Journal of the American Society of Hypertension 8(6) (2014) 394–404

Research Article

Diabetes and age-related demographic differences in risk factor control

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Manuscript received March 4, 2014 and accepted March 21, 2014

Abstract

Disparate vascular outcomes in diabetes by race and/or ethnicity may reflect differential risk factor control, especially pre-Medicare. Assess concurrent target attainment for glycohemoglobin <7%, non–high density lipoprotein-cholesterol <130 mg/dL, and blood pressure <140/<90 mm Hg in white, black, and Hispanic diabetics <65 years and ≥65 years of age. The National Health and Nutrition Examination Surveys 1999–2010 data were analyzed on diagnosed and undiagnosed diabetics ≥18 years old. Concurrent target attainment was higher in whites (18.7%) than blacks (13.4% [$P = .02$] and Hispanics [10.3%, $P < .001$] <65 years but not ≥65 years of age; 20.0% vs. 15.9% [$P = .13$], 19.5% [$P = .88$]). Disparities in health care insurance among younger whites, blacks, and Hispanics, respectively, (87.4% vs. 81.1%, $P < .01$; 68.0%, $P < .001$) and infrequent health care (0–1 visits/y; 14.3% vs. 15.0%, $P =$ not significant; 32.0%, $P < .001$) declined with age. Cholesterol treatment predicted concurrent control in both age groups (multivariable odds ratio >2, $P < .001$). Risk factor awareness and treatment were lower in Hispanics than whites. When treated, diabetes and hypertension control were greater in whites than blacks or Hispanics. Concurrent risk factor control is low in all diabetics and could improve with greater statin use. Insuring younger adults, especially Hispanic, could raise risk factor awareness and treatment. Improving treatment effectiveness in younger black and Hispanic diabetics could promote equitable risk factor control. J Am Soc Hypertens 2014;8(6):394–404.

Keywords: Diabetes mellitus; hypertension; hypercholesterolemia; health disparities.

Background

Diabetes is a major contributor to death and disability. From 1990 to 2010, diabetes mellitus rose from the 15th to 7th leading contributor to years of life lost in the United States.[1] Diabetes remained the 8th leading contributor to years lived with disability.

Vascular disease is the leading cause of death and disability in diabetes. Macrovascular disease contributes to morbidity and up to two-thirds of deaths.[2] Diabetes is the leading cause of blindness and end-stage renal disease,[3,4] which are microvascular complications.

Vascular benefits of risk factor control in diabetes are established. Treating hypertension and hyperlipidemia reduces coronary heart disease, stroke, renal, and retinal disease in adults with diabetes.[5,6] Concomitant vascular risk factors management provides greater macrovascular and microvascular protection.[7]

Funding: This report was supported in part by National Institutes of Health HL105880; NIH NS058728, and NIH HL091841, Bethesda, MD; Centers for Disease Control and Prevention, Atlanta, GA (Community Transformation Grant through the South Carolina Department of Health and Environmental Control [SC DHEC]).

Disclosures/conflict of interest: During the previous three years Dr. Egan received research support from Daiichi-Sankyo (>$10,000), Medtronic (>$10,000), Novartis (>$10,000), Takeda (>$10,000) and served as a consultant to AstraZeneca (<$10,000), Daiichi-Sankyo (<$10,000), Medtronic (>$10,000), Novartis (<$10,000), Takeda (<$10,000), Blue Cross Blue Shield South Carolina (>$10,000). JL, TW, and AS have nothing to disclose.

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1933-1711/$ - see front matter
http://dx.doi.org/10.1016/j.jash.2014.03.323

Diabetes contributes to health disparities. Prevalent diabetes and its complications are more common in African Americans and Hispanics than Caucasians.[8] Disparate outcomes are related in part to higher prevalence and/or lesser awareness and treatment in minority than white patients.[8,9] Race and/or ethnicity disparities in controlling risk factors including diabetes and hypertension are greater pre-Medicare and decline with Medicare coverage.[10–14]

This study was undertaken to (1) assess differences in attaining control of diabetes, hypercholesterolemia, and hypertension between Caucasian and Hispanic-African-Americans minorities with diabetes at ages <65 years and ≥65 years (Medicare eligibility for most), and (2) identify medically modifiable variables that could inform strategies to raise risk factor control and improve vascular outcomes and health equity in diabetes.

