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Original Article

Prevalence of prediabetes and diabetes among older adults in Ecuador: Analysis of the SABE survey

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ABSTRACT

Aims: To examine the prevalence of prediabetes and diabetes among subjects aged 60 years and older in Ecuador.
Materials and methods: The present study used data from the National Survey of Health, Wellbeing, and Aging to describe the prevalence of prediabetes and diabetes among older adults. Logistic regression models were assembled to examine the association between certain demographic and health characteristics of participants and prediabetes and diabetes prevalence rates.
Results: Of 2298 participants, the prevalence of prediabetes and diabetes was 36.9% (95% CI: 34.2%–39.6%) and 16.7% (95% CI: 14.9%–18.7%) among older adults in Ecuador, respectively. Notably, higher diabetes prevalence rates were seen among women, black subjects, residents in the urban coastal region, and obese participants than those without. In general, the prevalence of diabetes widely varied across provinces of the country, with higher rates seen in provinces along the coastal region of the country. After adjustment for age, gender, and BMI, residents in the urban coast, subjects with greater number of comorbidities, and those classified as having hypertension, and hypertriglyceridemia had significantly higher odds of having diabetes than those without.
Conclusions: Prediabetes and diabetes are prevalent among older adults in Ecuador. The increased prevalence of these metabolic disorders was particularly associated with obesity. Thus, the present findings may assist health care authorities to implement healthy lifestyle interventions among older Ecuadorians at risk for diabetes.

1. Introduction

Diabetes is a worldwide public health burden associated with increased morbidity related to its complications, excess disability, health care costs, and premature mortality [1–3]. According to the World Health Organization global report on diabetes, the number of people with diabetes has steadily risen over the past few decades, due to population growth, the increase in the average age of the population, and increasing rates of overweight and obesity. Moreover, diabetes prevalence rates have increased faster in low- and middle-income countries than in high-income countries [4].

The incidence of diabetes increases with age until about age 65 years, after which both incidence and prevalence seem to level off. As a result, older adults with diabetes may either have incident disease or long-standing diabetes with onset in middle-age or earlier [5]. For instance, the median prevalence of self-reported diabetes among U.S. adults aged 65–74 and 75 years and older was 22.5% and 21.2% in 2015, respectively [6]. In Latin America, a previous analysis of the SABE survey described that the prevalence of self-reported diabetes ranged from 12.2% in Buenos Aires to 21.3% in Mexico City [7]. Likewise, the prevalence of diabetes among older participants in the 10/66 dementia research group differed widely in Latin America sites from 8.7% in urban Peru to 32.1% in Puerto Rico [8].

In Ecuador, a previous study conducted to examine the association between sociodemographic and lifestyle factors and self-reported chronic medical conditions reported that diabetes was prevalent in 13.1% of adults aged 60 years and older [9]. Notably, a high prevalence of the metabolic syndrome, a cluster of cardio metabolic risk factors associated with increased risk of diabetes, was also described among older Ecuadorians [10]. Likewise, older women defined as having abdominal obesity had 2-fold higher odds of having diabetes than those who did not [11]. Despite these facts, there is scarce epidemiological data regarding

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the prevalence of diabetes, particularly among older adults in Ecuador. Thus, the purpose of the present study was to describe the prevalence of prediabetes and diagnosed diabetes in a nationally representative sample of adults aged 60 years and older.

2. Material and methods

The present study was based on data from the National Survey of Health, Wellbeing, and Aging (Encuesta National de Salud, Bienestar, y Envejecimiento; SABE). This survey is a probability sample of households with a least one person aged 60 years or older residing in the Andes Mountains and coastal regions of Ecuador. In the primary sampling stage, a total of 317 sectors from rural areas (<2000 inhabitants) and 547 sectors from urban areas of the country were selected from the 2001 population Census cartography. In the secondary sampling stage, 18 households within each sector were randomly selected based on the assumption that at least one person aged 60 years or older live in 24% and 23% of the households in the coastal and Andes Mountains regions, respectively. Between April and August 2010, participants underwent biochemical evaluation to determine their metabolic profile. Participants' laboratory data were processed at NetLab laboratory (Quito, Ecuador). Survey data, including operation manuals are publicly available [12].

