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ABSTRACT

Aim: To evaluate the biophysical, biochemical and clinical characteristics of pre-eclamptic pregnancies as a suitable approach to access and manage pregnancy at risk of pre-eclampsia.

Methods: 89 pregnant women with preeclampsia were investigated longitudinally at prepartum and postpartum. The biophysical, biochemical and clinical variables of both mother and neonate of pre-eclamptic pregnancy obtained by standard procedures were compared with the normotensive pregnant controls.

Results: Mean gestational ages were significantly lower in pre-eclampsia than in control group (P < 0.001). Caesarean section operations were significantly higher in the group with pre-eclamptic pregnancy compared with the control group (P < 0.05). Pre-eclamptic group recorded significantly higher maternal and neonatal mortality rates than the normotensive controls (P < 0.05). The mean placenta weight, one and five minutes apgar score of neonates of pre-eclamptic pregnancy were significantly lower compared with the controls (P<0.05). Systolic and diastolic blood pressures at each of the study periods in pre-eclamptic group were significantly elevated compared with the nomortensive pregnancy (P< 0.001). Pre-eclamptic pregnancies had varying degrees of significant microalbuminuria compared with the controls (P < 0.001).

Conclusion: Low birth weight, high maternal and neonatal mortality rates, and Cesarean section, low gestational age, apgar scores, placenta weight, elevated blood pressures and microalbuminuria occur more frequently in pre-eclampsia than in healthy normotensive pregnancy.

Keywords: biophysical, biochemical, clinical, micro-albuminuria, neonate; pre-eclampsia, normotensive.

1. INTRODUCTION

Pre-eclampsia is a pregnancy associated multiorgan disorder caused by altered trophoblastic invasion and endothelial cell dysfunction. It is reported to occur in 5-10% pregnancies and is the major cause of significant perinatal mortality and morbidity of the foetus, newborn and the mother (Conde-Agudele et al., 1994). Pre-eclampsia describes a common syndrome that occurs in the second half pregnancy but mainly seen in late pregnancy at more than 30-32 weeks of gestation (Cuninghm et al., 2003). This syndrome is defined as occurring at systolic/diastolic blood pressures values of over 140/90 mm of Hg in the presence of proteinuria greater than 0.3g/L in a 24 hour urine collection or exceeding 1g/L in a random urine sample (Seridou et al., 2002). Warden and Euerke (Warden and Euerle, 2002) rated pre-eclampsia as the second leading cause of maternal mortality worldwide, accounting for 12-18 % of pregnancy related death. In Northern Nigeria, pre-eclampsia accounts for 40% of maternal death with significant direct correlation with tendency towards culture of early marriage in that region (Abubakar et al., 2009). Afro-American and black women have higher prevalence and twice risk factors of developing pre-eclampsia than the Caucasians (WHO, 1987). This difference has been linked with marked racial difference in blood pressure levels in women (WHO, 1987).

The prevalence of pre-eclampsia varies significantly worldwide due to its wide variation in epidemiological studies. Estimates of prevalence of pre-eclampsia by World Health Organization (WHO) shows that it is seven times higher in developing countries than in developed countries (Sibai, 2003). In Southern Nigeria, prevalent rate of pre-eclampsia is between 5.6-7.6% (Alphosonsus, 2004, Arnolu et al., 2005) as against 5% prevalence reported among the Caucasians in developed countries (Saftlas et al., 1990). Documented predisposing factors for developing pre-eclampsia amongst others include primigravida, inherited tendency, molar pregnancy, maternal age below 20years or over 30 years, obesity and chronic hypertension (Saftlas et al., 1990, Ogunniyi, 2006). In Nigeria, reports show that low-socio economic status and nutrition may also constitute risk factors; (Salako et al.,2003), poor access to antenatal care, past history of pregnancy induced hypertension, abject poverty, poor reproductive care seeking behavior, cultural perception of eclampsia and lack of access to high quality maternal services such as intrapartum care (Population Council, 2009).

