Association between Maternal and Neonatal Blood Pressure

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Abstract

Objective: This study aims to describe the blood pressure profile of newborns of preeclampsia mothers in Vali-e-Asr hospital during 2003–2004.

Materials and methods: In this cross-sectional descriptive analytical study 200 mothers and their newborns were studied. Blood pressure of all newborns was checked by oscillometric method on the first day after birth and recorded in a questionnaire along with information pertaining to the mother, obtained by interview or through medical file retrieval.

Results: The newborns of mothers with high systolic (>140 mmHg) and diastolic (>90 mmHg) blood pressure had mean systolic (65.40 mmHg) and diastolic (42.85 mmHg) blood pressures higher than that in neonates of normotensive mothers(P <0.006). Mean systolic and diastolic blood pressure of neonates whose mothers were preeclampsia (68.2/42.11 mmHg or chronically hypertensive (68.59/ 41.50 mmHg–) were significantly higher than neonates of normotensive mothers (P<0.0001 and P<0.002, respectively).Newborns of smokers had significantly higher blood pressures too (P<0.02).

Conclusion: Mother's blood pressure can affect neonatal blood pressure. Chronic hypertension, pre–eclampsia, and cigarette smoking in mothers can adversely alter neonatal blood pressure. These maternal conditions should be screened and managed as soon as possible.

Keywords: neonatal blood pressure, maternal blood pressure, pre–eclampsia

Introduction

Blood pressure disorder during pregnancy is a term given to conditions such as preeclampsia, eclampsia, chronic hypertension prior to pregnancy, transient hypertension and hypertension which progresses to pre–eclampsia or eclampsia. Pregnancy related hypertensive disorders in each trimester affect fetal blood pressure and wellbeing.Intra Uterine Growth Retardation (IUGR), reduction in amniotic fluid volume, fetal distress, insufficient placental blood transmission, premature placental detachment, and intrauterine fetal death can be considered as early fetal complications, while late or transient complications include increased risk of hypertension during childhood or even during adulthood and delayed growth and development (1,2). Studies have shown that changes in maternal diastolic blood pressure (decreased or increased) can result in IUGR and consequently affect fetal growth and development (3,4). Precise data onprevalence of neonatal hypertension is not available but scattered studies have reported different figures (0.2–3% of all births in Iran). Neonatal hyper tension is usually seen among patients

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Table 1. Patient's medical history

Mother History	n (%)
Mother Systolic hypertension	45 (22.5)
Chronic hypertension	23 (11.5)
Antihypertensive drug used *	15 (7.5)
Cigarette smoking	10 (5)
Family history of hypertension	1 (0.5)
Pre–eclampsia	35 (17.5)
Diabetes mellitus	19 (9.5)
Induced labor	17 (8.5)

* The most common antihypertensive drug used was methyldopa (7 cases).

with Intra Ventricular hemorrhage (IVH), Patent Ductus Arteriosus (PDA), Bronchopulmonary Dysplasia (BPD), neonates with umbilical cord catheters, and neonates of mothers with at least one cardiac risk factor (5, 6). Also, some studies have shown that some neonatal disorders are found in some whose mothers had developed one blood pressure disorder during pregnancy (2). Most of these neonates were premature or SGA and suffered from IUGR as well as growth-retardation after birth. Maternal blood pressure disorders (of any type) restrict placental blood supply and affect fetal growth and development; therefore, it can cause fetal stress. Severity of complications affecting fetus and neonate may have relationship with severity of maternal problems. This study aims to find association between maternal blood pressure disorders and neonatal blood pressure during the first hoursof birth in patients referring to our department.

Materials and methods

In this cross–sectional descriptive analytical study which was conductedat 2003–2004 in the NICU and Neonatal Wards of Vali–e–Asr Hospital, all newborns were enrolled into the study regardless of having any specific exclusion criteria; (mothers who recently used anti–hypertensive drug were only enrolled when they were in a stable condition and their hypertension was controlled). A sample size of 200 newborns was included in this pilot study. Blood pressure of all newborns was measured 3 times a day when the newborn was in calm position by a trained operatorusing one oscillometric device. The average of these 3 measurements was considered was considered as hypertension when blood pressure was above 80/50 mmHg for preterm neonates and above 90 / 60 mmHg for term ones.

Maternal blood pressure, was taken by the trained interviewer too, three times a day after meal in rest and lying position; the average of these 3 measurements was considered in our evaluation. Hypertension in mothers was considered when blood pressure was above 140/90 mmHg or showed an increment of 30/15 mmHg in the next measuring.

Maternal data were gathered including: age, mean systolic and diastolic blood pressure during pregnancy, presence of complications of pregnancy such as pre–eclampsia, gestational diabetes, chronic background diseases such as hypertension, history of using any special drug use such as antihypertensive drugs, corticosteroids, or anticoagulants,cigarette smoking, need for induction of labor, and family history of hypertension. Neonatal data includedgestational age at birth time, first and five minute Apgar scores, and neonatal systolic and diastolic blood pressure. Data were collected and processed by pre–designed questionnaires by referring to perinatal medical files and subsequently saved in SPSS v.15 statistical software and finally analyzed by correlation coefficient and *t*–tests (significance level of 95%).

The study was carried out after scientific and ethical approval of Deputy of Research of Tehran University of Medical Sciences and no form of intervention took place. Also, all mothers were enrolled after being informed and given consent.

Results

A total of 200 mothers and their newborns were enrolled into the study. Out of these 200 mothers 45 (22.5%) had high systolic (>140 mmHg) and 25 (12.5%) had high diastolic (>90 mmHg) blood pressure, Table 1 shows a summary.

