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Offsprings of Hypertensive Parents Have Higher Blood Pressure and BMI

Syed Faraz Kazim, Muhammad Bilal Salman, Akbar Jaleel Zubairi, Aisha Afzal, Usman Ahmad and Philippe M. Frossard

Blood pressure levels and BMI values were compared between children (8-16 years old) of hypertensive and normotensive parents. Children of hypertensive parents (n=97) were found to have significantly higher mean Systolic Blood Pressure (mSBP), mean Diastolic Blood Pressure (mDBP) and BMI as compared to children of normotensive parents (n=93). Essential hypertension has a strong genetic basis, which is reflected by its significant inheritability.

Blood Pressure (BP) in children is by far the strongest predictor of adult BP levels.¹ It is, therefore, important to recognize children and adolescents, who carry an increased risk of developing essential hypertension in adulthood.^{2,3} These children and adolescents can then be counseled to adopt prevention strategies towards risk factors such as obesity, high salt intake in diet, and lack of exercise that have proven to be associated with increase in BP levels.⁴ Familial influence on BP levels in early life has been suggested³, and children from families with hypertension tend to have higher BP levels than children from normotensive families.⁵ The correlation in BP levels between parents and their biological children is significantly higher than between parents and adopted children.^{5,6}

This study was aimed at comparing mean BP levels in children of hypertensive and normotensive parents in a Pakistani population. A sample size of 90 cases was calculated using Epi Info version. Six for a pilot study with a confidence level of 95% and bound of error 5%, based on a previous study done by Kelishadi *et al.*⁸ A pilot case control study was thus done on 190 children and adolescents. The inclusion criteria for the cases was defined as healthy children aged 8 to 16 years and having one or both parents being known hypertensive(s); controls were children of the same age

group having both normotensive parents. A parent was labelled as a hypertensive, if he or she was diagnosed as one by a registered medical practitioner and was taking anti-hypertensive drug(s) at the time of study. Ninety seven children were enrolled as cases and 93 children as controls. The study subjects were selected randomly from children presenting to Aga Khan University, Hospital (AKUH), Community Health Center (CHC), Karachi, Pakistan, accompanied by one or both parents. BP measurements were done by a group of medical students of Aga Khan University Medical College (AKUMC). The group went through a standardized training program to minimize observer biases. BP values were measured using standard mercury sphygmomanometers with the child in sitting position and the forearm at the heart level. Appropriately sized BP cuffs (cuff width being 40% of the mid-arm circumference) with cuffs covering approximately two thirds of the distance between shoulder and elbow were used to ensure accurate measurements. The phase 1 and phase 5, Korotkoff sounds were recorded as systolic and diastolic blood pressures (SBP and DBP) respectively. All measurements were recorded thrice with duration of 5 minutes in between and their mean was taken for final analysis. The first reading was taken after the subject had rested quietly with legs uncrossed for 20 minutes.

Other quantitative variables recorded included weight, height, pulse, and body temperature. Body Mass Index (BMI) was calculated using the formula [weight (kg)/height (m)²]. Information regarding parent's ethnicity, consanguinity and socioeconomic status was also recorded.

The data was entered and analyzed using Statistical Package for Social Sciences (SPSS) version 13.0. Means were calculated for BP measurements and BMI reported as mean \pm standard deviation. Student's t-test was used to compare the means and determine the level of significance. A p-value of < 0.05 was considered as the criterion for statistical significance.

Table I summarizes the study subjects' characteristics. Mean SBP and DBP of children of both hypertensive parents were significantly higher (p=0.000 for SBP and p=0.001 for DBP) than children of normotensive parents. Mean SBP and DBP of children were also significantly higher, when one of the parents (mother or father) was hypertensive as compared to children of normotensive parents (p=0.000 for SBP and p=0.000 for DBP with hypertensive mother; p=0.001 for SBP and p=0.001 for DBP with hypertensive father).

Similarly, BMI of children of hypertensive parents was found to be significantly higher (p < 0.001) than those of children from normotensive parents.

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Table I: Characteristics of study subjects (n = 190).

Parameter	n (%)
Sex	
Male	105 (55.3%)
Female	85 (44.7%)
Age distribution	
8 to 12 years	114 (60%)
13 to 16 years	76 (40%)
Ethnicity	
Punjabi	33 (17.4%)
Sindhi	33 (17.4%)
Pathan	40 (21.0%)
Balochi	30 (15.8%)
Urdu speaking	46 (24.2%)
Others	8 (4.2%)
Consanguineous parents	
Yes	98 (51.6%)
No	92 (48.4%)
Socioeconomic status (monthly income)	
Low income (< Rs.5000)	29 (15.3%)
Lower middle (Rs.5,000 - Rs.10,000)	46 (24.2%)
Middle (Rs.10,000 - Rs.20,000)	45 (23.7%)
Upper middle (Rs.20,000 - Rs.50,000)	43 (22.6%)
Upper (> Rs.50,000)	27 (14.2%)

Table II: Comparison of systolic blood pressure (SBP), diastolic blood pressure (DBP), and body mass index (BMI) between children of hypertensive and normotensive parents.

Study parameter	Hypertensive parents			
	None	Father	Mother	Both
Number	93	39	36	22
Systolic blood pressure				
Mean	102.2832	106.4274	105.4907	105.3939
Standard deviation	03.91330	03.74864	3.83922	3.87863
Diastolic blood pressure				
Mean	63.3333	67.9658	67.8611	68.0606
Standard deviation	02.54192	02.76231	02.16520	1.43145
Body mass index (BMI)				
Mean	17.9431	19.7356	19.1850	19.7956
Standard deviation	02.77636	02.16354	01.97625	01.11480

In recent years, increasing evidence has shown that essential hypertension begins to develop during the first two decades of life. A study performed in Brazil, reported higher BP levels and altered lipid profiles among the offspring of hypertensive parents, when compared to those of normotensive parents.⁷ A study from Iran reported that mean SBP, DBP and Mean Arterial Blood Pressure (MABP) of children of hypertensive parents were higher than those of children from normotensive parents.⁸ Framingham heart study researchers have also shown that both paternal and maternal BP levels correlate significantly with those of the offspring.⁹

The results of this pilot study confirms these findings. SBP, DBP and BMI were found to be higher amongst children of one or both hypertensive parents, and despite the relatively limited sample size of this study cohorts, these results are highly statistically significant. It is now accepted that genetic effects underlying an

individual's genetic susceptibility to complex traits and disorders (including, among many others, blood pressure levels, essential hypertension and obesity) are transmitted in recessive manners. As an outcome of consanguinity, is to raise homozygosity levels, this phenomenon is thus exacerbated in consanguineous groups such as the Pakistani population, and may contribute to explain our observations and their high associated statistical significance.

These results re-emphasize the needs for strict monitoring of BP levels of children of hypertensive parents. As even small BP decrements have been shown to considerably decrease hypertension-related morbidity and mortality¹⁰, commencement of risk factors, prevention strategy early in life, may lead to substantial improvements. In the case of children with increased risk of developing hypertension later on, starting adequate physical activity and adjustment of dietary habits, for example, should be recommended. This is especially critical in a country such as Pakistan, where the prevalence of hypertension and related cardiovascular diseases is high and increasing.

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