

Relationship between children's and parents' blood pressure

Desy Aswira Nasution, Rusdidjas, Supriatmo, Rafita Ramayati,
Oke Rina Ramayani, Rosmayanti Siregar

Abstract

Background A family history of hypertension is a risk factor for hypertension in children. Past studies have reported a significant relationship between elevated blood pressure in children and hypertensive parents.

Objective To assess for an association between blood pressure in children and that of their parents.

Methods A cross-sectional study was conducted in 90 children aged 6-18 years in Baringin Village, Panyabungan, from May to June 2010. Subjects were collected by consecutive sampling. Classification of hypertension was based on *Fourth Task Force Guidelines* by measuring blood pressure, height, and weight. We used Student's T-test to analyze numerical data. Simple linear regression was used to investigate the relationship between blood pressures of children and their parents.

Results Of the 90 participants recruited, 24 boys and 17 girls had hypertensive parents. The mean systolic (SBP), diastolic (DBP) and arterial blood pressure (MABP) were significantly higher in children with hypertensive parents than in children with normotensive parents [(SBP 116.7 (SD 7.07) vs. 87.1 (SD 13.57) mmHg; $P=0.0001$), (DBP 77.8 (SD 8.33) vs. 51.8 (SD 11.70) mmHg; $P=0.0001$), (MABP 90.7 (SD 7.41) vs. 63.6 (12.10) mmHg; $P=0.0001$]. There was a significant relationship between elevated SBP in boys and their fathers, as indicated by the correlation coefficient ($r=0.806$; $P=0.0001$).

Conclusion The blood pressure is significantly higher in children with hypertensive parents than in those with normotensive parents. There is a correlation between SBP in boys and that of their fathers. [Paediatr Indones. 2014;54:202-5].

Keywords: hypertension, blood pressure, parents

Hypertension in children is an indicator for adult hypertension, so it is important to identify children and adolescents at high risk for essential hypertension as adults.^{1,2} High blood pressure is the main cause of stroke, heart attack, and heart failure.³ Essential hypertension rarely exists in children and adolescents, but it is a risk factor for heart and blood vessel diseases later in life.⁴

An Iowa study found that systolic and diastolic blood pressures of children with a family history of hypertension were higher than in children with a family history of low or moderate blood pressure.⁵ Another study in Sao Paulo showed that children with a history of family hypertension had higher total cholesterol, high density lipid (HDL), and low density lipid (LDL) levels, and higher triglyceride level in their blood than children with no family history of hypertension.⁶

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From the Department of Child Health, University of Sumatera Utara Medical School/ H. Adam Malik Hospital, Medan-Indonesia

Reprint requests to: Dr. Desy Aswira Nasution. Department of Child Health, University of Sumatera Utara Medical School / H. Adam Malik Hospital, Jl. Bunga Lau No.17, Medan 20136. Tel (061) 8361721 – 8365663 Fax. (061) 8361721. E-mail: desy_aswira@yahoo.com.

The aim of this study was to assess for a relationship between blood pressure in children and that of their parents.

Methods

This cross-sectional study was conducted from May to June 2010 at Baringin Village, Panyabungan. The inclusion criteria were normal weight children aged 6- 18 years. Children with renal disease, heart disease, obesity, or those who had consumed corticosteroids were excluded. Informed consent was obtained from their parents after an explanation of the study was given.

Consecutive sampling was done on children who met the inclusion criteria. Blood pressures were measured using mercury sphygmomanometers (Riester, Germany) with subjects in a sitting position. Appropriate-sized cuffs were used (cuff-width 40% of mid-arm circumference) with cuff bladders covering 80-100% of the arm circumference and approximately two-thirds of the length of the upper arm without overlapping. Sphygmomanometer readings were recorded at the first, fourth, and fifth Korotkoff phases. The readings at the first and the onset of the fifth Korotkoff phases were taken as systolic and diastolic blood pressures, respectively. Elevated blood pressure was defined as a mean SBP or DBP above the 95th percentile for age and gender, after adjusting for weight and height.⁷ Parents with an average blood pressure of more than 140/90 mmHg or those on antihypertensive drugs at the time of this study were classified as hypertensive.

We also used questionnaires to obtain information on children's and parents' identities, history of disease, history of medication use, as well as their activities and exercise habits.

A Camry scale, with a precision of 0.1 kg, was used for weighing, which had been calibrated to a capacity of 125 kilograms. A 2-meter microtoise with a precision of 0.5 cm was used to measure height. For measuring blood pressure, we used Nova Riester mercury sphygmomanometer and a Littmann Classic II pediatric stethoscope.

This study was approved by the Ethics Committee of the University of North Sumatra Medical School. Data were analyzed with SPSS version 15.0. Student's T-test was used to analyze numerical data. Simple linear regression and ANOVA test was used to analyze the relationship between children's and parents' blood pressure findings. The significance level was accepted as $P < 0.05$.

Results

A total of 90 children met the inclusion criteria and were eligible for analysis. Of these, 9 children had two hypertensive parents, 32 children had one hypertensive parent, and 49 children had normotensive parents (Table 1).

There was a significant association between children's blood pressure and their parents hypertensive status ($P < 0.0001$). The analysis revealed significant higher in mean blood pressure parameters between children with two hypertensive parents and children with one hypertensive parent compared to those with normotensive parents (Table 2).

