Perinatal Outcome in Patients With Pre-Eclampsia in Benin City, Nigeria.

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Abstract

Objective: To determine the prevalence of pre-eclampsia and examine its influence on perinatal outcome among Nigerian women.
Methods: Among 3780 deliveries over a two-and-half year period, 212 singleton infants were born after pre-eclamptic pregnancies. We compared the perinatal outcome with those of 636 control infants. Pre-eclampsia was defined as (1) an increase in either systolic or diastolic blood preasure (BP) greater than 30mm Hg or 15mmHg respectively above the booking BP plus proteinuria (> 1+) without simultaneous urinary tract infection. (2) an intrapartum BP > 140 /90mmHg obtained on at least two occasions not less than 6 hours apart during delivery plus presence of proteinuria as indicated in (1) above.
Results: The prevalence of pre-eclampsia was 5.6%; corresponding to 77.9% of all cases of hypertensive disorders in pregnancy. Pre-eclampsia occurred most frequently among women aged 20-24 years (2.7%); corresponding to 48.6% of all cases and whose parity were zero (3.6%); corresponding to 64.2% of all cases. The perinatal mortality rate, the preterm delivery rate and the incidence of birth asphyxia were separately significantly higher in mothers with pre-eclamptic pregnancies than in controls. Mean birth weight was significantly lower in infants delivered after pre-eclamptic pregnancies (2995 + 340g) than after control pregnancies (3105 + 301g). Presence of heavy proteinuria (= 3+) potentiated the adverse effects of pre-eclampsia on perinatal outcome.
Conclusion: Pre-eclampsia commonly complicates pregnancy in young primiparous women. It affects the fetus adversely resulting in fetal growth restriction, preterm delivery, birth asphyxia and sometimes, fetal demise.

Key Word: Pre-Eclampsia, Hypertension, Pregnancy, Proteinuria [Trop J Obstet Gynaecol, 2004; 21:148-152]

Introduction

Pre-eclampsia is a progressive disease of pregnancy characterised by signs of hypertension and proteinuria. Defective placentation may precede these signs. [1] Shallow trophoblastic invasion of decidual arteries can precipitate pre-eclampsia, reduce placental perfusion and cause insufficient transport of nutrients. [2] It is speculated that fetal growth restriction (FGR) depends on abnormal placental development. [3, 4] Pre-eclampsia affects the fetus adversely resulting in FGR, preterm delivery, birth asphyxia and sometimes, fetal demise. [1,3-8]

The perinatal risks are greater in developing than in developed countries as well as among Blacks than Whites. [7, 9, 10] Majority of the studies describing the perinatal outcome of pre-eclampsia involve Caucasians. Few local studies have examined the perinatal outcome of pre-eclampsia. Where local studies are available, details are lacking. This is ironical, in view of the reported higher frequency of adverse perinatal outcome in Blacks compared with Whites as well as the greater perinatal risks in developing compared with developed countries. [7, 9, 10] There is therefore a need for a more detailed description of the influence of pre-eclampsia on perinatal outcome among Africans. The purpose of this study is to determine the prevalence of pre-eclampsia and described its perinatal outcome among Nigerian women.

Patients and Methods

In this case-control study, conducted at the University of Benin Teaching Hospital (UBTH), Benin City the study population included all infants delivered by Nigerian women with pre-eclampsia during the study period, 1st January, 1992 to 30th June, 1994. For each case of pre-eclampsia three consecutively admitted healthy normotensive pregnant mothers were recruited as controls following informed verbal consent. The basis for comparison was the state of non-hypertension in the mother.

In conformity with a previous study [11] in our centre and hence for ease of comparison of result the criteria for diagnosis of pre-eclampsia and inclusion into the study were:

1. An increase in either systolic or diastolic blood pressure greater than 30mmHg or 15mmHg respectively above the booking blood pressure (BP) plus proteinuria (using albustix) of one plus (1 +) and above, without simultaneous urinary tract infection.
2. An intrapartum BP = 140/90mmHg obtained on at least two occasions not less than six hours apart during delivery plus presence of proteinuria as indicated in (1) above.
3. Mothers of control infants were normotensive throughout pregnancy and upon admission for delivery and had no know exposure to diuretics and drugs with anti-hypertensive properties.
4. Both groups of mothers were Nigerians who did not smoke and were also free of major diseases

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Such as diabetes mellitus, sickle cell anaemia, renal failure, heart disease and bronchial asthma. Women with multiple gestations were also excluded.

