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RESEARCH ARTICLE

Maternal Hypertension and Neonatal Outcomes Of Small For Gestational Age Infant Compared With Appropriate For Gestational Age Infant

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Abstract

Background: Hypertensive disease complicate 5-7% of all pregnancies. It is responsible for high maternal and perinatal morbidity and mortality rates.

Objective: To evaluate the impact of maternal hypertension on the neonatal outcomes, whether they are appropriate for gestational age (AGA) or small for gestational age (SGA).

Method: Mothers of 197 newborns who had hypertension (gestational, essential) were enrolled. The population divided according to the newborn gestational age and their body weight; the SGA group (N= 37) who had a body weight less than 10% of the gestational age, second group, those with AGA group (N=160) who had a body weight between 10% - 90% for the gestational age. Newborns products of these mothers were followed up from delivery until discharge.

Results: The mean of the gestational age was 36.2 ±3 weeks and the mean of babies body weight was 2865.75±786.51 gm. 6.6 % of the newborns delivered vaginally and 84 % of the mothers developed gestational hypertension, 75% of the newborns discharged immediately to the mother while 23% of them admitted to the NICU. There was no statistical significant difference between AGA group compared to SGA group. RDS, TTN and sepsis were significantly more in the SGA group than in AGA group. Those with gestational hypertension develop RDS and TTN more than those with essential hypertension ($p = 0.043$).

Conclusion: SGA newborns of hypertensive mothers have better respiratory outcome than AGA newborns, but there was no difference in general neonatal outcome. This result confirms the protective impact of maternal hypertension.

INTRODUCTION

Hypertensive disease complicate 5-7% of all pregnancies. This disease is responsible for high maternal and perinatal morbidity and mortality rates, and is one of the main public health problems [1, 2]. On the other hand, one of the primary goals of obstetricians is to deliver infants who are functionally mature and capable of adapting to the extra uterine environment without the need for intensive care [3]. Therefore, in pregnancies complicated by preeclampsia, obstetricians must balance the need for achieving *in utero* fetal maturation with the maternal and fetal risks of continuing pregnancy, including progression to eclampsia, abruptio placentae, and HELLP syndrome, as well as fetal growth restriction and demise [4, 5].

Recent work has suggested that women with mild pregnancy-induced hypertension may have improved perinatal outcomes when compared with those either without hypertension in the setting of small for gestational age (SGA) infants or with an iatrogenic reduction in elevated blood pressure [6-8].

Several studies have shown that late preterm infants are at increased risk for respiratory distress syndrome (RDS), transient tachypnea of the newborn (TTN), persistent pulmonary hypertension (PPHN), and respiratory failure compared to term infants [9-13]. Evidence suggests that late-preterm infants have a nine times greater incidence of respiratory distress syndrome than term infants [14]. In this study, we attempt to evaluate the impact of maternal hypertension on the neonatal outcomes, whether these newborns are appropriate for gestational age (AGA) or SGA.

Methods

This is a cross sectional study conducted at Al-Zahra is teaching hospital from the first of April till first of September 2012. Mothers of 197 newborns who delivered in this hospital vaginally or by cesarean section (CS), (emergency or elective) and had hypertension (gestational, essential) were enrolled in this study. The population divided into two groups according to the newborn gestational age and their body weight; first group, the small for gestational age group (N= 37) who had a body weight less than 10% of the gestational age, second group, those with appropriate for gestational age (N = 160) who had a body weight between 10% - 90% for the gestational age.

Blood pressure was taken by using appropriate sized cuff, mothers with a blood pressure reading of less than 130\90 mm Hg were labeled as normotensive, mothers with blood pressure more than 130\90 mm Hg in the absence of proteinuria were labeled as having hypertension while mothers with blood pressure more than 130\90 mm Hg with at least 300 mg of protein in a 24 hour collection of urine were labeled as having pre-eclampsia. Mothers who were already hypertensive regarded as having essential hypertension and those who acquired hypertension during pregnancy, regarded as pregnancy induced hypertension.

Normotensive mothers and hypertensive mothers with other diseases like diabetes mellitus, cardiac disease, or chronic diseases were excluded. Mothers give congenitally abnormal babies also excluded. The information of mothers regarding age, gravid, parity, abortion, last menstrual period or u\s during pregnancy and their medication used during pregnancy were recorded.