Pre-eclampsia, when left untreated could lead to severe complications such as damage to vital organs such as the heart, liver and kidney. Most severe or life threatening complication known as eclampsia can also manifest as the end result of poor management of pre-eclampsia. When detected at late stage of pregnancy, immediate delivery through caesarian section becomes the inevitable option to prevent eclampsia. It is however, interesting to note that the triad of elevated blood pressure, proteinuria and oedema, which are pre-eclamptic symptoms, resolves 3 days or at most 6 weeks postpartum (Davey and MacGlivivary, 1986; Thomas et al., 2003).The aetiology of pre-eclampsia remains unknown, however, placental hypoperfusion and diffuse endothelial cell injury are considered to be the central pathologic events (Brown, 1995).

In Nigeria, approximately 37000 women die annually because of pre-eclampsia or eclampsia related complications (WHO, 2005). Unfortunately, the signs and symptoms of this disease become apparent at a relatively late stage in pregnancy, 3rd trimester. In contrast, the underlying causes of the pathologic mechanism that are thought to be responsible for the disease process appear to manifest or be initiated much earlier in the pregnancy (Robertson and Khong, 1987). In spite of this, numerous screening tests for detecting preeclampsia have failed to absolutely screen or predict this pregnancy specific disorder (Friedman and Lubarsky, 2001). For this reason, it seems absolutely necessary to search for early indicators of pre-eclampsia.

Several clinical, biophysical and biochemical tests have been reported in literature to predict the development of pre-eclampsia (Sibai, 1988) yet none of these tests have been shown to be absolutely appropriate, valid, or acceptable for the prediction or diagnosis of preeclampsia (Sibai, 2004, Kenny et al., 2010), hence research on the aetiopathogenesis of pre-eclampsia is a continuous process (Arinola et al., 2006). This present study is designed to harness the knowledge of the main outcome of maternal and neonatal pre-eclamptic pregnancies by evaluating the biophysical, biochemical and clinical variables of pre-eclamptic pregnancies. This may help in identifying pregnant women at risk of pre-eclampsia so that they can be targeted for antenatal surveillance and prophylactic interventions such as early delivery.

2.0 MATERIALS AND METHODS

2.1. Study population

The study was in two phases, longitudinal and convenience sampling method was used. The participants were recruited from the antenatal clinics and wards of a Tertiary Teaching Hospital in South West Nigeria. Study protocol was approved by the local Ethics and Research committee. Verbal and written consent to participate in the study were obtained from the participants after explaining the innocuous nature of the study.

(a) Phase one of the study included 79 pre-eclamptic women aged 30 (± 0.7) years at their 3rd trimester (34-38 weeks) aged matched with 80 apparently healthy normotensive pregnant women (control). They were investigated and monitored from 3rd trimester to 3 days post-delivery.

(b) Phase two of the study was designed as a follow up of phase one to detect the onset of the abnormality observed in phase 1. It included apparently healthy normotensive pregnant women recruited at 8-13 weeks of gestation attending the antenatal clinic of the tertiary teaching Hospital in South West Nigeria. They were investigated and monitored from 1st to 3rd trimester and 3 days to 6 weeks post-delivery... During the study period, 10 out of the apparently healthy normotensive pregnant women developed pre-eclampsia and were grouped as cases of interest. Eleven remained till and after delivery and were used as controls for the study. The pre-eclamptic patients were identified by the presence of persistent hypertension, (blood pressure ≥ 140 / 90mm Hg, significant proteinuria; ≥ 1+dip stick protein testing) at 23.2 ± 0.7 weeks of gestation. Participants who developed extreme complication of pre-eclampsia known as eclampsia were identified by additional feature of convulsion or coma and pathological oedema. . Baseline values for biophysical, biochemical and clinical features for statistical analyses were taken at 8-14 weeks of gestation.

The inclusion criteria were normotensive, non-proteinuric antenatal cases registered before 13 weeks of gestation and voluntarily gave consent to participate in the study.

The exclusion criteria included non-pregnant women, hypertensive and proteinuric antentenal cases before 13 weeks of gestation.

2.2 Demographic Data: Information on age, parity, gestation age, occupation, mode of delivery, progression to pre-eclampsia and gender of babies born from pre-eclamptic and normotensive pregnancies were obtained through structured questionnaire.

