Homocysteine, Fibrinogen and Lipid Profile in Children of Young Adults with Coronary Artery Disease

Plasma homocysteine (9.05 ± 4.78 *vs* 5.93 ± 1.46µmol/L, *P*<0.01), plasma fibrinogen (313.76 ± 80.02 *vs* 275.47 ± 53.77 mg/dL, *P*<0.01), serum total cholesterol (171.64 ± 35.48 *vs* 152.62 ± 25.40 mg/dL, *P*<0.01), serum LDL cholesterol (109.51 ± 36.93 *vs* 87.6 ± 21.6 mg/dL, *P*<0.01) and fasting blood sugar (99.89 ± 17.46 *vs* 90.29 ± 9.85 mg/dL, *P*<0.01) were significantly higher in children (*n*=45) of young adults (≤45 y) with coronary artery disease as compared to control group (*n*=45). No significant correlation was found for plasma homocysteine level of children with that of their parents in either group, whereas significant correlation was found for plasma fibrinogen of children with their parents in both the groups.

Key words: *Children, Coronary artery disease, Fibrinogen, Homocysteine, India, Parents*.

We conducted this study to determine plasma total homocysteine, fibrionogen, fasting blood sugar and lipid profile in 45 children (5-18y) of young adults (≤ 45y) with coronary artery disease (CAD) and compare their values with age and sex matched controls (*n*=45). 20 parents of the study group and 19 parents of the control group were also analyzed for similar parameters as their children.

A detailed history of the parents regarding diabetes, hypertension, alcohol intake, smoking, drug intake and family history of CAD was taken. Weight, height and abdominal girth were recorded and body mass index (BMI) was calculated for both parents and children in each group. Blood pressure was measured for all the parents and their children. Quantitative determination of fibrinogen in plasma was done using clotting method of Clauss [1]. Enzyme immunoassay [2] was used for quantitative estimation of total homocysteine in plasma. Serum lipid profile was estimated by enzymatic colorimetric method. ***Table* I** compares the children and parents in the two groups.

In the study group, BMI and abdominal girth of children had significant correlation with that of their parents. This suggests that obesity, more so apple type obesity in form of increased intra-abdominal fat is a risk factor for development of CAD in Indian population, and that it has a familial predisposition. There was significant difference in diastolic blood pressure between the two groups, both in children and their parents. Among the study cases, DBP of children had significant correlation with that of their parents, suggesting that increased DBP is an important risk factor for later development of CAD in Indian population. Blood sugar, serum total cholesterol and serum LDL cholesterol also differed significantly between cases and controls, both for the children and their parents. The findings of various other studies correspond to our findings [3-6].

Plasma fibrinogen level differed significantly between study cases and controls, both for the children and their parents. Correlation of plasma fibrinogen with age was positive in children in the case as well as in the control group. There was no correlation with sex in either group. Significant correlation was found for plasma fibrinogen of children with their parents in both the groups in our study. It supports the hypothesis that since plasma levels of fibrinogen have a genetic component, it could be a useful marker in identifying children at high risk for coronary artery disease. Plasma homocysteine levels also differed significantly between cases and controls, both for the children and their parents, as also reported earlier [7,8].

We conclude that apple type obesity, increased diastolic blood pressure, insulin resistance and a deranged lipid profile in form of increased serum total cholesterol and serum LDL cholesterol are potential risk factors of CAD, and they start operating early in life. Plasma levels of fibrinogen and homocysteine could be a useful marker for identifying children at high risk for coronary artery disease.

Contributors: AK: design, drafting and revision; KM; data acquisition, draft; SK: editing, literature review; VM: biochemical analysis. All authors approved the manuscript.
Funding: None.
Competing interests: None stated.