Research Design and Methods

The National Health and Nutrition Examination Surveys (NHANES) assess a representative sample of the U.S. civilian noninstitutionalized population. All adults provided written consent approved by National Center for Health Statistics.

Participants included adults ≥18 years old in NHANES 1999–2010.

Race/Ethnicity was determined by self-report and separated into non-Hispanic white (white), non-Hispanic black (black), and Hispanic ethnicity.

Diagnosed diabetes was defined by positive response to one or more questions, ''Have you ever been told by a doctor that you have diabetes?'', ''Are you now taking insulin?'', ''Are you now taking diabetic pills to lower your blood sugar?'', and a match between medication(s) reported or brought to exam and known diabetes medication(s).

Duration of diabetes among aware (diagnosed) adults was determined by the difference between age at the time of examination and age when subjects were first told they had diabetes.

Undiagnosed diabetes was defined in subjects without diagnosed diabetes as fasting glucose ≥126 mg/dL and/or glycosylated hemoglobin (HbA1c) ≥6.5%.[15]

Patients without diabetes were defined by fasting glucose <126 mg/dL and HbA1c <6.5%. In patients with only one value, the single value was within target.[15,16]

Diabetes control was defined by HbA1c values <7% as recommended.[16,17] The American Diabetes Association has long recognized that less stringent goals, for example <8%, may be acceptable for individuals with long-standing diabetes, severe or frequent hypoglycemia, and other major comorbid health conditions, for example, frailty and cardiovascular disease.[16,17]

Hypertension was defined by mean (excluding first value) systolic blood pressure (BP) ≥ 140 and/or diastolic BP ≥ 90 mm Hg, and/or a positive response to questions ''Are you currently taking medication to lower your BP?'', and by individuals reporting a physician told them twice they were hypertensive.[18]

Hypertension control was defined as BP < 140/<90 mm Hg. Although goal BP in diabetes was <130/<85−<80 mm Hg for 1999–2010,[19,20] recent evidence does not support lower treatment goals.[21,22]

Hypercholesterolemia was defined by non–high density lipoprotein-cholesterol (HDL-C) ≥130 mg/dL[2]. Non–HDL-C was selected because low density lipoprotein-C (LDL-C) was missing on >50% of adults.[18] Non–HDL-C is also a better vascular disease predictor than LDL-C.[22] Hypercholesterolemia was also defined by a 'Yes' response to ''Are you now taking medication to lower your cholesterol?'' and a match between medication(s) reportedly taken and known lipid-lowering medication(s).[18] Non–HDL-C <130 mg/dL defined control.[24]

Major coronary heart disease (CHD) risk factors were defined as described except[25] family history of premature CHD, which was defined as CHD in first-degree relatives <50 years old given limited family history documentation of CHD in NHANES.[26]

CHD was defined by positive response to, ''Has a doctor ever told you that you had a heart attack,'' and/or ''Has a doctor ever told you that you had coronary heart disease?'' and/or angina by Rose questionnaire.[27]

Stroke was defined by positive response to, ''Has a doctor ever told you that you had a stroke[28]?''

Chronic kidney disease (CKD) was defined by estimated glomerular filtration rate <60 mL/1.73 m^2/min and/or urine albumin:creatinine ≥30 mg/g.[29,30] Serum creatinine values were adjusted for comparisons across surveys.[31]

Medical visits were defined by response to, ''How many times did you receive health care over the last year?'' and dichotomized into <2 versus ≥2 visits/y.

Uninsured were defined by negative answer to ''Are you covered by health insurance or some other kind of health care plan?''

Cigarette smoker was defined by ''Every day'' or ''some days'' answer to ''Do you now smoke cigarettes?''

Data Analysis

SAS version 9.3 (Cary, NC) was used for all analyses to account for NHANES complex sampling design. Standard errors were estimated with Taylor series (linearization) method. PROC SURVEYMEANS was used for means and confidence intervals. PROC SURVEYFREQ was used to estimate percentages and confidence intervals. PROC SURVEYLOGISTIC was used to explore effects of multiple modifiable covariates on BP, non–HDL-C, and HbA1c control separately and combined. The effect of diabetes duration on control of diabetes and other risk factors was assessed. Rao–Scott chi-square test in PROC SURVEYFREQ was used to test for differences in categorical variables; Wald F test in the PROC SURVEYREG was used to test for