2.3 Anthropometric Data: Anthropometric indices such as weight, height, body mass index were measured using standard devices as described by Umoh et al., (2010)

2.4 Clinical Data: Systolic and Diastolic blood pressures of all the participants were taken in sitting position in triplicate using standard mercury sphygmomanometer at least after 10 minutes rest. Systolic blood pressure was recorded at the appearance of sound and diastolic blood pressure was recorded at the disappearance of fifth phase Apgar scores of the babies were obtained at one and five minutes by objective assessment of the following characteristics of the baby immediately after delivery: appearance (baby's colour), pulse rate (respiratory effort), activity (heart rate), grimace (hold), response to stimuli (flexion of extremities).

2.5 Biochemical data: 5mls of blood was collected from the antecubital vein and put in sodium EDTA for some haematological parameters (blood group antigen and genotype).10ml of fasting urine was also collected at each point of contact with the participants for routine urinalysis.

2.6 Statistical Analysis: Data entry and analysis were performed with statistical package for social sciences (SPSS) version 15.0. Continuouos variables were presented as mean and standard error of mean. While categorical variables were presented as percentages. Differences between groups were compared using independent t-test for continuous variables. Chi-square test was used to find associations of categorical variables. p- Values of less 0.05 were considered statistically significant.

2.7 Ethical issues: Prior to initiating the study, written permission was obtained from the hospital, where the study was conducted and approval was obtained from the Ethic and research committee of the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife Osun State, South West Nigeria. The guidelines of Helsinki Declaration of 1975, as revised in 1983 was adopted to obtain informed consent of the participants.

3.0 RESULTS

3.1 Phase 1

Table1 shows the demographic characteristics of pre-eclamptic (cases) and nomortensive (controls) pregnancies. The ages, of both cases (30 ± 0.7years) and controls (29 ± 0.5years) were statistically (p> 0.05). comparable without significant difference Women between the age bracket of 23-34 years are more likely to be vulnerable to developing pre-eclampsia (p > 0.05). However gestational age at delivery in cases was statistically significant lower in cases compared with the controls (P < 0.05). Mean parity in cases was higher but not statistically significant compared with the Controls (P > 0.05). There was no statistically significant difference between case and controls in other demographic variables (p>0.05).

The univariate analysis (Table 2) showed no statistically significant difference in all the anthropometric indices between the pre-eclamptic group and the controls. Table 3 illustrates systolic and diastolic blood pressures at each of the study periods in both cases and control groups. Blood pressures of the pre-eclamptic group was significantly elevated compared with the nomortensive pregnancy controls (p < 0.001)

The urine biochemical variables before delivery (3rd trimester) at 3 days post-delivery are shown in Tables 4 and 5 respectively. Urine concentration of micro-albumin in cases was significantly elevated (p < 0.001) compared with the controls. There was significant association between micro-albuminuriua and the risk of development of pre-eclampsia (p < 0.001) (Table 4).

Table 1: Demographic characteristics pre-eclamptic (cases) and normotensive (controls) pregnant women at 3rd trimester

Variables	Cases (n=79)	Controls (n=80)	t-value	P-value	X^2 - value	P-value
Age (years)	30 ± 0.7	29 ± 0.5	.739	084		
Age distribution (years)	6 (8.6 %)	9 (11.3%)			2.969	P>0.05* (NA)
15-24						
25-34	49 (70 %)	62 (77.5%)				
≥ 35	15(21.4 %)	9 (11.3 %)				
Gestation age at term (weeks)	35.7 ± 0.0.4	38.4 ± 0.2	5.696	p<0.001*		
Parity before delivery	0.84 ± 0.1	0.68 ± 0.1	0.978	0.33		
Occupation:						
Civil servant	35(43.8 %)	36(51.4 %)			17.25	0.101
Self employed	23(32.9 %)	21(26.3 %)			2	(NA)
Students	17(21.3 %)	7(10 %)				
Applicants	0(0 %)	5(6.3 %)				
House wife	4(5.7 %)	2(2.5 %)				
	0.84 ± 0.1	0.68 ± 0.1	0.33			
Parity before delivery						

Key: NA=No association, P=probability, t=Student's t-test, X^2=Chi square test, *=significant

Table 2: Anthropometric characteristics of pre-eclamptic (cases) and normotensive (controls) pregnant women

Variables	Cases (n= 79) mean±sem	Controls (n=80) mean±sem	P-value
MOTHERS:			
Height(m)	1.60 ± 6	1.62 ± 5	P > 0.05
Weight before delivery(kg)	75.4±16.0	73.9 ±13.7	P > 0.05
Weight at day3 post-delivery (kg)	68.4±15.8	68.3 ±13.4	P > 0.05
BMI before delivery (Kg/m^2)	29.6±6.4	28.3 ± 5.0	P > 0.05
BMI at day 3 post-delivery	26.8±6.1	26.1 ± 4.9	P > 0.05

BMI= body mass index, Kg= kilogram, P=probability

Table 3: Clinical characteristics of pre-eclamptic (cases) and nomortensive (controls) pregnant women.