5. In both groups of infants those with Rhesus isoimmunisation and major congenital abnormalities were excluded.

Pre-eclampsia was classified based on BP and degree of proteinuria into subgroups as follows: (i) Mild to moderate pre-eclampsia is an increase in BP as indicated above plus proteinuria of 1 + or 2 + on a dipstick. (ii) Severe pre-eclampsia is an increase in BP as indicated above plus proteinuria of = 3+. During the study period, the following therapeutic approaches were used: for mild to moderate pre-eclampsia bed rest as well as sedative (diazepam) was administered while for severe pre-eclampsia, intravenous hydrallazine was added followed by delivery at a suitable fetal maturity (if clinical condition permits). Supportive therapy, monitoring of the patient and delivery were according to standard obstetrical practice at the UBTH. Data on general obstetrical population were extracted from the relevant delivery registers. The maternal antenatal cases-notes were also examined and relevant information extracted.

At birth, all babies (study and control groups) were given routine care or resuscitation as indicated by the baby's clinical condition. Gestational age was determined by maternal dates and Dubowitz et al [12] gestational age examination of the infant 12 to 24 hours after birth by one of the authors (ANO). If a discrepancy of more than 2 weeks existed the gestational age was assigned from the Dubowitz score. All study babies were admitted into the Special Care Baby Unit (SCBU) following delivery. Attention was given to their clinical state and their morbidities in the first 7 days of life were documented. A similar attention was given to the clinical state of the control babies and their morbidities in the first 7 days of life were also documented. Each neonate (study and control) was weighed naked within the first hour of birth using the Waymaster scale. The scale used was checked daily for zero error and with known weights for reliability. The birth length was measured on Holtain infant measuring table. From the data on birth weights and lengths, the ponderal indices of all growth retarded babies, using the Miller and Hassanein criteria [13] were calculated. The head and mid-upper-arm circumferences were measured with an inelastic tape. The result of each measurement was carefully documented. The Apgar scores of both groups of infants were determined using the Apgar Scoring System.[14] Supportive therapy was provided for symptomatic infants with oxygen, intravenous fluid (5% dextrose in water at 75% maintenance rate) and incubator nursing. Where necessary infants were appropriately screened for sepsis and treated with antibiotics.

In this study, a preterm delivery was taken as a pregnancy which lasted less than 37 weeks of gestation; a small-for-gestational age (SGA) infant was one whose weight was less than the 10th percentile for gestational age by Battaglia and Lubchenco's criteria [15]. Ponderal index is a ratio of the weight to the length of the baby and it is expressed mathematically as the weight in grammes divided by the cube of the length in centimetres multiplied by 100. Birth asphyxia was taken as an Apgar score of 6 and below in the first minute of life.

Statistical Methods

Descriptive analysis was carried out and z-score test and Student 't'test were used in ascertaining the level of significance of differences, which was set at $P< 0.05$.

Results

Prevalence of pre-eclampsia

Out of the 3780 pregnancies delivered at UBTH during the study period, 212 of them were complicated by pre-eclampsia; thus giving an overall prevalence of 5.6%. Pre-eclampsia accounted for 77.9% (212 /272) of all cases of hypertensive disorders in pregnancy. In women aged 20-24 years the prevalence of pre-eclampsia was 2.7% (212/ 3780); corresponding to 48.6% (103/ 212) of all cases of pre-eclampsia. The prevalence in para-zero women was 3.6% (136/ 3780); corresponding to 64.2% (136/ 212) of all cases of pre-eclampsia. Among the 212 pre-eclamptic pregnancies, 121 (57.1%) were classified as mild to moderate pre-eclampsia while the remaining 91 (42.9%) were classified as severe pre-eclampsia. There were 636 normotensive mothers recruited as controls during the study period.

Maternal Characteristics

The pre-eclamptic and normotensive mothers did not differ significantly in terms of maternal height, marital or socio-economic status.