TABLE I COMPARISON OF CHILDREN AND PARENTS IN THE TWO GROUPS

	Children			Parents		
	Cases (*n*=45)	Controls (*n*=45)	*P* Value	Cases (*n*=20)	Controls (*n*=19)	*P* Value
Age (years)	12.06 ± 4.19	12.24 ± 4.27	0.842	40.80 ± 4.84	41.42 ± 2.98	0.631
Weight (kg)	37.94 ± 15.78	35.05 ± 14.35	0.367	76.20 ± 10.87	63.562 ± 11.34	0.001
Height (m)	1.40 ± 0.20	1.41 ± 0.21	0.772	1.68 ± 5.43	1.64 ± 6.50	0.051
BMI (kg/m^2)	18.28 ± 3.51	16.55 ± 2.56	0.009	26.90 ± 3.06	23.41 ± 2.94	0.001
Abd. Girth (cm)	61.39 ± 9.68	56.74 ± 8.25	0.016	98.58 ± 6.71	86.70 ± 5.34	0.001
SBP (mm Hg)	104.75 ± 14.30	104.00 ± 10.81	0.778	139.60 ± 25.72	116.10 ± 7.16	0.001
DBP (mm Hg)	67.37 ± 10.98	61.20 ± 9.12	0.005	87.50 ± 15.17	76.31 ± 5.62	0.005
Sugar (mg/dL)	99.88 ± 17.46	90.28 ± 9.84	0.002	144.60 ± 43.79	103.36 ± 10.32	0.001
TG (mg/dL)	123.93 ± 43.41	127.55 ± 34.08	0.661	165.40 ± 77.47	151.78 ± 33.22	0.478
Cholesterol (mg/dL)	171.64 ± 35.48	152.62 ± 25.40	0.004	236.60 ± 32.50	202.89 ± 15.55	0.001
HDL (mg/dL)	37.35 ± 6.19	39.51 ± 6.96	0.124	35.55 ± 8.13	38.36 ± 6.40	0.236
LDL(mg/dL)	109.51 ± 36.92	87.60 ± 21.60	0.001	167.66 ± 30.62	134.16 ± 18.05	0.001
Fibrinogen (mg/dL)	313.75 ± 80.021	275.46 ± 53.76	0.009	422.45 ± 96.18	338.36 ± 45.76	0.002
Homocysteine (µmol/L)	9.04 ± 4.77	5.93 ± 1.45	<0.001	18.06 ± 13.92	8.10 ± 1.25	0.005

All values depict mean ± SD.

Anita Khalil, Kausik Mandal, Sumaira Khalil and V Mallika*

Department of Pediatrics and Biochemistry, Maulana Azad Medical College and GB Pant Hospital, New Delhi, India.
anitakhalil@yahoo.com

REFERENCES

1. Clauss A. Rapid physiological coagulation method for determination of fibrinogen. Acta Haemat. 1957;17:237-46.
2. Frantzen F, Faaren AL, Altheim I, Nordhei AK. An enzyme conversion immunoassay for determining total homocysteine in plasma or serum. Clin Chem. 1998:44:311-6.
3. Greenlund KJ, Valdez R, Srinivasan SR, Berenson GS, Bao W, Wattigney WA, *et al*. Verification of parental history of coronary artery disease and associations with adult offspring risk factors in a community sample: the Bogalusa Heart Study. Am J Med Sci. 1997;313:220-7.
4. Tamirc I, Bojanower Y, Levtow O, Heldenberg D, Dickerman Z, Werbin B. Serum lipids and lipoproteins in children from families with early coronary heart disease. Arch Dis Child. 1972; 47;808-16.
5. Khalil A, Gupta S, Madan A, Venkatesan M. Lipid profile norms in Indian children. Indian Pediatr. 1995;32:1177-80.
6. Knuiman JT, West CE. Epidemiological studies on cardiovascular risk factors during childhood: total and HDL cholesterol in relation to diet. Frog Clin BioI Res. 1985;188:139-44.
7. Hyanek J, Stribrny J, Sebesta P, Klika M, Kramar J, Kozich V, *et al*. Diagnostic significance of mild hyperhomocysteinemia in a population of children with parents or grandparents who have peripheral or coronary artery disease. Cas Lek Cesk (Czech). 1999;138:333-6.
8. Greenlund KJ, Srinivasan SR, Xu JH, Dalferes E Jr, Myers L, Pickoff A, *et al*. Plasma homocysteine distribution and its association with parental history of coronary artery disease in black and white children: the Bogalusa Heart Study. Circulation. 1999;99:2144-9.