Identification of Obesity in Patients With Type 2 Diabetes From Australian Primary Care

The NEFRON-5 Study

MERLIN C. THOMAS, MBCHB, PHD, FRACP[1]
PAUL ZIMMET, MD, PHD, FRACP, FACE, FAFPHM, AO[2]
JONATHAN E. SHAW, MD, MRCP, FRACP[2]

The recognition of obesity by treating physician is fundamental to the management of diabetes (1). In this article, we describe the frequency of obesity in patients with type 2 diabetes in Australian general practice and examine the identification of obesity by general practitioners.

RESEARCH DESIGN AND METHODS — The National Evaluation of the Frequency of Renal Impairment cO-existing with NIDDM (NEFRON) study was an incident-driven, clustered, stratified survey of 3,893 patients with type 2 diabetes in the Australian primary care setting. Investigator selection and patient characteristics are described elsewhere (appendix 1 [available at http://care.diabetesjournals.org]) (2).

Caucasian individuals with a BMI 25.0–29.9 kg/m^2 were classified as overweight, while those with a BMI ≥30.0 kg/m^2 were classified as obese (3). In Asian patients, overweight and obese categories were defined by a BMI ≥23 and ≥25 kg/m^2, respectively (4). Waist circumference was measured halfway between the lower border of the ribs and the iliac crest on a horizontal plane. Men with a waist circumference between 94.0 and 101.9 cm and women with a waist circumference between 80.0 and 87.9 cm were classified as overweight. A waist circumference ≥102.0 cm in men and ≥88.0 cm in women classified abdominal obesity, except in patients of Asian ethnicity where the World Health Organization Expert Committee on Obesity in Asian and Pacific populations has recommended that a waist circumference of 90.0 cm for men and 80.0 cm for women can be used for identifying individuals with abdominal obesity (5).

Practitioners were asked whether they currently perceived their patient as underweight, ideal weight, overweight, or obese. No instruction was provided on how to classify patients. The predictive value for variables associated with the perception of obesity by practitioners were deduced from the area under the receiver operating characteristic curve.

RESULTS — Using classification based on race-specific BMI criteria, 53.0% (95% CI 51.5–54.5) of patients with type 2 diabetes who were seen in general practice were obese. A further 32.8% (33.4–36.1) of patients were overweight, meaning that at least four of every five diabetic patients (85.6%) seeing their general practitioner were obese or overweight according to BMI-based categories. Abdominal obesity, defined by race-specific waist circumference criteria, was also common, where 91% were obese or overweight. Most of these patients were in the obese range (76.0%). There were no significant differences in the frequency of obesity between racial subgroups (Fig. 1). Weight-based criteria alone was inadequate to identify the large numbers of patients with abdominal obesity (Fig. 1). This was particularly true in patients aged >65 years, where 58% of patients with abdominal obesity had a BMI <30 kg/m^2.

At the same time, 30.9% of NEFRON patients were identified by their general practitioner as obese, with a further 44.4% classified as being overweight. This categorization was overtly discordant with national and international criteria used to define obesity. More Caucasian individuals with diabetes were identified by their own general practitioner as obese (33.6%) compared with those of Asian ethnicity, where only 7.6% of patients were identified as obese, although 8–10 times this number met race-specific criteria. This was largely explained by the dependence of practitioners on raw weight (receiver operating characteristic 0.88), without making adjustments for ethnicity in the interpretation of body habitus. Indeed, significantly fewer Asian-ethnicity patients with BMI >30 kg/m^2 were considered obese by their general practitioners (38%) compared with patients with a Caucasian background (58%, $P < 0.01$).

CONCLUSIONS — Obesity represents the major unmet need in the management of type 2 diabetes, and its prevalence is rising (6,7). Currently, half

From the [1]Juvenile Diabetes Research Foundation/Danielle Alberti Memorial Centre for Diabetes Complications, Baker Medical Research Institute, Melbourne, Victoria, Australia; and the [2]International Diabetes Institute, Melbourne, Victoria, Australia.

