and BMI and systolic BPs and diastolic BPs of the women. There was no statistically significant relationship between BMIs and systolic BPs as well as diastolic BPs. There was, however, statistically significant but weak correlation between parity and systolic BPs (r = 0.20 and P = 0.02), but there was no statistically significant relationship between parity and diastolic BPs. There was also no statistically significant relationship between BMI and both systolic and diastolic BPs.

Data on the comparisons of the means of systolic and diastolic BPs between women with and without previous history of pre-eclampsia, with and without a history of hypertension and between booking status are presented in Table III. Women with the previous history of pre-eclampsia had higher mean systolic pressure of 158.29 (22.98) compared with a mean of 157.58 (24.44) in those without previous history of pre-eclampsia. This difference was, however, not statistically significant (t = 0.16 and P = 0.86). Result also showed that women with previous history of pre-eclampsia have lower mean diastolic BP of 99.63 (17.55) compared with a mean of 102.13 (14.56) in those without a history of pre-eclampsia. The difference also was not statistically significant (t = 0.84 and P = 0.40). The results further showed that women with previous history of hypertension in pregnancy had higher mean systolic BP of 173.30 (33.86) compared with a mean of 157.00 (23.20) in women without previous history of hypertension, and the difference was, however, not statistically significant (t = 1.64 and P = 0.10). Furthermore, women with a previous history of hypertension in pregnancy had higher mean diastolic BPs of 110.00 (1.40) compared with a mean of 100.88 (15.56) in those without previous history of hypertension. This difference was however not statistically significant (t = 1.40 and P = 0.16). Statistically significant higher means of systolic and diastolic BPs were recorded among unbooked compared with those of booked women (t = 2.69, P = 0.01 and t = 3.03, P = 0.01), respectively.

Key foetomaternal outcomes were birth asphyxia: this was recorded in 25 (19.8%) of the children and necessitated admission into the special baby unit. Foetal mortality occurred in 6 (4.8%) of the cases. Eclampsia was experienced by 23 (18.3%) of the women, followed by post-partum haemorrhage in five (3.9%) and disseminated intravascular coagulation in two (1.6%). Maternal deaths were recorded in four (3.2%) of the women. Sixty-seven (53.1%) of the women had spontaneous vaginal delivery while the rest delivered by caesarean section.

Table II: The relationship between age, parity body mass index and both systolic and diastolic blood pressure

Variables	SBP	DBP
Age	−0.01 (P=0.86)	−0.13 (P=0.14)
Parity	0.20 (P=0.02)*	0.07 (P=0.41)
BMI	0.04 (P=0.63)	−0.002 (P=0.98)

*Correlation is significant at the 0.05 level (two-tailed). SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table III: Comparisons of the means of systolic and diastolic blood pressures between women with and without previous history of pre-eclampsia and with and without a history of hypertension and booking status

Variables	Systolic, mean (SD)	t	df	P
Previous history of pre-eclampsia				
Yes	158.29 (22.98)	0.16	124	0.86
No	157.53 (24.44)			
Previous history of hypertension				
Yes	173.33 (33.86)	1.64	124	0.10
No	157.00 (23.20)			
Booking status				
Booked	153.01 (20.84)	2.69	124	0.01*
Not booked	164.34 (26.34)			
Variables	**Diastolic, mean (SD)**	**t**	**df**	**P**
Previous history of pre-eclampsia				
Yes	99.63 (17.55)	0.84	124	0.40
No	102.13 (14.56)			
Previous history of hypertension				
Yes	110.00 (14.14)	1.40	124	0.16
No	100.88 (15.56)			
Booking status				
Booked	97.88 (14.81)	3.03	124	0.01*
Not booked	106.06 (15.47)			

SD: Standard deviation, *t-test is significant at P<0.05 level

DISCUSSION

Pre-eclampsia has been a disease of unclear aetiology, but it has been linked with some factors which were further explored in the setting of the present study. Most of the women in the present study were primiparous, and previous studies have reported an increased risk of pre-eclampsia among this set of women.[8,15] However, in analyses of the first 2 pregnancies of 97 women in a previous study by Wolf *et al.*,[16] a decrease in circulating sFlt-1 from the first to the second pregnancy was reported, suggesting that higher levels of sFlt-1 in primiparous women may predispose them to an elevated risk of pre-eclampsia.

Most of the participants in the present study were booked and educated women. This finding was in sharp contrast with the findings of Singhal *et al.*[17] in which majority of the women with pre-eclampsia were unbooked and belonged to low socioeconomic status. The difference in literacy rates might result in varying antenatal utilisation levels among the two groups of women. Booking status was significantly associated with lower systolic and diastolic BPs. This reiterates the importance of early booking and antenatal care services in maintaining the health of pregnant women as this would help to detect some health problems early and necessary intervention commenced.