2.1. Characteristics of participants

Age and sex were self-reported. The race of participants was classified according to the following question: "Do you consider yourself to be white, black, mestizo, mulatto, or indigenous?" Body height in centimeters and weight in kilograms were measured and the body mass index (BMI) was calculated (kg/m^2). Subjects also reported their region (coast vs. Andes Mountains) and area of residence (urban vs. rural). Literacy was defined by answering affirmatively to the question "Can you write and read a message?" Smoking status was classified as current, former, and never. The average use of alcohol per week during the previous three months was classified as none, one day, or two or more days per week. Vigorous physical activity was evaluated by the question, "Have you exercised such as jogging, dance, or performed rigorous physical activity for the past year". Participants reported the number of days per week of vigorous physical activity (0, 1–4, and 5–7 days). Cognitive status was evaluated by the abbreviated Mini Mental State Examination (MMSE). This modified MMSE was developed by Icaza and Albala to identify the MMSE questions that could best explain cognitive deterioration. The abbreviated MMSE was developed with nine variables instead of the 19 original MMSE variables. A cut-off point of 12 or less identify older adults with cognitive impairment [13]. The following activities of daily living (ADLs) were included in the present study: walking across a room, dressing, bathing, eating, getting in and out of bed, and using the toilet. Those participants who needed help or were unable to perform one or more of the six ADLs were considered functionally impaired [14]. Moreover, the following physician-diagnosed chronic conditions were self-reported: cancer, chronic obstructive pulmonary disease, heart disease, stroke, and arthritis. Subsequently, these conditions were grouped into three categories (0, 1, ≥2 comorbidities). Subjects were considered to have hypertension if they had a systolic ≥ 140 mmHg or a diastolic ≥ 90 mmHg blood pressure or self-reported the use of antihypertensive medications [15].

Prediabetes was classified as a fasting plasma glucose between 100 and 125 mg/dl and subjects with a self-reported medical diagnosis of diabetes or a fasting plasma glucose ≥ 126 mg/dl were defines as having diagnosed diabetes according to the American Diabetes Association 2017 criteria [16].

2.2. Statistical analysis

The demographic characteristics of participants were compared using *t* test and chi-squared test for continuous and categorical variables, respectively. The prevalence of diabetes was reported according to demographic, behavioral, and health characteristics of the participants. For purpose of this analysis, underweight and normal weight subjects were grouped into a BMI category defined as normal weight (<24.9 kg/m^2) since only 1.4% of women with diabetes were classified as being underweight. Logistic regression models adjusted for age, gender, and BMI were assembled to examine the association between demographic and health characteristics of the participants and the prevalence of prediabetes and diabetes. Results of the multivariate model are presented as odds ratios (OR) with their 95% confidence intervals (95% CI). Moreover, age-adjusted diabetes prevalence rates were examined by provinces of the country using the 2010 Ecuadorians Census population as the standard. All analyses used sample weights to account for the complex survey design and to report national prevalence estimates. Statistical analyses were performed using SPSS, version 17 software (SPSS Inc., Chicago, IL).

3. Results

A total of 2298 participants comprised the study sample, representing an estimated 1.1 million older adults in Ecuador. As shown in Table 1, the age, race, and residency of participants were similarly distributed by gender. However, higher proportions of men were literate, smokers, reported to drink alcohol more frequently and engaged in physical activities regularly. On the contrary, women had higher prevalence rates of hypertension, cognitive impairment, functional limitations, and self-reported comorbidities than those in men. Moreover, triglycerides and LDL cholesterol concentrations among women were significantly higher as compared with men.

Overall, 16.7% (95% CI: 14.9%–18.7%) of subjects were defined as having diabetes, representing an estimated 193,000 older diabetics in Ecuador. However, higher diabetes prevalence rates were seen among women, black participants, residents in the urban coastal region, and obese subjects than those without. Similarly, the prevalence of diabetes was increased among individuals defined as having hypertension, hypertriglyceridemia, and higher number of comorbidities compared with those who did not. After adjustment for age, gender, and BMI, residents in the urban coast, subjects with greater number of comorbidities, and those defined as having hypertension and hypertriglyceridemia had significantly higher odds of having diabetes than those without (Table 2). As shown in Fig. 1, the age-adjusted prevalence of diabetes varied widely across provinces of the country from 4.4% in Cotopaxi to 31.1% in Esmeraldas. However, higher diabetes prevalence rates were seen particularly along the coastal region of the country.

Table 3 shows the prevalence of prediabetes among older adults in Ecuador. Of 1893 participants without diagnosed diabetes, 36.9% (95% CI: 34.2%–39.6%) were classified as having prediabetes, representing an estimated 355,000 older adults with prediabetes. Notably, higher prediabetes prevalence rates were seen in women, obese subjects, those who self-reported their race to be mulatto, residents in the urban Andes Mountains, and older adults with hypertension or hypertriglyceridemia.

4. Discussion

The present findings indicate that prediabetes and diagnosed diabetes were prevalent in 36.9% and 16.7% of older adults in Ecuador, respectively. Notably, even higher diabetes prevalence rates were seen in women, those who self-reported their race to be