Studying the association between maternal and neonatal blood pressures (Table 2), we found that there is a significant relationship ($P<0.006$) between maternal and neonatal systolic blood pressure. Correlation coefficient index also indicates a strong relationship between maternal and neonatal blood pressure ($r = 0.93$). The mean neonatal blood pressure of preeclamptic mothers was significantly higher than others ($P<0.0001$). There was also a significant difference between neonates born to maternal chronic hypertension and those born to normotensive regarding their systolic ($P<0.02$) and diastolic ($P<0.04$) blood pressure. A significant statistical relationship ($P<0.02$) was found between blood pressure of newborns and cigarette smokingstatus of mothers.

No association was observed between familial hypertension and neonatal blood pressure, this may–be due to the small sample size. The birth weight of new-

borns born to Systolic hypertensive mothers was significantly less than newborns of normotensive mothers (2316 ± 6.4 grams vs. 3471 ± 19.7 grams). In other words, there is strong correlation between neonatal weight at birth and maternal blood pressure (P<0.01, r = 0.75) as well as neonatal birth weight and neonatal blood pressure (P<0.005, r = 0.80). We found that a significant statistical relationship exists between neonatal systolic (P<0.02) and diastolic blood pressure and Apgar score (P<0.01). No significant relationship was found between neonatal blood pressure and gestational age, inductive labor, and maternal age.

Discussion

According to previous studies, hypertension is not significantly prevalent in neonatal period and just a rate of 0.2%–3% has been mentioned. Singh (1992) for example, stated that 8% of newborns are hypertensive (6). Seliem (2007) studied more that 2500 mothers and found that 1.3% of neonates born to these mothers had hypertension (4). Friedman (2005) reported that 2.6% of newborns were hypertensive in his NICU Ward (7). Kent (2007) in a hypothetical study stated a maximum rate of 3% for neonatal hypertension (8). In the present study although neonatal blood pressure was associated with some maternal factors, neonatal hypertension was not detected in any case. Maternal hypertension is considered as an important factor in neonatal hypertension. Badawi (1998) in Australia considered maternal hypertension of any type, as a risk factor in neonatal complications and death (2). Zinner (1990) mentioned maternal hypertension as one of the most important factors causing neonatal hypertention (9). Seliemalso considered the maternal consumption of corticosteroids, cardiac anomalies, and hypertension as risk factors for neonatal hypertension (4). In the current study, we also found that blood pressure of newborns born to mothers with hypertension or to mothers with pre–eclampsiawas higher than those of normotensive mothers, which shows maternal blood pressure can affect neonatal blood pressure (10). Himelmabn (1994) explains this effect from the third day of life to childhood (11). We also found systolic and diastolic neonatal blood pressures were significantly higher in mothers with pre–eclampsia as compared to normotensive mothers. Different studies also show the effect of blood pressure on neonates, such that McConahiie (1998) noticed that chronic systolic hypertension in mother results in low–birth weight and can predispose the child to develop hypertension in adulthood (1).

Table 2. Association of mother and neonate blood pressure

Mother group	Neonatal (Means) mmHg	P–Value
High systolic BP*	65.40 ± 11.28	0.0006
Normotensive	59.46 ± 12.24	
	Systole	
Preeclampsia	68.20 ± 14.50	0.0001
Normotensive	49.85 ± 5.49	
	Diastole	
Preeclampsia	42.11 ± 11.46	0.0001
Normotensive	30.17 ± 11.89	
	Systole	
Hypertensive drug used	57.67 ± 15.71	0.07
Normotensive	59.78 ± 12.58	
	Diastole	
Hypertensive drug used	27.13 ± 9.32	0.79
Normotensive	30.89 ± 11.89	
	Systole	
Chronic HTN**	68.59 ± 10.60	0.02
Normotensive	58.74 ± 11.87	
	Diastole	
Chronic HTN	41.50 ± 8.74	0.04
Normotensive	30.73 ± 11.80	
	Systole	
Cigarette smokers	71.00 ± 11.68	0.02
Non smokers	59.57 ± 12.58	
	Diastole	
Cigarette smokers	39.55 ± 10.25	0.01
Non smokers	30.6 ± 11.78	
	Systole	
Diabetic	62.59 ± 13.26	0.23
Non diabetic	52.11 ± 6.52	
	Diastole	
Diabetic	31.00 ± 14.62	0.34
Non diabetic	27.55 ± 4.69	
	Systole	
Apgar<6	71.00 ± 7.57	0.02
Apgar>6	49.85 ± 7.49	
	Diastole	
Apgar<6	32.12 ± 6.35	0.01
Apgar>6	26.57 ± 4.89	

* Blood Pressure ** Hypertension

Greenberger (1979) in a prospective study noticed that maternal hypotension of normal range can cause low birth weight (12). Zinna (1980) also stated such significant association (9). RomundStad (2007) also found a significant relationship between maternal blood pressure and neonatal birth weight (3). Seliem (4) also noticed that neonates with hypertension due to any reason have lower body weight and lower gestational age as compared to normotensive neonates (4). In the

present study, we also found that neonates of hypertensive mothers, not only had a significant rise in blood pressure, but also had significantly lower body weight. Similar to Brion's study (2008), we also found that maternal cigarette smoking significantly elevates neonatal blood pressure (13).

Conclusion

Maternal chronic hypertension, pregnancy–induced hypertension, and cigarette smoking can affect neonatal blood pressure and may result in complications such as delivery of low birth weight newborns.

Acknowledgment

The study was carried out after scientific and ethical approval of Deputy of Research of Tehran University of Medical Sciences as a medical student thesis, and there is no conflict of interest to declare.

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