Most of the babies delivered by the women in the present study were of average birth weights of 2.5–3.5 kg. This was not surprising as studies have shown that infants born at term to mothers with pre-eclampsia have similar birth weights, on the average, to those of infants born to women without pre-eclampsia.[18] Furthermore, most of the babies were delivered at gestational age above 34 weeks at which chances of survival are almost similar to that of babies delivered at term.[19]

The prevalence of pre-eclampsia found in the present study was lower than the 6% reported by Makinde *et al.*[20] in Ile-Ife, southwest Nigeria and 3.3% reported by Ugwu *et al.*[21] in Enugu, southeastern Nigeria, but higher than the 0.74% reported by Thapa and Jha in Nepal.[22] In general, the rate of pre-eclampsia of 1.9% recorded in the present study was lower than the range of 2.0%–16.7% reported in several studies.[23-26]

The mean systolic and diastolic BPs of 158 mmHg and 101 mmHg in the present study were comparable with values obtained in a similar study conducted by Koofreh *et al*.[27] Systolic BP as high as 260 mmHg was recorded in the present study and was also reported in previous studies conducted in Nigeria.[20,27] Diastolic BP as high as 180 mmHg was recorded in a few of the pregnant women, which was not the case in most previous studies. Such extremely high values of BP in pregnancy are notably associated with high maternal and perinatal morbidity and mortality.[28] The mean proteinuria of 2+ (corresponding to urinary protein concentration of 100 mg/dl) recorded in the present study was similar to the results of earlier studies on pre-eclampsia done in Nigeria.[27,29]

Association between maternal age and development of pre-eclampsia has been reported in studies done in Finland[30] and Iran.[31] The results of the present study did not find such association. Moreover, there was no statistically significant difference between the means of systolic and diastolic BP of women with or without previous history of pre-eclampsia although women with pre-eclampsia have been reported to be at higher risk of developing the disease in the future pregnancies.[32] Low percentages of pre-pregnancy hypertension and diabetes were recorded in the present study although both conditions have been reported as risk factors for pre-eclampsia.[33-35] Although many studies have shown a strong link between chronic renal disease and development of pre-eclampsia,[36-38] none of the women with pre-eclampsia in the present study had a previous history of the chronic renal disease. The absence of chronic renal disease in the present study was probably because prevalence of chronic renal disease was low among the pregnant women in the environment of the study – a reflection that pregnancy in women with kidney disease is relatively uncommon.[36] Six (4.8%) of the women were patients with sickle cell disease. This finding was in line with the findings in other studies that have linked pre-eclampsia with vasculopathy of sickle cell disease.[39,40]

It was interesting to find that 42.1% of the women with pre-eclampsia were obese with BMI of 30 g/m^2 and above. Although the result of the present study did not show statistically significant association between BMI and systolic BP, some previous studies have reported that obese women were at higher risk of pre-eclampsia compared with normal weight women.[32] Obesity has been reported to increase the risk of pre-eclampsia about three-fold and is a leading attributable risk factor for pre-eclampia in high-income countries,[41] and weight loss is, therefore, encouraged to reduce the risk of pre-eclampsia.[42]

A striking observation about mode of delivery in the present study was that most of the women with pre-eclampsia had spontaneous vaginal delivery; contrary to the result of a study in which the mode of delivery in larger percentage was abdominal.[43] This lower rate of caesarean section in the present study may be due to the aversion to caesarean operation among the study population. There was also the possibility of late-onset pre-eclampsia in which there was higher success rate of vaginal delivery compared to early-onset pre-eclampsia.

Eclampsia was the most common maternal complication among the women with pre-eclampsia, occurring in 18.3% and this was in contrast to the findings of Agida *et al.*[44] who reported placenta abruption and coagulopathy as the most common complications. While there was no maternal death recorded in some studies,[44,45] the maternal deaths of 3.2% recorded in the present study might not be unconnected to a better level of intensive care and aggressive rapid intervention in the aforementioned areas of study. Perinatal asphyxia of 19.8% and foetal mortality rate of 4.8% recorded in this study were comparable with the findings obtained in other climes.[46-48]

The results of the present study have shown that pre-eclampsia was still a major obstetric challenge. Collaborative and complementary efforts of nurse-midwives with obstetricians and gynaecologists are needed for early detection, management and follow-up of women who have risk factors for the disease. Nurses-midwives can play significant roles in advocacy for measures to improve public education on early detection and need for prompt management. Nurses-midwives can also assist the women through health education and counselling to: understand pre-eclampsia and eclampsia and its implications; recognise and immediately report signs and symptoms indicative of pre-eclampsia; and seek medical treatment early from skilled birth attendants and health facilities.

Moreover, health education by nurse-midwives should not only be directed at pregnant population but also the general population relating to the risk factors for pre-eclampsia, signs and symptoms and the need for early intervention. There is also the need to promote pre-conception care for women within the reproductive age group to identify, treat and control pre-existing medical conditions/risk factors such as chronic hypertension, diabetes mellitus and obesity. Pregnant women should also be educated and supported to book early for antenatal care to facilitate early detection and management of pre-eclampsia, and referral systems should be strengthened within the healthcare system to improve access of women with pre-eclampsia to needed medical services. Improving the competency of nursing personnel as well as other healthcare workers in the early detection and management of pre-eclampsia using evidenced-based approach is also critical to ensuring improved management outcomes. For nurse-midwives, in particular, early detection and management of pre-eclampsia can be incorporated into the Mandatory Continuing Professional Development Programme.

A major limitation of the present study was its focus on a teaching hospital; as such, the data may not be totally representative of Ekiti State as cases managed at private health facilities as well as other levels of healthcare within the public sector were not captured. Second, the inability to retrieve the case note of some of the cases of pre-eclampsia may have implications for the representativeness of the rate of cases and patterns of outcome reported. Given the fact that the present study site was the only tertiary health facility in Ekiti State, it was likely that many cases initially treated in private facilities and lower level public sector healthcare facilities might have ended up being referred to the teaching hospital. The retrieval rate of about 86% with regard to the case notes of clients was high and likely to minimise the effect of any potential bias on the overall results.

CONCLUSION

The present study shows that pre-eclampsia was still a major contributor to obstetric morbidity and mortality in the study setting. Booking status was significantly linked with higher diastolic and systolic blood pressure. Pregnant women should be encouraged to book early for prompt identification and management of pre-eclampsia

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Conflicts of interest

There are no conflicts of interest.

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