For each baby born to these mothers, resuscitation by trained resident doctor were appropriately done. Weight within one hour of delivery without clothes, length, head circumference, gestational age by assessment of last menstrual period or by ultrasound were recorded. Decision to discharge the newborns to the mother or admission to the neonatal intensive care unit (NICU) when it was indicated, was taken by the same resident doctor. For each baby admitted to the NICU, daily follow up and treatment with the final diagnosis on the day of discharge was recorded by the study coordinator.

Two blood samples were collected (2ml) for each, one from the mother and one from the newborn and sent for complete blood count analysis using automated hematology analyzer (Sysmex KX-21N,).

A written consent was taken from the mother before deliver. The study was approved by the scientific and ethical committee of the college of medicine / university of Kufa, and the scientific committee of the Al Zahra teaching hospital.

Statistical analyses:

All analyses were performed using commercially available software (SPSS *version 18*). Significant differences of continuous variables (means) were assessed by independent sample *t*-tests. Categorical data (Percentage) were assessed by Chi squared (χ^2) test. A P-value ≤ 0.05, ≤ 0.01 were considered as statistically significant at 5% and 1% respectively.

Results:

The mean of the gestational age was 36.2±3 weeks and the mean of baby's body weight was 2865.75±786.51 gm. 6.6 % of the newborns delivered vaginally and 84 % of the mothers developed gestational hypertension, 75% of the newborns discharged immediately to the mother while 23% of them admitted to the NICU as shown in table (1).

The main causes of admission of the neonate to the NICU were RDS and TTN as shown in table (2). Apart from the newborn's body weight, there was no statistical significant difference between AGA group compared with the SGA group as shown in table (3). RDS, TTN and sepsis were significantly more in the SGA group than in the AGA group as shown in table (4).

There was no major difference between essentially hypertensive mother and those who develop gestational hypertension, but those with gestational hypertension develop RDS and TTN more than those with essential hypertension ($p = 0.043$) as shown in table (5).

Table (1) Characteristics of the study population.

Parameters	Mean±SD
Mothers	
Age (year)	28.43±7
Parity Prime Multi	 37(19%) 160(81%)
Type of delivery NVD C/S	 13(6.6%) 184(93.4%)
Type of hypertension Essential Gestational	 32(16%) 165(84%)
Hb (g/dl)	10.4±1.6
Baby	
Gender Male Female	 102(52%) 95(48%)
Gestational age (weeks)	36.2±3
Birth weight (g)	2865.75±786.51
Length (cm)	46.72±4.57
Head circumference	34.47±4.78
Hb (g/dl)	15.31±2.14
Outcome Immediate discharge Stillbirth Admission	 148(75%) 4(2%) 45(23%)
Data represented as Mean±SD, otherwise as N (%).	

Table (2) Neonatal outcome of admission.

Causes	Admitted to NICU	
	No	%
TTN	11	24.4
RDS	11	24.4
Hypoglycemia	7	15.6
Sepsis	6	13.3
CHD	4	8.9
Meconium	4	8.9
Birth Asphaxia	2	4.5
Total	45	100
TTN=transient tachypnea of newborn, RDS= respiratory distress syndrome, CHD= congenital heart disease.		

Table (3) Comparison of the AGA group with the SGA group

Parameters	AGA (N=160)	SGA (N=37)	P Value
Mothers	Mean±SD	Mean±SD	
Age (years)	28.48±7	28.22± 7	0.834
Parity Primiparas multiparas	31(19.4%) 129(80.6%)	6(16.20%) 31(83.80%)	0.91
Delivery NVD CS	 11(6.87%) 149(93.13%)	 2(5.41%) 35(94.59%)	0.89
Hypertension Essential Gestational	 27(16.87%) 133(83.13%)	 5(13.51%) 32(86.49%)	0.86
Hb (g/dl)	10.47±1.619	10.14±1.548	0.26

Baby			
Gender Male Female	86(53.75%) 74(46.25%)	20(54.05%) 17(45.95%)	0.99
G. A (weeks)	36.16±3.183	36.38±2.712	0.7
B. Wt (g)	3065.63±692	2001.46±554.58	0.000
Length (cm)	46.87±4.12	46.03±6.15	0.31
Head circumference (cm)	34.28±3.049	35.32±9.077	0.23
Hb (g/dl)	15.33±2.175	15.35±2.111	0.96
Outcome			
Immediate discharge Stillbirth Admission	120(75.0%) 3(1.88%) 36(22.5%)	28(75.67%) 1(2.70%) 9(24.3%)	0.96
For data represented as Mean±SD, p- value was calculated by t-test; for data represented as N (%), p- value was calculated by Chi squared ($\chi 2$) test			