Variables	Cases n=79 mean ± sem	Controls n=80 mean±sem	P –value
Sbp at 35-38 weeks(3rd trimester) (mm/hg)	166 ± 21	122 ± 13	P < 0.000
Dbp at 35-38 weeks(3rd trimester) (mm/hg)	107 ± 15	78 ± 9	P <0.000
Sbp at day 3 post delivery (mm/hg)	142 ±14	114 ± 11	P < 0.000
Dbp at day 3 post delivery (mm/hg)	89 ± 11	70 ± 10	P < 0.000

Key: Sbp = Systolic Blood Pressure, Dbp= Diastolic Blood Pressure

Table 4: Biochemical characteristics of pre-eclamptic (cases) and nomortensive (controls) pregnant women at 3rd trimester in Urine

Variables	Cases n=79	Controls n=80	X^2	p-value	t-test	p-value
Protein (+)	35(54.3 %)	0 (0%)	150.0	p<0.001		
(++)	25(35.7 %)	0 (0%)		AS		
(+++)	5(7.1 %)	0 (0%)				
(++++)	2(2.9 %)	0 (0%)				
Glucose	0(0 %)	0 (0%)				p<0.001
Micro-albumin(g/L)	130.9 ± 8.9	38.9 ± 3.5				

AS= associated, X^2=Chi square test, t=Student's t test, P=probability

Table 5: Biochemical characteristics of pre-eclamptic (cases) and nomortensive (controls) pregnant women at day 3 post delivery in Urine

Variables	Cases n=79	Controls n=80	p-value
Protein	Negative	Negative	
Glucose	Negative	Negative	
Micro-albumin (g/L)	42.4 ±5.4	22.7±3.0	p < 0.001

3.2 Phase 2

Table 6 illustrates the clinical and anthropometric features from 1st to 3rd trimester, 3 days to 6 weeks post-partum in both cases and controls. The observed significant elevated blood pressure in pre-eclampsia at 3rd trimester in phase one was precipitated at the second trimester of pregnancy. The elevation peaked at the 3rd trimester and started declining just after delivery till 6 weeks post-partum before stabilizing to pre-pregnancy level. The body mass index in both cases and controls showed progressive increase from 1st – 3rd trimester but started declining at 3 days till 6 weeks post-partum before stabilizing to pre-pregnancy level. However, the differences in the body mass index throughout gestation and post-partum were not statistically significant p>0.05).

Table 7 describes the progressive appearance of proteinuria/micro-albuminuria in the pre-eclamptic subjects compared with the controls. The pre-eclamptic group had significantly elevated (p<0.001) urine micro-albumin compared with the normotensive group. The degree of proteinuria/micro-albuminuria was observed to increase with advancement in gestation age. There is significant association between proteinuria and vulnerability to developing pre-eclampsia.

Blood group and genotype distribution among the cases and controls are shown on Table 8. Significant population of the cases and controls were observed to possess blood group antigen O and genotype as shown on table; 80% 0f of cases posses genotype AA compared with 90% of Controls which have AA genotype. The distribution of blood group antigen O between cases and control is comparable. A significant association (p < 0.05) between genotype and vulnerability to pre-eclampsia was also observed on this table.

The maternal and neonatal outcomes of pre-eclamptic and normotensive pregnancy are shown on Table 9. Mean gestation age and delivery by caesarian section in cases were significantly (p<0.05) higher compared with the controls Strong and significant (p<0.001). Association between mode of delivery and pre-eclampsia was observed in cases and control group. Two (2.9%) maternal and eleven (13.8%) neonatal deaths were recorded among the cases and there was strong and significant (P < 0.05) association between pre-eclamptic pregnancy and neonatal death Mean birth weights of the neonates of cases were seen to be significantly (p< 0.05). lower compared with the controls. Distribution of the mean birth weight revealed that neonates of pre-eclamptic group had higher incidences of low and very low birth weight compared with the controls. Chi-square test reveals strong association between birth weight and pre-eclampsia (p<0.001). The mean placenta weight, one and five minutes apgar score of pre-eclamptic neonates were significantly (p < 0.05) lower than with controls.

