

NEONATAL MORBIDITY PATTERN IN INFANTS BORN IN BENIN CITY TO NIGERIAN MOTHERS WITH HYPERTENSIVE DISORDERS IN PREGNANCY

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ABSTRACT

Background: Hypertensive disorders in pregnancy are worldwide in distribution with an incidence that varies depending on hospital population and criteria cited for diagnosis

Methods: In a case-control study, the neonatal morbidities of 256 live newborn infants of hypertensive mother were compared with those of 804 infants of normotensive mothers.

Results: The incidence of some neonatal morbidities such as birth asphyxia, neonatal seizures, neonatal polycythaemia and hyperbilirubinaemia were significantly higher among babies born to hypertensive mothers compared with those born to their normotensive counterparts. The Caesarean delivery rate was also significantly higher in hypertensive than in normotensive mothers.

Conclusion: Pregnancies complicated by hypertension are associated with an increase in neonatal morbidity. The implication is that newborn infants of hypertensive mothers represent a high-risk group requiring close observation and attention, aimed at prevention and prompt treatment of these morbidities.

Keywords: Hypertensive disorders in pregnancy; neonatal morbidities. (Accepted 30 October 2006)

INTRODUCTION

Hypertensive disorders in pregnancy (HDP) are worldwide in distribution. The reported incidence of HDP varies from 2.02% in Spain¹ to values high as 41.9% in South Africa²; depending on selection of hospital population and the criteria used for confirming the diagnosis.^{3,4} Both the incidence and degree of severity of HDP are reported to be higher in Blacks compared with Whites.^{2,5,6}

Hypertension in pregnancy is believed to predispose to acute or chronic uteroplacental insufficiency resulting in antepartum and intrapartum fetal hypoxia, which in turn is associated with several adverse outcomes such as premature birth, intrauterine growth restriction (IUGR), fetal demise, placental abruption and Caesarean delivery.⁹⁻¹⁴

Characterisation of the neonatal consequences of maternal hypertension is complicated by the administration of anti-hypertensive and anti-convulsant medications to the mother.^{15,16} On the other hand, there are studies with no increase in neonatal morbidity in infants born to mothers whose pregnancies were complicated by hypertension.^{15,16} Despite the fact that both the incidence and the degree of severity of HDP have been reported to be higher in Blacks compared with Whites,^{2,5,6} only very few local studies have examined the neonatal

morbidity pattern in the resultant newborn infants. There is, therefore, a need to document the neonatal morbidity pattern of newborn infants born to Nigerian mothers whose pregnancies were complicated by hypertension. Thus the knowledge gained, will help accurate anticipation and treatment of neonatal problems.

PATIENTS AND METHODS

All Nigerian mothers with hypertensive disorders in pregnancy (HDP) who presented at the University of Benin Teaching Hospital (UBTH) during the study period, 1st January, 1992 to 30th June, 1994, were recruited into the study. For each case of hypertension, three consecutively admitted healthy normotensive pregnant mothers were recruited as control following informed consent. Criteria for diagnosis of HDP and inclusion into the study include the following;

1. A documented history of hypertension (blood pressure = 140/90 mmHg) before pregnancy¹⁹.
2. An increase in either systolic or diastolic blood pressure greater than 30mmHg or 15mmHg respectively above the booking blood pressure¹⁹.
3. An intrapartum blood pressure = 140/90mmHg obtained on at least two occasions not less than six hours apart during delivery,¹⁹

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4. Mothers of control infants were normotensive throughout pregnancy and upon admission for delivery and had no known exposure to sedatives, diuretics and drugs with anti-hypertensive properties.
5. Both groups of mothers did not smoke and were free from major diseases such as diabetes mellitus, sickle cell anemia, renal failure, heart disease and bronchial asthma. Twin pregnancies were also excluded.
6. In both groups, infants who had Rhesus isoimmunisation and major congenital abnormalities were excluded.

Patients whose hypertension started early in pregnancy or preceded pregnancy were identified and subsequently followed up by the Obstetricians as an out-patient unless they developed complication requiring hospitalisation. Clinic visits were scheduled every 2 weeks thereafter. At each visit, the blood pressure was checked and urine test for protein was performed using albutix and the results were recorded onto a standardised form.

