

Original Research**Characterization of Type 2 Diabetes Mellitus Burden by Age and Ethnic Groups Based on a Nationwide Survey[☆]**Janice M.S. Lopez, PharmD, MPH¹; Robert A. Bailey, MD¹; Marcia F.T. Rupnow, PhD¹; and Kathy Annunziata, MA²¹Health Economics and Outcomes Research, Janssen Scientific Affairs, LLC, Raritan, New Jersey; and ²Health Sciences Practice, Kantar Health, Princeton, New Jersey**ABSTRACT**

Background: Type 2 diabetes mellitus (T2DM) is the most common form of diabetes. Risk factors for its development include older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose metabolism, physical inactivity, and race/ethnicity.

Objective: The purpose of this study was to characterize T2DM burden, from a patient perspective, with respect to age and race/ethnicity.

Methods: Adults aged ≥ 18 years with T2DM from a large, Internet-based, nationwide survey were retrospectively analyzed. Demographic and clinical characteristics (glycemic control, body mass index [BMI], comorbidities, and diabetes-related complications), hypoglycemic episodes, and medication adherence were used to assess diabetes burden. Degree of burden was compared across age (18–64, 65–74, and ≥ 75 years) and racial/ethnic (white, African American, Hispanic, Asian, and American Indian) groups.

Results: An apparent association was found between glycemic control and medication adherence. Hispanics had the lowest percentage of participants with a hemoglobin A_{1c} (HbA_{1c}) level $< 7.0\%$ (24.4%) and the highest percentage of those not knowing their HbA_{1c} levels (55.4%) but also had the poorest medication adherence among racial/ethnic groups. Conversely, American Indians and whites had the best

glycemic control, HbA_{1c} knowledge, and medication adherence. The 18- to 64-year age group had the poorest glycemic control (28.8%), the most with unknown HbA_{1c} levels (46.3%), and the poorest medication adherence of the age groups. Mean BMIs were high (> 30 mg/kg²) for all racial/ethnic groups other than the Asian group (28.9 mg/kg²). Approximately 71% of Asians were obese or overweight compared with $\geq 90\%$ in the other racial/ethnic groups. Mean BMIs decreased with increasing age group (34.5, 32.6, and 29.8 kg/m² for the age groups of 18–64, 65–74, and ≥ 75 years, respectively). Regarding diabetes-related comorbidities, the Asian group had the lowest percentages of those with hypertension (39.1%) and hypercholesterolemia (46.6%). The Asian group had the lowest mean Charlson Comorbidity Index (CCI) score (score of 1.4); the American Indian group had the highest CCI score (score of 1.8). Of the age groups, the 65- to 74-year group had the highest percentages of those with hypertension (69.0%) and hypercholesterolemia (67.4%). The mean CCI scores in the 65- to 74-year and ≥ 75 -year age groups (scores of 1.8 for both) were significantly higher than in the 18- to 64-year age group. The Asian group had the lowest percentage of participants reporting hypoglycemia (37.3%). The 18- to 64-year age group had the

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highest percentage of participants reporting hypoglycemia (52.7%). Limitations of this study include selection bias (Internet-based survey), recall bias, missing values, and descriptive analyses without adjustment for multiplicity.

Conclusion: There are many factors that contribute to diabetes burden and the complexity of diabetes management. The results of this study provide insight from a patient perspective regarding how these factors vary across age and race/ethnicity to aid in the individualization of diabetes treatment. (*Clin Ther.* 2014;36:494–506) © 2014 The Authors. Published by Elsevier HS Journals, Inc. All rights reserved.

Key words: age, ethnicity, patient perspective, survey, type 2 diabetes.

INTRODUCTION

Diabetes is an insidious public health problem. The prevalence of diabetes in the United States has nearly tripled in the past couple of decades. From 1990 to 2010, the prevalence of diabetes in those aged ≥ 18 years increased from 6.6 million in 1990 to 20.7 million in 2010.¹ Type 2 diabetes mellitus (T2DM), also known as non-insulin-dependent diabetes mellitus or adult-onset diabetes, is the most common form of diabetes, affecting approximately 90% to 95% of all patients diagnosed as having diabetes. Risk factors for its development include older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose metabolism, physical inactivity, and race/ethnicity.^{2–4} Age is a significant driver of the diabetes epidemic, with $>25\%$ of the US population aged ≥ 65 years having diabetes. The prevalence of diabetes is expected to double in the next 20 years, in part because of the aging of the population.⁵ Certain races/ethnicities have a particularly high risk of developing T2DM. The age-adjusted prevalence rates of T2DM in adults aged ≥ 20 years in 2010 were 16.1%, 12.6%, 11.8%, and 8.4% among American Indian and Alaska Natives, African Americans, Hispanics, and Asian Americans, respectively.⁶ Being overweight or obese is considered the principal modifiable risk factor.⁴ In 2010, 84.7% of adults aged ≥ 18 years with diagnosed diabetes were overweight or obese.⁷ There are disproportionate increases in the prevalence rates of T2DM among African Americans and Hispanics in overweight adults aged 20 to 74 years; however, the differences become

minimal in obese and severely obese adults with T2DM.⁸

Although there is evidence that factors such as age, race/ethnicity, and obesity influence the risk of developing T2DM, fewer studies have examined how these factors influence the burden (eg, glycemic control, comorbidities, diabetes-related complications, risk of mortality, medication adherence, and hypoglycemia) in those who have T2DM. There is some evidence that age and race/ethnicity affect the development of diabetes-related complications and mortality. The prevalence rates of cardiovascular disease (heart disease or stroke), hospitalization for cardiovascular disease, end-stage renal disease (ESRD), and hospitalization for lower-extremity amputation have been found to increase with increasing age.⁹ Rates of diabetic complications are higher in racial/ethnic minority populations in the United States. Compared with non-Hispanic whites, African Americans have higher prevalence rates of visual impairment, ESRD, hospital discharges, and mortality; Hispanics have higher rates of ESRD and mortality; and American Indians have a higher mortality rate.¹⁰ A contributing factor may be the development of diabetes at younger ages in minorities, increasing the risk of developing complications at a younger age. Obesity complicates T2DM management by increasing insulin resistance and blood glucose concentrations. Being overweight or obese is an independent risk factor for coronary heart disease and cardiovascular disease in patients with T2DM. Intentional weight loss has been associated with improved insulin action, decreased fasting blood glucose concentrations, and reduced need for diabetes medication. Weight loss has also been found to decrease cardiovascular risk by decreasing blood pressure, improving serum lipid concentrations, and reducing serum markers of inflammation.^{11,12}

The complexity of diabetes and diabetes management has caused an evolution in diabetes management guidelines. Recognizing this complexity, medical treatment guidelines have been broad, focusing on not only evidence-based glycemic control targets but also the management of comorbidities. The American Diabetes Association (ADA) continues to recommend a general hemoglobin A_{1c} (HbA_{1c}) goal of $<7.0\%$ and the potential for additional benefits with more intensive control in selected patients, but they have recently emphasized the individualization of treatment based

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