Table 6: Clinical and anthropometry characteristics of pre-eclamptic (cases) and normotensive (controls) pregnant women at 1st, 2nd, 3rdtrimester, day 3 and 6 weeks post-partum

Variables	Cases					Controls					
	1st n=10	2nd n=10	3rd n=10	Day 3 n=10	6th weeks n=10	1st n=11	2nd n=11	3rd n=11	Day3 n=11	6weeks n=11	p-value
Gestational Age (weeks)	10.9±0.3	23.2±0.7	34±1.0			12.6±0.7	24.5±0.5	35.1±0.5			
Blood Pressure											
SBP (mm/Hg)	116.0±3.4	145.0±6.2	150.0±3.8	130.0 3.7±	100.0 ±3.7	111.5±2.2	111.0±3.8	109. 0±3.7	115.0 ±2.0	119.0 ± 2.3	0.001
DBP (mm/Hg)	69.0±3.5	90.0 ±6.0	106.0 ±3.3	89.0±3.8	63.0±2.8	67.5±2.2	65.0±2.0	65.0±2.0	69.5 ±2.2	74.0±1.9	0.001
Anthropometry											
Height (m)	1.6 ± 0.17	1.6±0.17	1.6±0.17	1.6±0.17	1.6±0.17	1.60.75 ± 0.17	1.6±0.13	1.6±0.13	1.6 ± 0.13	1.6±0.13	0.654
Weight (Kg)	73.55 ±7.3	78.45±7.2	81.45±7.3	76.35±7.4	74.45±7.5	70.1±3.6	75.8±3.6	78.7±3.4	73.3±3.2	72.8±3.2	0.683
BMI (Kg/m^2)	28.75 ± 2.4	30.6± 2.7	31.8±8.5	29.8±2.7	29.1±2.8	27.1±2.7	29.4±1.4	30.5±1.3	28.4 ± 1.3	28.3 ± 1.3	0.465

SBP=systolic blood pressure, DBP=diastolic blood pressure, BMI=body mass index

Table 7: Biochemical characteristics of pre-eclamptic (Cases) and normotensive (Controls) pregnant women at 1st, 2nd, 3rd trimester, and day 3 and 6 weeks post-partum in urine

Variables	Cases n=10					Controls n=11					p -value
Trimester/ Day/week	1st	2nd	3rd	Day 3	6 weeks	1st	2nd	3rd	Day3	6weeks	
Gestational Age	10.9±0.3	23.2 ±0.7	34±1.0			12.6±0.7	24.5±0.5	35.1±0.5			
Protein	Neg	Pos (++)	Pos (+++)	Pos (+)	Neg	Neg	Neg	Neg	Neg	Neg	p<0.001 AS`
Glucose	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	-
Micro albumin (g/L)	2.7± 0.5	96.0 ± 36.0	263.0± 23.1	103.60±14.3	7.40±1.5	3.90± 0.6	8.55± 0.7	31.00± 6.4	11.25± 2.5	1.39± 0.2	p<0.001

Neg= Negative, Pos= positive, n=number of participants

Table 8: Haematological indices of pre-eclamptic (cases) and normotensive (controls) pregnant women.

Variables	Cases (n=79)	Controls (n=80)	X^2	p--value
Blood group				
A	18 (25.7 %)	19 (23.8 %)	X^2 =5.402	p >0.05
B	8 (11.4 %)	14 (17.5 %)		NA
AB	2 (2.5 %)	1 (1.4 %)		
O	42 (60 %)	45 (56.3 %)		
Genotype:				
AA	56 (80 %)	72 (90 %)	X^2 =6.433	p<0.05
AC	3 (4.3 %)	5 (6.3 %)		AS
AS	11 (15.7 %)	3 (3.8 %)		

NA= No association, AS=Association, X^2=Chi squa

Table 9: Maternal and Neonatal outcome of pre-ecclamptic and normotensive pregnancy