In the classification of HDP, the method recommended by Welt and Crenshaw²⁰ with modification by Acien²¹ was used because it was more closely related to the method adopted for documentation at the UBTH. During the study period the following therapeutic approaches were used:

i) for transient hypertension rest and/or oral diazepam was administered, (ii) for mild pre-eclampsia rest and sedative (diazepam) was administered, (iii) for severe pre-eclampsia I.V hydrallazine was added followed by delivery at suitable foetal maturity (if clinical condition permits) (iv) for eclampsia diazepam infusion (titrated against level of consciousness) and I.V hydrallazine followed by delivery after control of seizure was the mode of therapy. (v) Mothers with chronic hypertension with superimposed pre-eclampsia had treatment similar to that of the mothers with severe pre-eclampsia. (vi) Those with chronic hypertension had alpha-methyl-dopa orally. Supportive therapy, monitoring of the patient and delivery were according to standard obstetric practices at the UBTH. Following delivery all babies had 1- minute and 5- minute Apgar scores and the resuscitation was determined by the baby's clinical condition. Infants whose 1- minute or 5- minute Apgar Scores were =3 or =5 respectively and had seizures were treated with phenobarbitone, 20mg/kg/day stat and subsequently maintained on 8mg/kg/day 8 hourly. Where despite this mode of initial therapy there were protracted seizures for which no aetiological factor could be

identified, diazepam 0.25mg/kg stat was added to this therapy. Within the first hour after birth, Supportive therapy such as oxygen and intravenous fluid (5% dextrose in water at 75% maintenance rate) was provided as determined by the baby's clinical condition. Where necessary infants were appropriately screened for sepsis and treated with Antibiotics. Babies were weighed naked within the first hour after birth using the Waymaster Scale. The scale was checked daily for zero error and with known weights for reliability. The gestational ages of all babies were determined by maternal dates using the last menstrual period and a Dubowitz Scoring System.²² If a discrepancy of more than two weeks existed, the gestational age was assigned from the Dubowitz score. Attention was given to the clinical state of both groups of babies and their morbidities in the first 28 days after birth were documented. Normal principles of neonatal care were followed.

STATISTICAL METHODS

The data were analysed by calculating percentages, means and standard derivations. Chi-square test, Student t test and Z test were used in ascertaining the level of significance between two differences, which was set at $P < 0.05$.

DEFINITION OF TERMS

For this report, preterm delivery was taken as a pregnancy which lasted less than 37 weeks of gestation.

RESULTS

Out of the 3,780 women who delivered at the University of Benin Teaching Hospital (UBTH) during the study period, 272 (7.2%) of them had pregnancies complicated by hypertension. There were 816 normotensive mothers recruited as control during the study period. Comparing the hypertensive mothers with their normotensive counterparts there were 16(5.9%) still births versus 12(1.5%) still births $\chi^2 = 15.836 P < 0.01$. There were therefore 256 and 804 live babies delivered by hypertensive and normotensive mothers respectively that were available for analysis.

Incidence Of Low Birth Weight (Lbw), Preterm And Small For Gestational Age (Sga) Deliveries.

Comparing hypertensive with normotensive mothers the incidence of LBW delivery was 39.5% (101/256) versus 17.9% (144/804), Z score = 6.465 $P < 0.001$; preterm delivery 29.3% (75/256) versus 12.1% (97/804) Z score = 5.201 $P < 0.001$ and SGA delivery 8.2% (21/256) versus 5.5% (44/804) Z score = 1.426 $P > 0.05$. Of the 75 preterm deliveries, 27 (36.0%) were iatrogenic as a mode of therapy for the maternal hypertensive diseases while the remaining 48

(64.0%) were spontaneous.

Further details on LBW are shown in table II

Mean Birth Weight

The mean birth weight for male infants of hypertensive and normotensive mothers were 2.85 ± 0.40 g and 3.14 ± 0.03 g respectively. ($t = 4.95$ $P < 0.001$). For female infants of hypertensive and normotensive mothers the mean birth weights were 2.75 ± 0.30 kg and 3.0 ± 0.35 kg respectively ($t = 5.96$ $P < 0.001$).