Table (4) Comparison in regard to type of GA

	AGA (N=36)	SGA (N=9)	P Value
Causes	N (%)	N (%)	
TTN	8(22.2)	3(33.3)	<0.001
RDS	11(30.6)	0(0)	<0.001
Hypoglycemia	6(16.7)	1(11.1)	0.065
Sepsis	4(11.1)	2(22.2)	<0.001
CHD	2(5.6)	2(22.2)	0.003
Meconium	4(11.1)	0(0)	<0.001
Birth Asphyxia	1(2.8)	1(11.1)	<0.001
TTN=transient tachypnea of newborn, RDS= respiratory distress syndrome, CHD= congenital heart disease. P- value was calculated by Chi squared ($\chi 2$) test.			

TABLE (5) Comparison of neonatal outcome in regard to type of hypertension

Parameters	Type of Hypertension		
	Gestational (N=165)	Essential (N=32)	P value
	Mean ±SD	Mean ±SD	
G. A (weeks)	36.17±3.127	36.34±2.97	0.77
B. Wt (g)	2863.36±791.335	2878.12±773.3	0.92
Length (cm)	46.61±4.917	47.25±1.95	0.47
OFC (cm)	34.49±5.203	34.41±1.10	0.93
Hb (g/dl)	15.15±1.937	15.91±2.89	0.07
Outcome	N (%)	N (%)	
Immediate discharge Admitted Stillbirth	124(75.15%) 39(23.64%) 2(1.21%)	24(75%) 6(18.75%) 2(6.25%)	
Final Diagnosis TTN RDS Hypoglycemia Sepsis CHD Meconium B. Asphyxia	 10(31.25%) 9(23.08%) 7(17.95%) 5(12.82%) 3(7.69%) 3(7.69%) 2(5.13%)	 1(16.67%) 2(33.33%) 0(0%) 1(16.67%) 1(16.67%) 1(16.67%) 0(0%)	 0.043*
TTN=transient tachypnea of newborn, RDS= respiratory distress syndrome, CHD= congenital heart disease. For data represented as Mean ±SD, p- value was calculated by t-test; for data represented as N (%), p- value was calculated by Chi squared (χ^2) test.			

Discussion:

Many studies had been performed to show the effect of maternal hypertension on neonatal outcome compared with normotensive mothers. In this study we try to compare the effect of maternal hypertension on neonatal outcome in SGA compared with AGA neonates.

Although the birth weight was significantly different in AGA from SGA newborns, there was no significant impact of maternal hypertension on neonatal outcome of AGA compared with SGA, the admission rate to the NICU was similar in both groups (22.5%, 24.3% respectively). This result was inconsistent with Peter von et al [15], who showed among SGA neonate in NICU, maternal hypertension was associated with improved admission and neonatal physiology, he hypothesized that the survival was related to changes in blood pressure within inter-villous space gives more perfusion of which may improve maternal –fetal transfer of nutrient & oxygen that lead to improve neonatal health. It was believed that maternal hypertension specially preeclampsia has a protective effect on the fetuses and may cause an acceleration in the maturation of the lungs of these fetuses and might be associated with less RDS rate [16, 17].

So, our result confirms that the SGA group had less respiratory disorders (RDS, TTN) than those in AGA group, consolidating the theory of chronic intrauterine exposure to stressful conditions associated with less respiratory distress due to endogenous secretion of steroids that accelerate lung maturation and early surfactant secretion [15, 18, 19].

Although we didn't find difference in general neonatal outcome between essential maternal hypertension and pregnancy induced hypertension, we found that RDS and TTN were significantly more in pregnancy induced hypertension than essential hypertension ($p = 0.043$). It was consistent with Chaim et al [20], who showed increased risk of fetal growth restriction & fetal outcome in gestational hypertension.

As a limitation to this study, we didn't choose a case control model to compare all the results with normotensive mothers.

In conclusion, SGA newborns of hypertensive mothers have better respiratory outcome than AGA newborns, but there was no difference in general neonatal outcome. This result confirms the protective impact of maternal hypertension.

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