Variables	Cases	Controls	t-value	X^2 value	p -value
	n=89	n=91			
Mean Gestation age (weeks)	35.7±0.0.4	38.4±0.2	5.696		p < 0.001*
Mode of delivery:					
Safe Vaginal Delivery	13 (18.6%)	56 (70%)		39.752	p < 0.001 AS)
Caesarian Section	57 (81.4%)	24 (30%)		39.752	p < 0.001 (AS)
Preeclampsia	80 (100%)	0 (0%)		140.0	p < 0.001 (AS)
Eclampsia	20 (25%)	0 (0%)		140.0	p < 0.001 (AS)
MortalityRecorded:					
Mother`	2 (2.9%)	0 (0%)		2.317	p > 0.05 (NA)
Neonate	11 (13.8%)	1 (1.3%)		8.084	p < 0.05 (AS)
`Baby/Neonate:					
Gender: Male	31 (44.2%)	43 (53.8%)		1.76	p->0.05 NA
Female	39 (55.7%)	37 (46.3%)		2.16	p ->0.05 NA
Mean birth Weight	2.5±0.8	3.0±0.6		4.57	p <0.05
Normal birth weight (>2.5 Kg)	39 (55.7%)	71(88.8%)		21.67	p < 0.000 (AS)
Low birth weight (1.5 - 2.5 Kg)	22 (31.4%)	8(10.0%)		21.67	
Very low birth weight (<1.5Kg)	9 (12.9%)	1 (1.3%)		21.67	
1st minute apgar score	7.9±0.4	9.8±0.1	4.290		p < 0.05
5 minute apgar score	7.9±0.4	9.8±0.1	4.290		p < 0.001
Placenta weight(Kg)	0.56±0.95	0.63±0.16	3.156		p < 0.002

NA= No association, AS= Association, t=Student's t-test, P=probability, X^2=Chi square

4.0 DISCUSSION

Pre-eclampsia is an obstetric and medical emergency because it manifests mostly at the 3rd trimester or at delivery leading to high maternal and child mortality. The earlier pre-eclampsia is detected and confirmed, the better the maternal and foetal prognosis. The identification of the features and risk factors of pre-eclampsia and the administration of preventive measures would ensure better pregnancy outcome for both mother and child. The knowledge of maternal and neonatal outcome of pre-eclamptic pregnancy will also enhance the ability to manage women who develop pre-eclampsia, the neonate at pre and post partum.

Women with previous preeclampsia that required delivery at <34 weeks' gestation are of particular concern because it is recognized that they are at greater risk of recurrent pre-eclampsia and worse fetal outcome (Kate et al., 2011). In this present study the pre-eclamptic subjectsdelivered their babies at 35.7 ± 0.04 which was significantly lower than the control group of 38.4 ± 0.2 weeks (p< 0.001). Young et al., (2007) reported an association between gestational age of 34 - 36 weeks and risk of infant mortality. These authors showed that mortality and the relative risk of neonatal death decreases with each increasing week in gestational age compared to term (40 weeks) controls. This report agrees with the findings of this study which recorded eleven neonatal deaths among the pre-eclamptic group.

Many authors have reported that maternal age has an important influence on the incidence of pre-eclampsia and on the pivotal mortality (Kwashingi et al., 2003, Davey, 1986). In our study, the maternal age range of pre-eclamptic women was 25 - 34 years. This is a sharp variation from the mean maternal age of pre-eclamptic mothers in northern Nigeria, reported to be 16 – 18 years (Abubakar,et al., 2009) and in other studies in developed countries (Ogunniyi, 2006, Kee-hak and Steinberg, 2009). Tamim et al., (2003) report of mean maternal age which predispose to pre-eclampsia agrees with our finding on maternal age The difference in predisposing maternal age might be due to differences in marriage culture, believe and religious teachings on marriage which varies from one country to another.

Parity is reported to have important influence on the vulnerability to developing pre-eclampsia and on associated perinatal mortality (Davey, 1995b). Although Mandana et al. (2007) showed that the mean parity was higher in normotensives group than in the pre-eclamptics, our present study showed similarity in both groups.

