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W.E. Feeman, Jr, Naveed Sattar, Denis St J. O'Reilly, Chris J. Packard, James Shepherd, Allan Gaw, Peter W. Macfarlane, Stuart M. Cobbe, Olga Scherbakova, Ian Ford, Steven M. Haffner and Chris Isles

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Metabolic Syndrome and Diabetes Mellitus

To the Editor:

I would like to extend the comments of Sattar et al¹ on the metabolic syndrome and its relationship to diabetes mellitus. In data presented at the American Academy of Family Physicians Annual Scientific Assembly (1999) and at the 2001 Drugs Affecting Lipid Metabolism symposium, I noted that the incidence of diabetes in patients with combined low HDL cholesterol and elevated triglycerides (TG) was 45% and the incidence of impaired glucose tolerance was 18%. (The data presented were a proposed classification of lipid disorders based on LDL and HDL cholesterol, stratified by TG). This group contained the highest number of patients with impaired glucose tolerance/diabetes of any of the possible LDL, HDL, and TG combinations—ie, high LDL, normal HDL, and low TG versus normal LDL, normal HDL, and high TG, versus high LDL, low HDL, normal TG, etc.

In data not published, I analyzed patients in my database collected over 28 years in my private practice of family medicine in Bowling Green, Ohio. Between November 4, 1974 and January 1, 2002, 1545 male patients and 1610 female patients underwent screening for risk factors for atherothrombotic disease. Such screening includes, in addition to a lipid profile, a 2-hour postprandial blood glucose (2-hour pp BSL). (From the 1970s to the late 1990s, plasma glucose was measured, but since the late 1990s, serum glucose has been measured. In our hospital laboratory, the difference between plasma and serum glucose is minimal.) The 2-hour pp BSL is measured precisely 2 hours after a standard 100-g carbohydrate meal (as calculated by the staff dietitian of Wood County Hospital, Bowling Green, Ohio).

A total of 1355 male and 1505 female patients who underwent the above testing had 2-hour pp BSL <199 mg/dl. Of these, 60 of 1355 (4%) male and 58 of 1505 (4%) female patients progressed to diabetes mellitus, as defined by a 2-hour pp BSL \geq 200 mg/dL. The traits that were most commonly associated with progression to diabetes were higher levels of 2-hour pp BSL (although not initially exceeding 199 mg/dL), high body mass index, and low levels of HDL cholesterol (\leq 39 mg/dL).

In conclusion, I can extend the observations of Sattar et al¹ to the west side of the Atlantic Ocean. The low-HDL, high-TG lipid disorder is a virtual marker for diabetes mellitus, and all such patients should be screened for diabetes periodically. Lifestyle changes (ie, diet, exercise, and weight loss) may help prevent—or at least delay the onset of—diabetes mellitus in this high-risk population.

W.E. Feeman, Jr, MD
The Bowling Green Study
Bowling Green, Ohio

1. Sattar N, Gaw A, Scherbavoka O, et al. Metabolic syndrome with and without C-reactive protein as a predictor of coronary heart disease and diabetes in the West of Scotland Coronary Prevention Study. *Circulation*. 2003;108:414–419.

Response

We thank Dr Feeman for his interest in our article.¹ His and our data confirm the association of high triglyceride, low HDL cholesterol, and elevated body mass index (BMI) with increased risk for type 2 diabetes, a pattern previously well established. For example, we had previously shown strong and independent

associations of elevated BMI and triglyceride and modestly elevated fasting glucose for subsequent diabetes, whereas systolic blood pressure and low HDL cholesterol were not predictive in multivariate analysis.² As we noted in our study, one of the major clinical uses for the National Cholesterol Education Program metabolic syndrome criteria could be to identify individuals at elevated risk for type 2 diabetes. It is likely, however, that modifications either in terms of cutoffs or parameters included in the current criteria could help improve diabetes prediction. In this respect, Stern et al³ recently determined that a simple multivariable model—consisting of readily available clinical measurements and not requiring a 2-hour oral glucose tolerance test—is superior to relying exclusively on the 2-hour glucose value for identifying persons at high risk for future type 2 diabetes. Moreover, the addition of the 2-hour oral glucose tolerance test to the model only minimally enhanced diabetes prediction.³ What is relatively unique about the West of Scotland Coronary Prevention Study is that it uses a recognized definition in high-risk subjects for heart disease. Clearly, further studies in this important area are required.

Naveed Sattar, MD
Denis St.J. O'Reilly, MD
Chris J. Packard, DSc
James Shepherd, MD
Allan Gaw, MD
Peter W. Macfarlane, DSc
Stuart M. Cobbe, MD

University Departments of Pathological Biochemistry
Clinical Trials Unit
Division of Cardiovascular and Medical Sciences
Glasgow Royal Infirmary
Glasgow, United Kingdom
nsattar@clinmed.gla.ac.uk

Olga Scherbakova, MSc
Ian Ford, PhD
Robertson Centre for Biostatistics
University of Glasgow
Glasgow, United Kingdom

Steven M. Haffner, MD
Department of Medicine
University of Texas Health Science Center at San Antonio
San Antonio, Tex

Chris Isles, MD
Department of Medicine
Dumfries and Galloway District General Hospital
Dumfries, Scotland

1. Sattar N, Gaw A, Scherbakova O, et al. Metabolic syndrome with and without C-reactive protein as a predictor of coronary heart disease and diabetes in the West of Scotland Coronary Prevention Study. *Circulation*. 2003;108:414–419.
2. Freeman DJ, Norrie J, Caslake MJ, et al. C-reactive protein is an independent predictor of risk for the development of diabetes in the West of Scotland Coronary Prevention Study. *Diabetes*. 2002;51:1596–1600.
3. Stern MP, Williams K, Haffner SM. Identification of persons at high risk for type 2 diabetes mellitus: do we need the oral glucose tolerance test? *Ann Intern Med*. 2002;136:575–581.