

How Should We Respond to the Worldwide Diabetes Epidemic?

The headlines coming from the International Diabetes Federation meeting in Helsinki this summer were about the worldwide increase in diabetes, particularly affecting the Third World (1). The U.S. will not be spared from this epidemic and its associated personal and societal costs. As the article by Harris et al. (2) clearly documents, there has already been a marked increase in the prevalence of diagnosed and undiagnosed diabetes and impaired glucose tolerance in the U.S., as documented in the sequential National Health and Nutrition Examination Surveys (NHANESs), and particularly in the latest survey (NHANES III, 1988–1994). These data raise two related questions: why are we seeing this increase in prevalence and what does this mean in terms of health costs and outcomes?

The explanation that the observed increased prevalence is due to the recent changes in diagnostic criteria or surveillance is adequately refuted by the data presented (2). The increased diabetes prevalence using the new criterion of a fasting blood glucose >125 mg/dl and that using the unchanged World Health Organization (WHO) criteria are virtually identical: from 8.9% in 1976–1980 to 12.3% in 1988–1994 using American Diabetes Association criteria and from 11.4 to 14.3% using WHO criteria. Similar increases are seen for impaired glucose tolerance.

Thus, the lowering of the level of fasting glucose diagnostic of diabetes did not just reclassify people, rather it identified new cases. Since the survey screens all patients included, ascertainment bias is also quite unlikely.

Then, if there are more people with diabetes living at ages 40–74 years, is this due to cohort survival or a higher incidence of diabetes? While not to minimize the true decrease in cardiovascular disease and deaths over the past 20 years, this does not appear to account for the increased prevalence of diabetes. Harris et al. suggest that the increase is due to the increased obesity and sedentary lifestyle seen in the U.S. over the past 20 years (2–4). We share this view, and the worldwide epidemic seems to sus-

tain it. The gene(s) inclining so many members of society to insulin resistance, cardiovascular disease, and diabetes are markedly prevalent in many ethnic groups (5). An improved standard of living seems inevitably to result in lifestyle changes that result in reduced physical activity, increased body weight, and vascular disease and diabetes. It seems almost certain that these lifestyle changes underlie the worldwide increased prevalence of diabetes.

Added to this increased prevalence of diabetes is the concomitant increase in the prevalence of impaired glucose tolerance and the newly defined impaired fasting glucose (2). We are struggling with how to address this even larger population known to be at risk for the development of both diabetes and cardiovascular disease. We published data in the June 1997 *Diabetes Care* documenting the increased cardiovascular risk associated with even mild abnormalities in fasting glucose (6). These observations suggest that the increase in cardiovascular risk occurs at an even lower plasma glucose than does the microvascular risk. Because many of those with impaired glucose at the beginning of a long-term epidemiologic study develop diabetes during the study, it is not certain whether it is the impaired glucose tolerance or the subsequent development of diabetes that is the risk factor for cardiovascular disease. Whatever the explanation, the increased prevalence of all abnormalities in glucose metabolism and of insulin resistance will predictably result in increased cardiovascular disease among these individuals (7,8).

How can we address this epidemic? Certainly applying the old and new diabetes therapies is the place to start. But we are hampered in this by our uncertainty regarding the effect of current interventions on either delaying the onset of diabetes or reducing cardiovascular disease (9). Thus, we must pursue a two-pronged attack on the problem of diabetes. First, we must vigorously pursue basic and clinical research into the reasons that diabetes and impaired glucose tolerance are associated with increased cardiovascular risk and how

we can prevent the development of cardiovascular disease. We must also examine how to reduce the conversion of impaired glucose tolerance into diabetes. The Diabetes Prevention Program occupies a central role in this latter effort.

Second, we must pursue a vigorous public health effort to improve the care of people with diabetes. Diabetes has become a major public health problem that consumes a rising percent of our health care dollars: nearly \$100 billion (one-sixth of all health care costs) and rising at last look (10). How society addresses diabetes as a public health problem will determine the fate of the nearly 18 million diagnosed and undiagnosed in the U.S. and the estimated 200 million people worldwide who will have diabetes as we enter the new millennium (1).

The good news is that we have effective treatments likely to improve the lives of people with diabetes and to reduce their long-term complications. The bad news is that these treatments are not being universally applied (11). Effective application of these treatments will require that the public, patients, practitioners, and policy makers take diabetes seriously to ensure that these treatments are effectively and uniformly applied. The recent changes in Medicare reimbursement as part of the budget reconciliation act are an important step. The establishment of the National Diabetes Education Program (NDEP) is another. Funded jointly by the National Institutes of Health and the Centers for Disease Control, NDEP has brought together over 100 organizations representing a broad cross-section of the public, people with diabetes, health care professionals, payers and policy makers, and industry dedicated to communicating the seriousness of diabetes and the marked difference that treatments can make in human and financial terms. Its public campaigns will be launched in the spring. By working together, we have the opportunity to reduce the potentially devastating effects of the coming diabetes epidemic.

CHARLES M. CLARK, JR., MD
EDITOR

References

1. Zimmet P, McCarty D: The NIDDM epidemic: global estimates and projection: a look into the crystal ball. *IDF Bulletin* 40(3):8-16, 1995
2. Harris MI, Flegal KM, Cowie CC, Eberhardt MS, Goldstein DE, Little RR, Wiedmeyer H-M, Byrd-Holt DD: Prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance in U.S. adults: the Third National Health and Nutrition Examination Survey, 1988-1994. *Diabetes Care* 21:518-524, 1998
3. Crespo CJ, Keteyian SJ, Heath GW, Sempas CT: Leisure-time physical activity among US adults. *Arch Intern Med* 156:93-98, 1996
4. Kuzmarski RJ, Flegal KM, Campbell SM, Johnson CL: Increasing prevalence of overweight among US adults: the National Health and Nutrition Examination Surveys, 1960-1991. *JAMA* 272:205-211, 1994
5. Zimmet PZ, Alberti KGMM: The changing face of macrovascular disease in non-insulin-dependent diabetes mellitus: an epidemic in progress. *Lancet* 350:1-4, 1997
6. Folsom AR, Szklo M, Stevens J, Liao F, Smith R, Eckfeldt JH: A prospective study of coronary heart disease in relation to fasting insulin, glucose, and diabetes: the Atherosclerosis Risk in Communities (ARIC) Study. *Diabetes Care* 20:935-942, 1997
7. Stern MP: Do non-insulin-dependent diabetes mellitus and cardiovascular disease share common antecedents? *Ann Intern Med* 124:110-116, 1996
8. Raman M, Nesto RW: Heart disease in diabetes mellitus. *Chronic Complications of Diabetes* 25:425-438, 1996
9. Nathan DM, Meigs J, Singer DE: The epidemiology of cardiovascular disease in type 2 diabetes mellitus: how sweet it is. . . or is it? *Lancet* 350:4-9, 1997
10. Javitt JC, Chiang YP: Economic impact of diabetes. In *Diabetes in America*. 2nd ed. Harris MI, Cowie CC, Stern MP, Boyko EJ, Reiber GE, Bennett PH, Eds. Washington, DC, U.S. Govt. Printing Office, 1995, p. 601-612 (NIH publ. no. 95-1468)
11. Marrero DG: Evaluating the quality of care provided by primary care physicians to people with non-insulin-dependent diabetes mellitus. *Diabetes Spectrum* 9:30-34, 1996