Address correspondence and reprint requests to Merlin Thomas, Danielle Alberti Memorial Centre for Diabetic Complications, Baker Medical Research Institute, P.O. Box 6492, Melbourne, Victoria 8008, Australia. E-mail: mthomas@baker.edu.au.

Received for publication 20 June 2006 and accepted in revised form 1 September 2006.

M.C.T. has received funding by Servier.

Additional information for this article can be found in an online appendix at http://care.diabetesjournals.org.

Abbreviations: NEFRON, National Evaluation of the Frequency of Renal Impairment cO-existing with NIDDM.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

DOI: 10.2337/dc06-1288

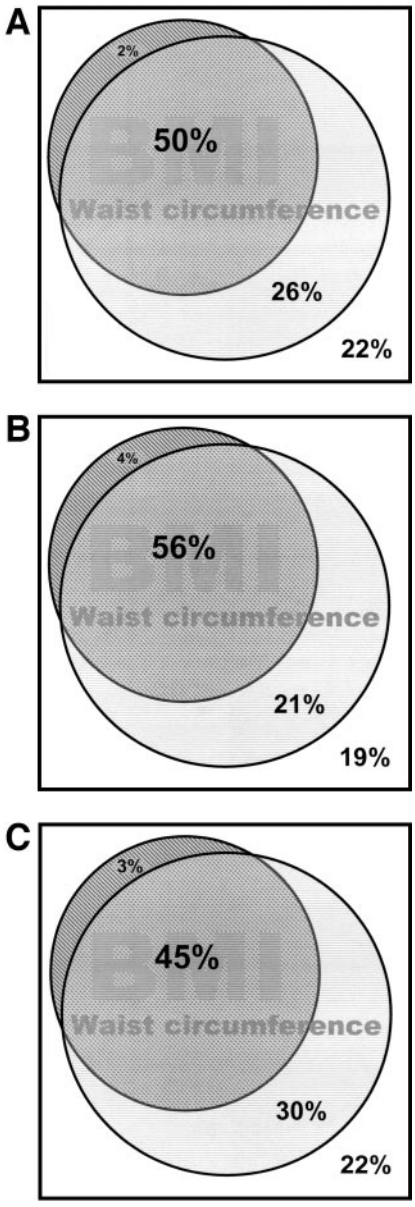

Figure 1—*Venn diagrams showing the pattern of obesity with type 2 diabetes in Australian general practice in Caucasian patients* (A)*, Asian patients* (B)*, and indigenous Australians* (C)*. Cross hatch denotes patients with obesity defined by race-specific BMI criteria; light shading denotes patients with abdominal obesity defined by race-specific waist circumference criteria (see text).*

of all patients with type 2 diabetes presenting in general practice are obese, according to race-specific BMI criteria, and three of four patients have abdominal obesity. This is similar to data from the AusDiab survey of the Australian general community (8,9), where 46.2 and 87.7% of individuals with type 2 diabetes met BMI- and waist circumference–based criteria for obesity, respectively (J.E.S., P.Z., personal communication).

While obesity is common in diabetes, and a key target for intervention, it remains inadequately assessed in primary care (1). The extent of the problem is significantly underestimated by weight-based criteria that do not account for racial and age-related differences in body habitus. BMI is known to be a less-than-reliable indicator of overall and abdominal obesity in the elderly (10), the cohort that constitutes the majority of Australians with diabetes (2,11). Data from the NEFRON study further underline the call for the practice of using only scales to identify overweight or obese individuals with diabetes to be reevaluated, since doing so misclassifies at least one of three patients who are at risk.

In addition, the frequency of obesity was further underestimated by general practitioners themselves, and their estimates are at variance with national and international criteria used to define obesity. General practitioners identified obesity in Caucasian individuals at a rate over four times that in Asians (33.6 vs. 7.6%, respectively, $P < 0.001$). This reflects the inappropriate dependency on weight for the stratification of risk, whereby Asian patients actually needed a higher BMI than Caucasian individuals to be perceived as obese. However, when using race- and sex-appropriate criteria, the frequency of obesity was similar, regardless of ethnic background.