Table 1 shows that the mean peak systolic and diastolic blood pressures were significantly higher in hypertensive mothers compared with their normotensive counterparts.

Table II shows that the overall incidence of delivery of LBW infant was significantly higher in hypertensive compared with normotensive mothers. Table III shows that the incidence of birth asphyxia, hyperbilirubinaemia, polycythaemia and septicaemia were respectively significantly higher in infants of

Table I: Blood Pressure (BP) Values In Hypertensive And Normotensive Mothers

BLOOD PRESSURE (BP) in mmHg	Hypertensive mothers n = 272	Normotensive mothers n=816	Statistical significance t (P value)
Means (SD) peak systolic BP	168 (12)	109 (13)	43.633 (<.001)
Means (SD) peak diastolic BP	108 (11)	74 (8)	47.001 (<.001)
Range of systolic BP	140 210	90 120	
Range of diastolic BP	90 135	60 85	

SD = Standard deviation

Table II: Comparison of Rate Of Delivery of Low Birth Weight Infants Among Hypertensive And Normotensive Mothers

Variable	IHM(n=256)		INOM (n=804)		Statistical SIGNIFICANCE	
	No of LBW	%of LBW	No of LBW	% of LBW	Z-Score	(P value)
ELBW	8	7.9	9	6.3	0.476	(>0.05)
VLBW	22	21.8	13	9.0	1.557	(>0.05)
MDLBW	35	34.7	58	40.3	1.274	(>0.05)
MILBW	36	35.6	64	44.4	1.394	(>0.05)
TOTAL LBW	101	100	144	100		

IHM = Infants of hypertensive mothers

INOM = Infants of normotensive mothers

LBW = Low birth weight (birth weight < 2500g)

ELBW = Extremely Low Birth weight (birth weight between 500-999g)

VLBW = Very low birth weight (birth weight between 1000-1499g).

MOLBW = Moderately low birth weight (birth weight between 1500-1999g)

MILBW = Mild low birth weight (birth weight between 2000-2499g)

However, when analysed according to the various sub groups of LBW, none of the differences reached statistical significance.

Table III: Comparison Of Neonatal Morbidities In Infants Of Hypertensive And Normotensive Mothers

MORBIDITY	IHM n = 256 No. (%)		INOM n = 804 No. (%)		STATISTICAL SIGNIFICANCE Z-Score (P value)	
Birth asphyxia (1-minute Apgar score =6)	70 (27.3)	61 (7.6)	61 (7.6)	6.707	<0.001	
- Mild (Apgar score 6)	33 (8.6)	24 (10.5)	24 (10.5)	3.023	<0.01	
- Moderate (Apgar score 4-5)	27 (10.5)	24 (3.0)	24 (3.0)	3.735	<0.001	
- Severe (Apgar score = 3)	21 (8.2)	13 (1.6)	13 (1.6)	3.714	<0.001	
Neonatal Seizure	9 (3.5)	4 (0.5)	4 (0.5)	2.553	<0.001	
Hyperbilirubinaemia (SB = 12mg/dl)	36 (14.1)	45 (5.6)	45 (5.6)	3.662	<0.001	
Polycythaemia (Venous PCV = 65%)	22 (8.60)	18 (2.2)	18 (2.2)	3.499	<0.001	
Septicemia (Positive blood culture)	23 (9.0)	27 (3.4)	27 (3.4)	2.948	<0.01	
Hypoglycaemia (whole blood glucose < 40mg/dl)	7 (2.7)	9 (1.1)	9 (1.1)	1.572	>0.05	
Hypothermia (Rectal temperature = 35.5°C)	5 (2.0)	9 (1.1)	9 (1.1)	0.948	>0.05	

IHM = Infants of hypertensive mothers

INOM = Infants of normotensive mothers

SB = Serum bilirubin

PCV = Packed cell volume

Table IV: Mode of Delivery In Hypertensive And Normotensive Mothers

Mode of delivery	Hypertensive mothers		Normotensive mothers		Statistical Significance	
	No.	%	No.	%	X ²	(P value)
Spontaneous/oxytocin						
Induced vertex delivery	157	57.7	580	71.1	17.460	(<0.)
Caesarean delivery	97	35.7	201	24.6	12.478	(<0.05)
Forceps delivery	11	4.0	16	2.0	8.273	(>0.05)
Vacuum extraction	7	2.6	16	2.3	0.629	(>0.05)
Total	272	100	816	100		

hypertensive mothers compared with their counterparts whose mothers were normotensive. Table IV shows that hypertension in pregnancy is associated with a significant increase in Caesarean delivery.

