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Glycemic control, cognitive function, and family support among middle-aged and older Hispanics with diabetes: The Hispanic Community Health Study/Study of Latinos

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ABSTRACT

Aims: To examine among Hispanics in the U.S., a population with increased reliance on informal healthcare support structures, (1) the association between cognitive function and control of diabetes; and (2) whether this association is modified by family support.

Methods: The Digit Symbol Substitution Test (DSST), word fluency, and learning and delayed recall components of the Spanish English Verbal Learning Test were administered to 1794 Hispanic adults aged 45–76 years with diagnosed diabetes. An executive function index and global cognitive function index (GCFI) were derived. Uncontrolled diabetes (HbA1c $\geqslant$ 7% [53 mmol/mol]) was compared across quartiles of cognitive function using multivariable logit models with interaction terms for cognitive function and family support.

Results: After adjustment, lower DSST scores were associated with uncontrolled diabetes ($P = 0.03$). Family support modified the relationship between other measures of cognition and diabetes control ($P_{interaction}$: 0.002, 0.09). Among individuals with low family support, as cognitive function declined, the odds of uncontrolled diabetes increased (P-trend across

Abbreviations: ACCORD, Action to Control Cardiovascular Risk in Diabetes; CESD, Center for Epidemiologic Studies Depression Scale; CVD, cardiovascular disease; DSST, Digit Symbol Substitution Test; HCHS/SOL, Hispanic Community Health Study/Study of Latinos; HRS, Health and Retirement Study; OHGA, oral hypoglycemic agents; SEVLT, Spanish English Verbal Learning Test; WF, word fluency

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quartiles of the GCFI, 0.015). Among those with low family support, persons in the lowest quartile of global cognitive function were more than twice as likely to have uncontrolled diabetes as those in the highest performing quartile (OR = 2.31; 95% CI: 1.17, 4.55). There was no similar effect among those with high family support.

Conclusions: Family support may buffer the negative association between low cognitive functioning and diabetes control in US Hispanics/Latinos. Educational programs targeted at family members of middle-age and older persons with diabetes regardless of neurocognitive status may help improve population-level glycemic control.

1. Introduction

Both type 2 diabetes and cognitive decline are common problems in older adults [1,2] and both may disproportionally affect Hispanic individuals [2–4]. Type 2 diabetes is a risk factor for cognitive decline and dementia [5–9]. Cognitive problems, in turn, may make optimal glycemic self-control more difficult, potentially shifting the burden of care to others [10,11].

Cognitive decline in older adults ranges from subtle executive dysfunction and memory difficulties to dementia [1]. Cross-sectional and longitudinal results from the Action to Control Cardiovascular Risk in Diabetes (ACCORD) trial revealed inverse associations between cognitive function and glycemic control [12]. In a separate urban clinic-based study of older adults with diabetes, executive dysfunction and memory impairment were independent predictors of inadequate glycemic control [13]. Further cross-sectional studies have also reported a link between cognitive function and control of diabetes [14,15].

Taken together, prior studies suggest that cognitive dysfunction may interfere with diabetes self-management and that poor diabetes control may contribute to cognitive decline. Diabetes self-management tasks, including close attention to diet, exercise, medication administration, and glucose monitoring, are cognitively demanding [11]. Evidence also suggests that family support improves diabetes control in older adults with impaired cognition. In the Health and Retirement Study (HRS) of over 1000 persons with self-reported diabetes ages 50 years and older, respondents in the lowest quartile of cognitive scores with low levels of social support had significantly higher hemoglobin A_{1c} (HbA1c) levels than those in the highest quartile of cognition or those with high social support [15]. Importantly, higher levels of social support ameliorated this association between cognitive impairment and glycemic control. A more recent study of mild cognitive dysfunction in a largely Hispanic urban population found no association with glycemic control, though it was noted by the authors that assistance from informal care givers could not be ruled out [16]. Indeed, family support may be especially relevant to health outcomes among Hispanic individuals [17–19], and particularly important for the cognitively-demanding activity of diabetes self-care.

In this study we hypothesized that lower levels of memory, executive functioning, and overall cognitive function would be associated with poor glycemic control in community-dwelling Hispanic/Latino adults with diabetes age 45 years and older. We also sought to examine whether these relationships were modified by family support.

2. Subjects, materials and methods

2.1. Study population and data collection

The Hispanic Community Health Study/Study of Latinos (HCHS/SOL) is a population-based study of 16,415 Hispanic adults age 18–74 years at recruitment living in 4 U.S. urban centers (Bronx, NY; Chicago, IL; Miami, FL; and San Diego, CA). Participants were recruited using a 2-stage area probability sample design, as detailed previously [20,21]. The household-level response rate was 33.5% and 41.7% of screened individuals were enrolled, representing 16,415 persons from 9872 households. Of 2007 adults age 45–74 years at enrollment who reported a previous diagnosis of diabetes and/or taking antidiabetic medications within four weeks prior to the baseline interview, the current study was limited to those for whom complete data were available with regard to glycemic control, cognitive function, family support, and educational attainment (n = 1794 or 89%).

The HCHS/SOL baseline examination was conducted between 2008 and 2011 by bilingual interviewers in either English or Spanish, including blood collection, questionnaires covering a comprehensive assortment of sociodemographic, medical, environmental and lifestyle components, and a cognitive battery administered to those age 45 years and older. This study was approved by the Institutional Review Boards at each participating institution and all subjects gave informed consent.

2.2. Cognitive variables

The cognitive tests administered to HCHS/SOL participants have been previously described [22]: (1) Spanish English Verbal Learning Test (SEVLT), (2) word fluency (WF) Test, and (3) Digit Symbol Substitution Test (DSST). All examiners were trained to a common proficiency level in the scoring and administration of cognitive measures; certification was required prior to test administration and audio-taped exams from each examiner, with associated paper responses, were reviewed periodically by the Neurocognitive Reading Center