Cardiovascular Risk Factors Among Children of Men With Premature Myocardial Infarction

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THE INCREASED FREQUENCY of coronary heart disease (CHD) among relatives of affected patients suggests that familial factors are associated with the occurrence of occlusive coronary disease (*1–3*). Family studies among adults have also shown higher than expected levels of cholesterol, blood pressure, and cigarette smoking, all established risk factors for coronary heart disease (*4–11*), among relatives of patients affected by CHD (*12*). Further, results of studies of hypercholesterolemic children suggest an increased frequency of CHD among their adult relatives (*13,14*).

Corroboration and extension of these findings is an important public health matter since it can provide further evidence that the prevention of CHD mortality and morbidity must involve the family as a whole, and in particular, that prevention should begin in childhood. In this report, we examine CHD risk factors among children of men with premature myocardial infarction (MI) and seek to extend the observation (*15*) that levels of cholesterol among such children are higher than cholesterol levels among children of healthy fathers by determining whether these differences are independent of a paternal history of early MI or whether they are influenced by other CHD risk factors.

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This study was supported by a research grant (HL 14141) from the National Heart, Lung, and Blood Institute; Dr. Hennekens is a recipient of a Research Career Development Award (HL 00286) from the Institute. Tearsheet requests to Robert S. Levine, MD, University of Miami School of Medicine, P.O. Box 016820, Miami, Fla. 33101.

Subjects and Methods

To identify these case families, letters were sent to physicians in two adjacent counties in southeast Florida requesting referrals of families having a father under 50 years old who had experienced an MI at least 6 months previously, a mother, and at least 1 child of these 2 parents living in the household. The MI was documented by World Health Organization criteria—consisting of an episode of chest pain accompanied by either a diagnostic electrocardiographic pattern or a rise in serum glutamic oxaloacetic transaminase (SGOT) above 50 international units (*16*). Control families were matched by paternal age (within the same decade as the case father) and by residence (within 1 mile of the case family). Control fathers had no evidence of CHD by history, physical, or electrocardiographic examination.

All the children received an evaluation that consisted of a medical history; a physical examination, including two blood pressure measurements taken 5 minutes apart, height, and weight; and a laboratory evaluation, including fasting levels of plasma cholesterol, triglyceride, and glucose (*15,17*).

Table 1. Coronary risk factors among children of affected [1] and healthy men

Risk factors	Children of affected men [2] (N = 91)	Children of healthy men [2] (N = 86)	t value	P value
Cholesterol (mg/100 ml)	200 ± 52	176 ± 27	3.86	0.001
Glucose (mg/100 ml)	89 ± 9	83 ± 10	3.82	0.001
Triglyceride (mg/100 ml)	70 ± 27	56 ± 23	2.81	0.005
Weight (pounds)	59 ± 20	56 ± 15	1.16	NS
Systolic blood pressure (mmHg)	110 ± 13	108 ± 12	0.81	NS
Diastolic blood pressure (mmHg)	64 ± 9	64 ± 9	0.00	NS
Heart rate (beats/minute)	77 ± 14	81 ± 11	−2.08	0.038

[1] Men who experienced a myocardial infarction before age 50.
[2] Mean value ± standard deviation.

NOTE: NS indicates not significant.

For cholesterol, glucose, triglyceride, systolic and diastolic pressure, and pulse, the mean levels of the children of affected fathers were adjusted for age, sex, and height according to standards derived from national health survey data (*18*). For each variable, we compared mean levels among children of affected and healthy men by two sample *t* tests (*19*).

To determine whether observed differences in mean values between children of case and control fathers were independently associated with a paternal history of early MI, multiple logistic regression analysis was used (*20*).

Complete data were obtained for 91 children of 38 case fathers and 86 children of 39 healthy men. The children's ages ranged from 2 to 21 years. All of the study families were white. One case family was excluded from the analysis because of insufficient data.

Results

Table 1 shows the means and standard deviations for various coronary risk factors among children of affected and healthy men. The mean cholesterol level in the children of the affected men, 200 ± 52 mg/100 ml, was higher than the level of 176 ± 27 mg/100 ml among the children of the controls ($P = .001$). Similarly, the children of the affected men had higher values for glucose (89± 9 compared to 83 ± 10 mg/100 ml, $P = .001$) and for triglyceride (70 ± 27 compared to 56 ± 23 mg/100 ml, $P = .005$). The differences for adjusted weight, systolic blood pressure, and diastolic blood pressure were not significant. With respect to mean heart rate, the children of the affected men had a slower rate than the children of the healthy men (77 ± 14 compared to 81 ± 11 beats per minute, $P = .038$).

Table 2. Childhood risk factors associated with paternal history of myocardial infarction—results of multiple logistic analysis

Variable	Regression coefficient	Standard error	t value	P value
Constant	0.0442	0.1858	.....	
Glucose [1]	0.6048	0.2204	2.74	0.006
Cholesterol [1]	0.6432	0.2137	3.01	0.003

[1] Log values used in this analysis.

The results of the multiple logistic analysis are shown in table 2. These results indicate that the only variables significantly associated with parental MI were childhood cholesterol ($P = .003$) and glucose levels ($P = .006$). There was no independent effect of triglyceride, heart rate, systolic pressure, diastolic pressure, or adjusted weight.

Discussion

The findings indicate that both cholesterol and fasting glucose levels are significantly higher among children of fathers with a history of early MI than among children of healthy men.

With respect to cholesterol, the finding could be explained theoretically by a few children with relatively high levels of cholesterol. Even after exclusion of all children with values at or exceeding 230 mg/100 ml, however, children of affected fathers still had significantly higher mean cholesterol levels than children of healthy men.

With respect to glucose, abnormal levels were not found in any of the children in this study; none were being treated for any abnormality of carbohydrate metabolism. Further, glucose levels per se have not been determined to be a risk factor for coronary disease. Nonetheless, analysis of data for these children showed a statistically significant difference between blood glucose levels among children of affected and nonaffected fathers. It would be of interest to determine if this finding can be replicated and if studies of dietary intake, physical activity, or other variables can shed

further light on the possible biological significance of such differences.

The data support the hypotheses that processes leading to atherosclerosis begin in childhood and that levels of circulating cholesterol levels may offer a mechanism whereby family history can be associated with future coronary disease risk. On the other hand, measurement of total cholesterol may provide only a crude index as to circulating levels of specific atherogenic lipoproteins (*21*). Additional research is needed to more clearly delineate early differences between those at increased and at usual risk for myocardial infarction and to determine the predictive value of differences found in childhood relative to risk factor levels in adulthood.

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SYNOPSIS

LEVINE, ROBERT S. (University of Miami School of Medicine), HENNEKENS, CHARLES H., ROSNER, BERNARD, GOURLEY, JANET, GELBAND, HENRY, and JESSE, MARY JANE: *Cardiovascular risk factors among children of men with premature myocardial infarction. Public Health Reports, Vol. 96, January–February 1981, pp. 58–60.*

The possible association between fasting glucose, cholesterol, triglyceride, blood pressure, and body weight in children and the early occurrence of paternal myocardial infarction (MI) was explored by examination of 91 children of 38 fathers who had experienced MI before they were 50 years old and 86 children of 39 healthy fathers.

The only variables significantly associated with paternal MI were childhood cholesterol ($P=.003$) and glucose ($P=.006$). The results are consistent with the hypothesis that elevated childhood cholesterol levels offer a mechanism whereby family history predicts future risk of coronary heart disease.