Maternal characteristics	Mothers with Pre-eclampsia No of cases (% of total)	Control mothers No of cases (% of total)
Maternal age (years)		
15 -19	27 (12.7)	30 (4.5)
20 -24	103 (48.6)	18 (28.9)
25 -29	55 (25.9)	242)38.1)
30 -34	23 (10.9)	130 (20.4)
35 -39	4 (1.9)	47 (7.4)
> 40	0 0	3 (0.5)
Total	212 (100)	636 (106)
Maternal parity		
0	136(64.2)	209 (32.9)
1	33 (15.6)	193 (30.3)
> 2	43 (20.2)	234 (36.8)
TOTAL	212 (100)	636 (100)

Mean birth weight of infants

The mean birth weight for male babies of pre-eclamptic and normotensive mothers were 2851 + 402g and 3120 + 304g respectively ($t = 4.945$ $df = 5$ $p<0.01$).

For female babies delivered to pre-eclamptic and normotensive mothers their mean birth weights were 2755 + 306g and 3001 + 350g respectively (t = 5.968 df =5 p<0.01).

Table 2. Comparison of Mean Weight, Length, Head and Mid-upper-arm Circumferences at Birth in Infants Born After Pre-eclampsia and After Control Pregnancies.

Anthropometric parameters	Live infants of Mothers with preeclampsia group n =204	Live infants Of Control n = 627	Statistical significance (Studentt-test/ p)
MBWT ± SD	2995 ± 340g	3105 ± 30g	18.518 (<0.001)
MBLT ± SD	48.7 ± 1.6cm	46. 1 ±1.4cm	2.408 (>0.05)
MHC ± SD	34.3 ± 0.83 cm	34.5 ± 0.76cm	0.678 (>0.05)
MMUAC ± SD	8.9 ± 0.50 cm	9.11 ±1.45cm	3.935 (<0.05)

MBWT = Mean birth weight.
MBLT = Mean birth length
MHC = Mean head circumference
MMUAC= Mean mid-upper-arm circumference
SD=Standard deviation.

Preterm deliveries in pre-eclampsia

Out of the 65 preterm deliveries 21 (32.3%) were undertaken as a treatment for maternal pre-eclampsia while the remaining 44 (67.7%) were spontaneous preterm deliveries. All the iatrogenic preterm deliveries occurred in women with severe form of pre-eclampsia. Pre-eclampsia accounted for 86.7% (56/ 75) of all cases of preterm deliveries in mothers with hypertensive disorders in pregnancy.

Table 3:
Comparison of Perinatal Outcome in Infants Born After Pre-eclampsia and After Control pregnancies.

Perinatal Parameters	Infants Of Mothers With Pre Eclampsia N= 212	Infantsof Control Group N=636	Statistical Significance Z-score (p Value)
o live newborn (per 1000 delivery)	204(962.3)	627 (985.8)	1.374 (>0.05)
Stillbirth (per 1000 delivery)	8 (37.7)	9 (14.2)	1.722(>0.05)
First week Deaths (per 1000 delivery)	7 (33.0)	11 (17 .3)	1.203 (>0.05)
Perinatal mortality rate (per 1000 delivery)	15 (70.8)	20 (31.4)	2.113 (<0.05)
Preterm delivery rate (per 1000 delivery)	65 (306.6)	79 (124.2)	5.340 (<0.001)
Births asphyxia (per 1000 live births	48 (235.3)	47 (75.0)	5.172 (<0.001)
Caesarean section rate (per 1000 delivery)	76 (358.5)	156 (245.3)	3.073 (< 0.01)

Small-for-gestational age (SGA) delivery rate and mean ponderal index.

The rates of delivery of SGA infants were 42.5 (9/ 212) per 1000 live births and 23.6 (15/ 636) per 1000 live births for pre-eclamptic and normotensive mothers respectively (Z-score =1.266 P > 0.05). Mean ponderal index (SD) was 2.28 (0.17) with a range of 2.20 2.47 in SGA infants of pre-eclamptic mothers while the mean ponderal index (SD) was 2.45 (0.14) with a range of 2.38-2.55 for SGA babies of normotensive mothers (t = 0.558 P > 0.05).

Table 4: Influence of Severity of Pre-eclampsia on Perinatal Outcome.

