RELATIONSHIP BETWEEN PARENTAL AND CHILD CARDIOVASCULAR RISK FACTORS

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Abstract

INTRODUCTION: Adult cardiovascular disease has its root in childhood. Cardiovascular disease aggregates in families, so determination of high-risk families and early screening and control of cardiovascular risk factors in offspring will help in efforts to prevent cardiovascular disease. This study was performed to determine the relationship between cardiovascular risk factors in parents with a positive history of premature myocardial infarction and their offspring.

METHODS: This cross-sectional study was conducted in 2004 on 91 parents and their offspring (91children). The parents were randomly selected from among patients hospitalized in the critical care unit of Vali-e-Asr hospital with premature myocardial infarction. Important indicators such as systolic blood pressure (SBP), diastolic blood pressure (DBP), body mass index (BMI), total cholesterol (TC), triglyceride (TG), low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) were measured in both groups.

RESULTS: There was no significant relation of systolic and diastolic blood pressure between parents and their offspring. Thirty-three percent of the parents had hypertension. No cases of hypertension were found in children. Mean systolic and diastolic blood pressure were significantly higher in the children of hypertensive parents. Significant relations were seen between BMI and obesity in parents and their children. There was no significant relation between serum lipids, high TC, high LDL-C and low HDL-C levels in parents and their children. The commonest lipid disorder in parents and their offspring was low HDL-C.

CONCLUSIONS: The results of this study show a significant relation between hypertension, obesity and blood lipid disorders between parents with positive history of premature myocardial infraction and their children. Hence, screening programs in these children for detection of cardiovascular risk factors are recommended.

Keywords: Cardiovascular risk factors, parental, relationships, offspring, premature myocardial infarction.

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Introduction

Adult cardiovascular disease (CVD) has its root in childhood.[1] Although CVD does not manifest itself until adulthood, its risk factors such as elevated blood pressure, excess weight and abnormalities in plasma lipid levels are present in childhood and persist into adulthood.[2]

Prospective studies have shown that cardiovascular disease aggregates in families.[3,4] This is probably due in part to familial aggregation of important cardiovascular risk factors such as hypertension,[5,6] obesity[7] and high total serum cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C).[8] Therefore, early detection and control of these risk factors in childhood may help in efforts to prevent cardiovascular disease, especially in high risk families.[9] The relationship between cardiovascular risk factors in parents and their children differs by ethnicity.[10]

This study was performed in the city of Birjand, northeastern Iran, to characterize the parent-child CVD risk factor relationship in parents with a positive history of premature myocardial infarction (MI) and their offspring.

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Materials and methods

The studied population consisted of 91 parents, randomly selected from among patients who had suffered premature myocardial infarction (<55 years) and were hospitalized in the coronary care units (CCU) of the Vali-e-Asr Hospital affiliated to Birjand University of Medical Sciences. Only one child (age 2-14 years) was randomly selected from every family. Parents who were taking anti-hypertensive medications were excluded. None of the parents were taking cholesterol-lowering medications at the time of examination.

Height and weight were measured in light clothing and no shoes. Weight (Seca Beam Balance) and height (Seca stadiometer) were measured to the nearest 0.1 kg and 0.1 cm, respectively. Body mass index (BMI) was measured as weight (kg) divided by weight (kg) squared.[11] Parents with 25 ≤BMI ≤29.9 and BMI ≥30 were considered as overweight and obese, respectively.[12] Children with BMI ≥ 95th percentile and 85th percentile ≤ BMI < 95th percentile were considered as overweight and at risk of overweight, respectively.[13]

Blood Pressure was measured on the subjects' right arm of subjects in a relaxed, sitting position using a mercury sphygmomanometer with suitable cuff size. The mean of two measurements of Korotkoff phase I and the mean of two values of phase IV (in children) and phase V (in parents) were recorded for systolic blood pressure (SBP) and diastolic blood pressure, respectively.

Based on the WHO definition, parents with SBP ≥140 mmHg or DBP ≥90 mmHg were considered as hypertensive.[12] Children with systolic or diastolic blood pressure greater than the 95th percentile were considered as hypertensive.[14]

Subjects had been instructed to fast for 12 to 14 hours. Antecubital venous blood was collected. Biochemical tests, including measurement of TC, triglyceride (TG), High- density lipoprotein cholesterol (HDL-C) and LDL-C were carried out. TC and TG were measured by German made Ependrof Elan 2000 autoanalyzer using the enzymatic method.

HDL-C was measured using heparin-manganese precipitation method.[15] LDL-C was measured in samples containing TG ≤400 mg/dl using the Friedwald formula.[16] It was otherwise measured using a special test kit. Parents with TG ≥200, TC ≥240, HDL-C ≤40, or LDL >100 (mg/dl) were considered as dyslipidemic.[17] In children, high levels of TC and LDL-C were defined as those >200 mg/dl and >130 mg/dl, respectively.[18]

TG level ≥130 mg/dl was considered high and HDL-C level <35 mg/dl was considered low.[19,20] Statistical analysis was performed by the SPSS statistical package using independent t-test and partial Pearson correlation coefficients. P values less than 0.05 were considered as significant.