There was no significant difference in the occupational distribution between the pre-eclamptic patients and the normotensive group in our study. No association was also observed between pre-eclampsia and occupation, which is an indication that socio economic status might not be associated with the development of pre-eclampsia contrary to the report of by Salako et al., (2003). Anthropometric indices compared in both cases and controls indicate that pre-eclamptic pregnancy has no influence on these indices and therefore might not be implicated as predisposing factors to pre-eclampsia (Arnolu et al., 2005). Significant blood pressure elevation is a major clinical index of suspicion of pre-eclampsia. In this study, we reportd a significant elevation in blood pressure of pre-eclamptic group compared with the controls. This observation is characteristic of pre-eclampsia and agrees with the criteria set up by NHBPEP (2000) and the report of Sibai, (2004) for identifying potential pre-eclampsia

The simplest test in a rural setting and one of the antenatal routines for pregnant women is urinalysis to detect proteinuria or albuminuria. Our study indicates that pre-eclamptics have varying degrees of proteinuria/ albuminuria. Significant association proteinuria with vulnerability to preeclampsia was observed in this study. The proteinuria/albuminuria is biochemical index of renal compromise, a severe complication of pre-eclampsia (NHBPEP, 2000). However we observed that proteinuria or albuminuria declined at most six weeks postpartum. This suggests that detection of these biochemical indices remain characteristic clinical features of pre-eclampsia. (NHBPEP, 2000).

Our study also showed the distribution of blood group and genotype antigens among pre-eclamptics compared with the controls. Blood group antigen (ABO) distribution was comparable between cases and controls and there was no association between pre-eclampsia and blood group antigen. The relationship between blood genotype and pre-eclampsia was examined in this study. Significant association between genotype group and pre-eclampsia was indicated. Women with AC genotype may be least vulnerable to developing preeclampsia (3; 4.3 %); Women with AA genotype may be most vulnerable to developing preeclampsia (56, 80 %). This study could not explain the principle behind this association. There is paucity of information in literature on this subject. Caesarean section rates were significantly higher in the group with pre-eclampsia than in the control group 57 (81.4 %), 24 (30 %) respectively ($p < 0.001$). The pre-eclamptic group who delivered by vaginal delivery (13(18.6 %) underwent induction of labour. The indication for the induction of labour was severity of pre-eclampsia (Mandana et al., 2007). Progression to full blown eclampsia was recorded in the 20 (25 %) of cases ($P < 0.001$) compared with the controls with no incidence of eclampsia recorded. Eclampsia is a severe complication of pre-eclampsia (NHBPEP, 2000). The mean birth weight of babies was significantly($p< 0.05$) lower in women with pre-eclampsia compared with the controls Further analysis of the birth weight revealed that babies of the cases had low birth weight 22 (31.4 %), and very low birth weight 9 (12.9 %) compared with the controls ($p < 0.001$). The common cause of low birth weight is intra uterine growth restriction (IUGR) that may be precipitated by Pre-eclampsia (Kate, 2011). The consequence of reduced birth weight increased neonatal mortality risk (Resnik et al., 1963, Resnik, 2002). Independent studies (Cnattingius et al., 1997, Odegård et al., 2000) reported an association between reduced birth weight and pre eclampsia. In this present study, two maternal and eleven neonatal deaths were recorded among pre-eclamptic group compared with the normotensive pregnant group. Maternal death occasioned by the severe consequences of pre-eclampsia complications is an extreme feature of this pregnancy disorder (Cynthia et al., 2003, Ogunniyi, 2006). The one and five minute's apgar score of babies of pre-eclamptic mothers was significantly lower compared with the controls. ($p < 0.05$, $p < 0.001$ respectively). We measured the placenta weight of the babies born from both type of pregnancies and observed the placenta weight of pre-eclamptic babies were significantly lower compared with babies of healthy nomortensive pregnant women ($p < 0.002$).

5. SUMMARY AND CONCLUSION

We conclude that pre-eclamptic pregnant women demonstrated elevated blood pressures, significant micro-albuminuria, pre- term delivery by caesarean section, recorded high maternal death and significant neonatal death. Pregnant women with AA genotype may be vulnerable to developing pre-eclampsia. However, the mechanism behind this association could not be explained by this study. In addition, babies born from pre-eclamptic pregnancy had low birth weight, apgar score and placenta weight.

CONFLICT OF INTEREST STATEMENT

The authors declare no potential conflict of interest with respect to the research, authorship and/or publication of this article.

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