PERINATAL PARAMETERS	IMMMP n = 121	IMSP n = 91	Statistical Significance Z score (P value)
No of live birth(per1000 delivery).	118 (975.2)	86 (945.1)	1.079 (>0.05)
Still birth(per1000delivery)	3 (24.8)	5 (54.9)	1. 079 (>0.05)
First week Deaths(per 1000 delivery)	2 (16.5)	5 (54.9)	1.426 (>0.05)
Preterm delivery rate(per 1000 delivery)	22 (181.8)	43 (472.5	2.373 (<0.05)
Birth asphyxia (pEr1000live births)	20 (169.5)	28 (325.6)	2.607 (<0.01)
Caesarean section rate(per 1000 delivery)	25 (206.6)	51 (560.4)	5.537 (<0.001)

IMMMP = Infants of mothers with mild to moderate pre eclampsia
IMSP = Infants of mothers with severe pre-eclampsia

Rate of still births Of the 212 babies delivered by pre-eclamptic mothers 8 (3.8%) were still births: 6 (75.0%) fresh and 2 (25.0%) macerated still births. Of the 636 babies delivered by normotensive mothers 9 (1.4%) were still births: 4(44.4%) fresh and 5 (55.6%) macerated still births. There were therefore 204 and 627 live babies delivered by pre-eclamptic and normotensive mothers respectively that were available for analysis.

Discussion

The 5.6% prevalence rate of pre-eclampsia being reported in this study agrees with 4.78% reported in 1980 by Diejomaoh et al [11] in the same centre. Thus the prevalence of pre-eclampsia has not shown any appreciable change over time. This suggests that the specific epidemiologic correlates of pre-eclampsia have not been influenced by time since the other factors remain unchanged. Maternal biologic factors such as age and parity influenced the occurrence of pre-eclampsia. The highest prevalence rate of pre-eclampsia was found among women aged 20- 24 years. Further confirming that younger mothers were more predisposed to developing pre-eclampsia. As in other studies, [6,9,10,16] pre-eclampsia was most commonly found in primiparous women indicating that it is a common complication of pregnancy in young primiparous women.

Pre-eclamptic pregnancies are associated with a significantly higher rate of caesarean delivery than normotensive pregnancies. Although a similar finding was reported by Diejomaoh et al [11] the rate was lower in their study. This probably reflects a more liberal use of caesarean section as a mode of delivery in pregnancies

Complicated by pre-eclampsia over time in our centre. In this study, as in others, [5, 6, 8, 18] pre-eclampsia is associated with significant increase in risk of delivery of preterm infant. The higher incidence of preterm delivery among women whose pregnancies were complicated by pre-eclampsia may be partly explained by the iatrogenic preterm delivery as a treatment for the maternal disease. In fact, in this series, 32.3% of all the preterm deliveries were iatrogenic. An additional explanation is the speculation that placental insufficiency (secondary to pre-eclampsia) in itself may trigger labour prematurely leading to spontaneous preterm delivery. [19] The more severe the pre-eclampsia the higher the incidence of delivery of preterm infant. This may be due to the fact that all the iatrogenic preterm deliveries occurred in mothers with severe form of pre-eclampsia

The mean birth weight was significantly lower in infants delivered by pre-eclamptic mothers compared with those delivered by their normotensive counterparts. Also the risk of delivery of small-for-gestational age (SGA) infant was 1.8 times higher in pre-eclamptic pregnancies compared with control pregnancies thereby confirming reports of other investigators. [5, 6, 7] This may be accounted for by the cumulative effect of increased incidence of fetal growth restriction and preterm delivery observed among infants delivered by pre-eclamptic mothers. Assessment of ponderal indices further confirmed the occurrence of intrauterine malnutrition among babies delivered after pre-eclamptic pregnancies. Using Miller and Hassanein criteria [13] the ponderal index was low indicating disproportionate intrauterine growth retardation in pre-eclampsia. This may be explained by the fact that in pre-eclampsia, the resultant insult on the fetus occurs later in pregnancy (after 20 weeks of gestation) thereby leading to a greater reduction in fetal weight gain than in length growth.