Results

Ninety-one parents (85 fathers, 6 mothers) with positive history of premature MI and 91 offspring (45 girls, 46 boys) were studied. Parents and children had mean ages of 44.4±4.5 and 11.2±2.6 years, respectively. Our study showed no significant relation of systolic and diastolic blood pressure between parents and their children (Table 1).

TABLE 1. Mean levels of BP, BMI and serum lipids in parents and their children and relation between them

Variable	Children (n=91) Mean ± SD	Parents (n=91) Mean ± SD	Partial correlation (r)	Pearson coefficients (p)
SBP (mmHg)	97.5±9.6	122.6±13.5	0.13	0.23
DBP (mmHg)	64±8.6	80.5±9	0.21	0.06
BMI (kg/m²)	17.4±3.2	26.9±4.6	0.31	0.04*
TC (mg/dl)	143.6±24.9	168.9±39.3	0.04	0.73
TG (mg/dl)	89±35.6	159.2±100.5	0.04	0.7
HDL (mg/dl)	38.5±11	39.4±11.4	0.16	0.17
LDL (mg/dl)	82±16.9	99.4±24.9	0.12	0.31

TABLE 2. Mean blood pressure in children of hypertensive and normotensive parents

Variable	BP (mmHg) Children of hypertensive (Mean ± SD)	BP (mmHg) Children of normotensive (Mean ± SD)	P value
SBP	100 ± 10.2	95.9 ± 8.3	0.05*
DBP	66.3 ± 8.5	62.3 ± 7.6	0.03*

TABLE 3. Prevalence of lipid disorders in parents and their children

Variable (mg/dl)	Children (n=91) Mean ± SD		Parents (n=91) Mean ± SD		P value
	N	%	N	%	
High – cholesterol	1	1.1	18	19.8	< 0.001*
High TG	32	35.2	23	23.1	0.15
High LDL	1	1.1	31	34.1	< 0.001*
Low HDL	34	37.4	47	51.6	< 0.05*

Thirty parents (33%) had hypertension. No cases of hypertension were found in children. Mean systolic and diastolic blood pressure were significantly higher in children of hypertensive parents (Table 2). There was a significant relation of BMI between parents and their children (Table 1).

28.6% (26 subjects) and 27.5% (25 subjects) of parents were obese and overweight, respectively. 3.3% (3 subjects) and 9.9% (9 subjects) of children were overweight and at risk of overweight, respectively. There was a significant relation of obesity between parents and their children (P<0.001). There was no significant relation of lipid profile between parents and their children (Table 1). 19.8% of parents and 1.1% of children had high TC levels. 23.1% of parents and 35.2% of children had high TG levels. 34.1% of parents and 1.1% of children had high LDL-C levels. 51.6% of parents and 37.4% of children had low HDL levels. There was a significant relation of lipid disorders (except for high TG level) between parents and their children (Table 3). Low HDL was the commonest lipid disorder in both parents and children.

Discussion

Familial aggregation of cardiovascular risk factors including blood pressure, serum lipids and obesity has been extensively investigated.[21,22]

It has been demonstrated that both genetic and environmental factors contribute to the variability of risk factors and their familial aggregation.[23,24] Our study did not show a significant relation of systolic and diastolic blood pressure levels between parents and their children. This supports the findings reported by Bao et al.[2] and Jago et al.[10] but contradicts the conclusions reported by Fuentes et al.[25] and Stamler et al.[26]

The data in the present study regarding higher mean systolic and diastolic blood pressure in the offspring of hypertensive parents are in line with many other reports, such as the studies by Kelishadi et al.,[27] Elias et al.[28] and Richard et al.[29] Thus it would be advisable to track childhood blood pressure, especially in the offspring of hypertensive parents.

Our study showed a significant relation of BMI and obesity between parents and their children. In a study of CVD in Bogalusa, the most significant relationships between parents and their children were for height and weight.[30] In another study, there was a significant association of BMI (P<0.05) between Hispanic mothers and their children, but not in other ethnic groups.[10]

Child obesity increases the risk of obesity in adulthood and is associated with CVD risk factors,[31] hence preventive work should begin in early childhood, particularly in children of families at high risk for coronary artery disease (CAD). Our study did not show a significant relation of serum lipids between parents and their children. This supports the findings reported by Bao et al.[2] and Shear et al.,[32] but Jago et al.[10] found that HDL and LDL levels were significantly associated between African American mothers and their children, but not in other ethnic groups. Parent-child associations of serum cholesterol were observed in a cohort of 440 children (from birth to 7 years of age) and their parents in Bogalusa.[30] Adult dyslipidemia may reveal familial and therefore, offspring dyslipidemia.[33] Our study showed a significant relation of dyslipidemia except for high TG between parents and their children. Another study showed that increased parental lipid levels are associated with persistently and substantially higher lipid levels in their offspring.[8]

The commonest lipid disorders both in parents and children in our study was low HDL that is an independent risk factor for CAD.[34]

Epidemiologic studies have suggested that multiple risk factors increase the probability of cardiovascular events, since CVD risk factors tend to reinforce each other in their influence on morbidity and mortality.[35] A family history of premature MI is a risk factor for CVD[2] and detecting other risk factors such as hypertension, obesity and dyslipidemia is very important.

This study showed a significant relation of CVD risk factors between parents with a positive history of premature MI and their offspring, so we recommend serial measurement of BP, BMI and lipids in these children from early childhood through young adulthood.

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