

Asymptomatic Hyperglycemia and Cardiovascular Diseases in Three Chicago Epidemiologic Studies

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Three epidemiologic studies in Chicago populations yielded inconsistent findings on the relationship of diabetes to cardiovascular disease. *DIABETES CARE* 2: 142-143, MARCH-APRIL 1979.

In the Western industrialized countries, it has long been observed that individuals with clinical diabetes have a greater risk of atherosclerotic disease, especially coronary heart disease, than those without diabetes.^{1,2} However, this result has not been observed worldwide; in particular, in regions with less atherogenic diets, diabetes may not be accompanied by severe atherosclerosis.^{3,4} Because glucose intolerance is a hallmark of diabetes, it has generally been assumed that glucose intolerance is the key to the increased atherosclerosis observed in clinical diabetics. Thus, it has also been assumed that *asymptomatic* glucose intolerance is a risk factor for adult cardiovascular diseases, although there is no extensive body of data to justify this assumption. One means of elucidating this important unsolved question is through epidemiologic investigation, in large population groups, of the possible independent association of asymptomatic hyperglycemia with an excess of coronary disease morbidity and mortality.

Such an epidemiologic investigation is now in progress, with findings of studies in 10 countries currently being analyzed in parallel. Because the studies reported in this paper are a part of the International Collaborative Group which will shortly complete its joint analysis, the findings of the Chicago group will be presented here only in summary form. Full description of methods and display of data will appear as part of the collaborative publication.

DESCRIPTION OF THE CHICAGO STUDIES

Three prospective studies form the basis of this report: the Chicago Heart Association (CHA) Detection Project in Industry,⁵ the Chicago Peoples Gas Company study, and the Western Electric Company study.^{6,7} The findings summarized here are for middle-aged white men.

In the CHA, this includes approximately 8000 men ages

40-59 yr; in the Gas Company, 840 men ages 40-64; and in the Western Electric Company, about 1700 men ages 43-59. In all studies plasma glucose level was determined after oral glucose load, and in addition, the Gas Company study has findings with a casual plasma glucose determination.

Data are available on association of base-line glucose level and base-line ECG abnormalities for the CHA and Gas Company studies, and mortality data are available after 5, 10, and 15 yr follow-up for CHA, Gas Company, and Western Electric, respectively.

To assess association of initial glucose level and ECG evidence of coronary heart disease, three sets of ECG criteria were used: definite myocardial infarction as defined by Minnesota code;⁸ criteria for definite, probable or possible CHD, as used in the British Whitehall Study;⁹ and criteria for major ECG abnormalities, as used in the U. S. Pooling Project Study.¹⁰ Endpoints for mortality analyses were death from all causes, from all cardiovascular diseases, and from coronary heart disease.

FINDINGS

(1) Among the men with a *prior diagnosis of diabetes*, mortality (including coronary heart disease and cardiovascular mortality) was two to three times higher than that of men with no such diagnosis, thus corroborating earlier findings in Western industrialized countries.

Because the focus of the investigation was on asymptomatic hyperglycemia, men with a base-line diagnosis of diabetes were eliminated from the remaining analyses reported below.

(2) Prevalence of ECG abnormalities was positively associated with initial glucose level in some analyses and not associated in others. In the CHA and Gas Company studies (both postload and casual), there was no association of

glucose with prevalence of *definite myocardial infarction on ECG*, in either univariate or multivariate analyses (controlling for variables correlated with glucose—age, blood pressure, serum cholesterol, relative weight—as well as for cigarettes).

(3) For the *Whitehall and Pooling criteria*, the CHA showed higher prevalence rates of these abnormalities for the upper glucose levels, in both univariate and multivariate analyses, whereas the Gas Company postload study showed such an association in univariate but not multivariate analyses.

(4) *Mortality findings* were similarly inconsistent among the three studies. In multivariate analyses, initial glucose level was not associated with any of the three endpoints (all causes, cardiovascular, or coronary) in the 15-yr follow-up at Western Electric; it was associated with all causes of mortality but not cardiovascular or coronary heart disease in the CHA study; and it was positively associated with all three endpoints in the Gas Company postload study, but not so associated in the casual glucose study.

CONCLUSION

The conclusion drawn from the above findings is that the inconsistency of the data do not permit a definite answer to the following question: is asymptomatic hyperglycemia an independent risk factor for cardiovascular and coronary disease?

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