In this study, the mean SBP, DBP and MABP of children with hypertensive fathers were significantly higher than in children with normotensive fathers. In addition, the mean SBP, DBP and MABP of children with hypertensive mothers were significantly higher than in children with normotensive mothers (Tables 3 and 4).

Table 1. Characteristics of the subjects

Characteristics	Children with two hypertensive parents (n = 9)	Children with one hypertensive parent (n = 32)	Children with normotensive parents (n = 49)
Gender, n			
Male	5	19	28
Female	4	13	21
Mean age (SD), years	9.7 (3.39)	11.5 (3.76)	9.4 (3.26)
Mean weight (SD), kg	23.9 (11.33)	30.5 (12.99)	25.1 (11.89)
Mean height (SD), cm	121.4 (18.09)	132.2 (19.16)	118.9 (18.14)

Table 2. The association between children's and parents' blood pressure parameters

Blood pressure parameters	Children with two hypertensive parents (n = 9)	Children with one hypertensive parent (n = 32)	Children with normotensive parents (n = 49)	P value
Mean systolic (SD), mmHg	116.7 (7.07)	120.3 (7.66)	87.1 (13.57)	0.0001
Mean diastolic (SD), mmHg	77.8 (8.33)	80.4 (6.55)	51.8 (11.70)	0.0001
Mean MABP (SD), mmHg	90.7 (7.41)	93.7 (6.47)	63.6 (12.10)	0.0001

Table 3. The association between children's and fathers' blood pressure parameters

Blood pressure parameters	Children with hypertensive fathers (n = 35)	Children with normotensive fathers (n = 55)	P value
Mean systolic (SD), mmHg	119.67 (7.79)	90.58 (16.34)	0.0001
Mean diastolic (SD), mmHg	79.71 (6.64)	54.97 (14.47)	0.0001
Mean MABP (SD), mmHg	92.93 (6.33)	66.87 (15.08)	0.0001

Table 4. The association between children's and mothers' blood pressure parameters

Blood pressure parameters	Children with hypertensive mothers (n = 15)	Children with normotensive mothers (n = 75)	P value
Mean systolic (SD), mmHg	117.4 (7.10)	97.9 (19.98)	0.0001
Mean diastolic (SD), mmHg	78.8 (8.51)	61.7 (16.95)	0.0001
Mean MABP (SD), mmHg	91.9 (74.03)	74.0 (17.74)	0.0001

We analyzed for a correlation between children's blood pressure and their parents' blood pressure by regression analysis. All independent variables had positive correlations with dependent variables. Based on the correlation value (r), the correlation of father's SBP with his son's SBP indicated very strong correlation (r = 0.806), while the correlation of father's DBP, mother's SBP and mother's DBP

indicated weak correlation with son's blood pressure and daughter's blood pressure (0.6 < r).

The correlation and regression analysis revealed a significant relationship between blood pressure of fathers and blood pressure of their sons (r=0.806; P=0.0001) (**Figure 1**). Fathers with higher SBP tend to have high SBP boys.

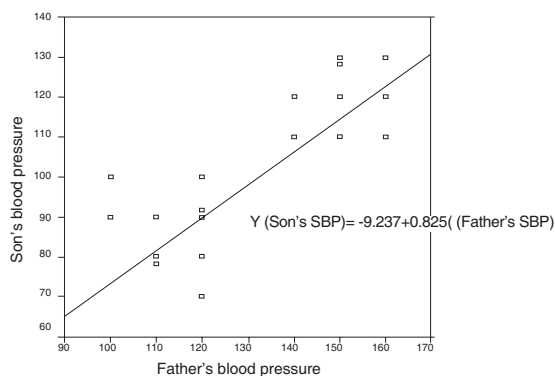


Figure 1. Correlation-regression between fathers' blood pressure (SBP and DBP) and sons' blood pressure (SBP and DBP)

Discussion

An Iranian study found that mean SBP, DBP and MABP of children with hypertensive parents were higher than controls, and a significant association was found between SBP of fathers and children as well as between SBP and DBP of mothers and children.² The Framingham Heart Study evaluated familial blood pressure associations and showed that both paternal and maternal SBP and DBP correlated significantly with that of offspring, even after adjustment for covariates known to influence blood pressure.⁸ A population study performed in Belgium on familial aggregation of blood pressure showed a significant correlation of both SBP and DBP in the first family

relatives of children.⁹ A child with a family history of hypertension is indicative of a persistent increase in his blood pressure, compared to a child with no family history of hypertension.¹⁰

We found that the mean SBP, DBP and MABP were significantly higher in children with hypertensive parents than in children with normotensive parents ($P=0.0001$).

To date, no convincing evidence for sex differences in the genetic regulation of blood pressure has been described, but certain studies have shown some differences between the blood pressure of girls and boys in correlation with their parent's blood pressure. An American study investigated the aggregation of blood pressure within 95 Anglo-American and 111 Mexican-American families, and found that the father's blood pressure correlated with children's blood pressure in both sexes. However, that correlation was weak for mothers.¹¹ A son with a family history of hypertension showed persistent increase of his blood pressure, compared to a son with no family history of hypertension.¹²

In this study, the father's SBP correlates significantly with SBP of their sons. Our findings suggest a need to monitor the blood pressure of children who have hypertensive parents. Pediatricians, therefore, have an important role to play in educating families and children on the strategies for preventing hypertension, particularly in at-risk children.

In conclusion, children's blood pressure is significantly higher in those with hypertensive parents than in those with normotensive parents. There is a correlation between SBP in boys and SBP of their fathers.

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