The increased incidence of birth asphyxia among infants delivered by mothers whose pregnancies were complicated by pre-eclampsia could be due to the fact that the babies having suffered from the adverse effects of uteroplacental insufficiency were then subjected to the additional stress of labour and delivery which led to further compromise of the feto-placental circulation with subsequent birth asphyxia. The more severe the maternal proteinuria, the higher the incidence of birth asphyxia thus further confirming the results of previous studies. [6,7,10,18] In keeping with other reports [6,7,11,18] there was a two-fold increase in perinatal mortality rate (PMR) in pregnancies complicated by pre-eclampsia. The adverse effect on PMR was potentiated by the presence of heavy proteinuria (> 3+). Previous studies have reported similar finding. [6, 7, 10, 18] The explanation for this observation may be found in the reports of several investigators who have shown that there might be a direct relationship between the degree of proteinuria and the placental lesion. [7, 20, 22] In addition, it might also be that nephrotic range proteinuria leads to depletion of the intravascular volume which has an adverse effect on fetal growth and survival. [6,8]

References

1. Clegg GR, Watters DAK. Intensive care management of eclampsia and severe pre-eclampsia. *Postgraduate Doctor Africa* 1990; 12 : 76-85.
2. Roberts JM, Redman CW. Pre-eclampsia: More than pregnancy induced hypertension. *Lancet* 1993; 341: 1447-1451.
3. Ness RB, Roberts JM. Heterogeneous causes constituting the single syndrome of pre-eclampsia: A hypothesis and its complications. *Am J Obstet Gynecol* 1996; 175: 1365 1370.
4. Khong TV. Acute atherosis in pregnancies complicated by hypertension, by small-for-gestational age infants and by diabetes mellitus. *Arch Pathol Lab Med* 1991; 115:722-725.
5. Long PA, Abell AD, Beischer NA. Fetal growth retardation and pre-eclampsia. *Brit J Obstet Gynecol* 1980; 87:13-18.
6. Lin C, Linderheimer MD, River O, Moawad AH. Foetal outcome in hypertensive disorders of pregnancy. *Am J Obstet Gynecol* 1982; 142: 255-260.
7. Naeye RL, Friedman EA. Cause of perinatal death associated with gestational hypertension and proteinuria. *Am J Obstet Gynecol* 1979; 133:8-10.
8. Odegard RA, Vatten LJ, Nilsen ST, Salvesen KA, Austgulen R. Pre-eclampsia and fetal growth. *Obstet Gynecol* 2000; 96 : 950-955.
9. Upadyaya N, Obstetric problems in rural India. *Journal of Obstetrics and Gynaecology* 1975; 25:135-139.
10. Page EW, Christainson RA. Influence of blood pressure changes with or without proteinuria upon outcome of pregnancy. *Am J Obstet Gynecol* 1976; 126: 821-827.
11. Diejomaoh FME, Omene JA, Omu AE. Pre-eclampsia at the University of Benin Teaching Hospital-A review of 226 cases. *J Trop Obstet Gynecol* 1980; 1:90-96.
12. Dubowitz LMS, Dubowitz V, Goldberg C. Clinical assessment of gestational age of the newborn infant. *J Pediatr* 1970; 77:1-10.
13. Miller H, Hassanein K. Diagnosis of impaired fetal growth in newborn infants. *Pediatrics* 1971;48: 511-517.
14. Apgar V. A proposal for new method of evaluation of the newborn infant. *Current Research in Anaesthesia and Analgesia* 1953;32:260-267.
15. Battaglia FC, Lubchenco LO.A practical classification of newborn infants by weight and gestational age. *J Pediatr* 1967; 71:159-165.
16. Chesley LC. False steps in the study of pre-eclampsia. *J Reprod Med* 1979; 23:151-153.
17. Brazy JE, Grimm JK, Little VA. Neonatal manifestations of severe maternal hypertension occurring before thirty sixth week of pregnancy. *J Pediatr* 1982; 100:265-267.
18. Acien P, Lloret M. Perinatal morbidity and mortality in pregnancy
19. Hypertensive disorders: prognostic value of the clinical and laboratory finding. *Int J Obstet Gynecol* 1990; 32:229-135.
20. Mesani KM, Parikh MN. Pre-eclampsia In: *A Textbook of Obstetrics.* Masani KM, Parikh MN (eds) 4th edition Bombay: Popular Prakhashan Publishers Ltd 1986 pp

217-229.

21. Fisher KA, Luger A, Spargo BH, Linheimer MD. Hypertension in pregnancy: clinical pathological correlation and remote prognosis. *Medicine* 1981; 60: 267-276.
22. Ghidini A, Salafia CM, Pezzullo JC. Placental vascular lesions and likelihood of diagnosis of pre-eclampsia. *Obstet Gynecol* 1997; 90: 542-545.
23. Teasdale F. Histomorphometry of the human placenta in maternal pre-eclampsia. *Am J Obstet Gynecol* 1985; 152: 25-31.