In previous studies (1), it is apparent that most obese patients are aware that they are overweight, and most of them recognize that their weight is a health risk. However, the identification of obesity in the primary care setting is poorly understood, although fundamental for the initiation and reinforcement of appropriate health interventions. While it can be argued that lifestyle interventions that include weight reduction should be applied to everyone with type 2 diabetes, correct stratification of obesity should influence the type and intensity of a range of interventions, particularly in this high-risk population. For the tide of diabesity (12) to be turned, there is an urgent need to reexamine the attitudes to and the assessment of obesity in primary care (13). If we want our patients to lose weight, we have to be prepared to identify obesity and openly discuss the complex issues surrounding it.

Acknowledgments— The NEFRON study was jointly supported by the Baker Health Institute, Kidney Health Australia, and the Servier Foundation. Data and project management services were provided by Quintiles (Australia) and statistical services by Statistical Revelations, Australia. M.C.T. had full access to data in the study and takes responsibility for the integrity and accuracy of the data analysis.

We thank the AusDiab Steering Committee for providing data from the AusDiab study.

References

1. Bramlage P, Wittchen HU, Pittrow D, Kirch W, Krause P, Lehnert H, Unger T, Hofler M, Kupper B, Dahm S, Bohler S, Sharma AM: Recognition and management of overweight and obesity in primary care in Germany. *Int J Obes Relat Metab Disord* 28:1299–1308, 2004
2. Thomas MC, Weekes A, Broadley O, Cooper ME, Mathew TH: The burden of chronic kidney disease in Australian patients with type 2 diabetes (the NEFRON study). *Med J Aust* 185:140–144, 2006
3. World Health Organization: *Obesity: Preventing and Managing the Global Epidemic: Report of the WHO Consultation on Obesity*. Geneva, World Health Org., 1998 (Tech. Rep. Ser., no. 646)
4. World Health Organization: *The Asia-Pacific Perspective: Redefining Obesity and its Treatment*. Geneva, World Health Org., 2000
5. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet* 363:157–163, 2004
6. Lusignan S, Sismanidis C, Carey IM, DeWilde S, Richards N, Cook DG: Trends in the prevalence and management of diagnosed type 2 diabetes 1994–2001 in England and Wales. *BMC Fam Pract* 6:13, 2005
7. Leibson CL, Williamson DF, Melton LJ 3rd, Palumbo PJ, Smith SA, Ransom JE, Schilling PL, Narayan KM: Temporal trends in BMI among adults with diabetes. *Diabetes Care* 24:1584–1589, 2001
8. Dunstan DW, Zimmet PZ, Welborn TA, Cameron AJ, Shaw J, de Courten M, Jolley D, McCarty DJ: The Australian Diabetes, Obesity and Lifestyle Study (AusDiab): methods and response rates. *Diabetes Res Clin Pract* 57:119–129, 2002
9. Snijder MB, Zimmet PZ, Visser M, Dekker JM, Seidell JC, Shaw JE: Independent and opposite associations of waist and hip circumferences with diabetes, hypertension and dyslipidemia: the AusDiab Study. *Int J Obes Relat Metab Disord* 28:402–409, 2004
10. Seidell JC, Visscher TL: Body weight and weight change and their health implica-

tions for the elderly. *Eur J Clin Nutr* 54 (Suppl. 3):S33–S39, 2000
11. Kemp TM, Barr EL, Zimmet PZ, Cameron AJ, Welborn TA, Colagiuri S, Phillips P, Shaw JE: Glucose, lipid, and blood pressure control in Australian adults with type 2 diabetes: the 1999–2000 AusDiab. *Diabetes Care* 28:1490–1492, 2005
12. Zimmet P, Alberti KG, Shaw J: Global and societal implications of the diabetes epidemic. *Nature* 414:782–787, 2001
13. Zimmet P, James W: The unstoppable Australian obesity and diabetes juggernaut: what should politicians do? *Med J Aust* 185:187–188, 2006