DISCUSSION

The 7.2% prevalence rate of hypertensive disorders in pregnancy reported here falls within the range of 1.0% to 16.4% reported for Nigeria by the World Health organization²³ but a lot lower than the 41.9% reported among black women in South Africa². This can be explained on the basis of the selection of hospital population. Their health facility served as a regional centre for all cases of severe hypertension among black women in the region. In comparison, although University of Benin Teaching Hospital (UBTH) also serves as a referral centre for high-risk groups in Benin City and its environs, its extent and scope of coverage are narrower accounting for the lower prevalence rate found in this study. Our findings indicate that pregnancies complicated by hypertension were associated with a significantly higher incidence of delivery of both preterm and low birth weight (LBW) infants thereby further confirming the results of other studies.^{1,7,8,10-14} The high incidence of LBW infants among hypertensive mothers might have resulted from the cumulative effect of intrauterine growth restriction and preterm delivery in this group. Indeed some of our hypertensive mothers were delivered before term as a treatment for the maternal hypertension.

This study further confirms that hypertension in pregnancy is associated with an increase in incidence of neonatal morbidity. For instance, the rate of occurrence of birth asphyxia, hyperbilirubinaemia, polycythaemia and septicaemia were respectively significantly higher

in infants of hypertensive mothers compared with their counterparts whose mothers were normotensive. Similar findings have been reported by other investigators.^{7, 9,14,24,25} In contrast with another study,²⁶ there was no significant difference in incidence of neonatal hypoglycaemia. This discrepancy may be explained by the fact that in our centre, during the intrapartum period, relatively more mothers in the hypertensive group had intravenous fluid (5% dextrose in water) than mothers in the normotensive group. This therefore may have reduced the frequency of occurrence of neonatal hypoglycaemia in our infants delivered to hypertensive mothers because of transplacental transfer of glucose just before delivery. The increased incidence of birth asphyxia among babies hypertensive mothers could be due to the fact that the babies might have suffered from the adverse effects of utero-placental insufficiency and that the additional stress of labour and delivery led to further compromise of the fetoplacental circulation with subsequent birth asphyxia. In addition, the diazepam infusion administered intrapartum to some of the hypertensive mothers may have contributed to the depressed Apgar Score recorded in this group of babies.

The higher incidence of significant hyperbilirubinaemia among infants of hypertensive mothers compared with those of normotensive mothers may be explained by the high bilirubin load due to large red cell mass (polycythaemia) and the impaired conjugation of bilirubin in preterm infants. Both conditions were commoner among infants of our hypertensive mothers. The higher incidence of polycythaemia observed in infants of hypertensive mothers may be related to the hypoxia suffered by these fetuses as a result of placental insufficiency engendered by the maternal hypertension. The explanation for the higher incidence of septicaemia

in infants of hypertensive mothers may be found in the results of some studies which have shown that there is reduction in neutrophil production, leading to increased vulnerability to infections in babies delivered following maternal hypertension in pregnancy.^{24,27-29} In addition, the higher incidence of preterm delivery and birth asphyxia in this group, with its attendant inevitable excessive handling during resuscitation may contribute to the higher incidence of septicaemia observed in these infants. In this study, as in others,^{9, 14, 24} there was a significantly higher rate of Caesarean delivery in hypertensive women compared with their normotensive counterparts. However, the Caesarean delivery rate reported here among hypertensive mothers is three times higher than that reported previously from the same centre by Diejomaoh et al,⁹ indicating a more liberal use of Caesarean section as a mode of delivery in women with hypertension in pregnancy.

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