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Social Connections, Diabetes Mellitus, and Risk of Mortality among White and African-American Adults Aged 70 and Older: An Eight-Year Follow-up Study

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PURPOSE: To examine the independent and joint effects of having a lack of social connections (LSC) and diabetes mellitus (DM) on the risk of mortality among older white and African-American (AA) adults.
METHODS: Data (N = 9246) from the Second Longitudinal Study of Aging was used. LSC score was created by the use of seven social connection measures. Subjects with a score ⩾90% of the distribution in the total sample were classified having LSC.
RESULTS: Subjects with LSC, DM, or both had significantly greater risks of death. After multiple covariates were adjusted, the hazard ratios (95% confidence interval) of death in those with both LSC and DM were 2.45 (2.43–2.47) in white men, and 2.95 (2.91–2.99) in AA men. The corresponding values were 2.72 (2.70–2.73) in white women and 3.13 (3.09–3.18) in AA women. Those who had LSC but had no DM, had a similar survival trend to those who had DM only.
CONCLUSIONS: The risk of LSC for mortality is similar to DM. Both factors are independent predictors of death among white and AA adults. In addition to controlling disease risks, improvement of social connections may offer new insights to the reduction of mortality among older adults.
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KEY WORDS: Diabetes, Mortality, Older Adults, Propensity Score, Social Connections.

INTRODUCTION

Diabetes mellitus (DM) is the seventh-leading cause of death in the United States. According to the reports by the Centers for Disease Control and Prevention, DM contributed to a total of 233,619 deaths in 2005 in this country (1, 2). Furthermore, the incidence, prevalence, and mortality caused by diabetes and diabetic complications (cardiovascular diseases in particular), increase with aging (2–6). In addition to mortality risk from diseases, social factors may also have important effects on the risk of mortality (7–16). Of social factors, social connections, including social communications with family and friends and participation in neighborhood activities, may be especially important during old age when individuals face the greatest risk of illness and disruption in their sources of support (8, 17). However, it is unknown whether a lack of social connections has a significant effect on the risk of death after adjustment for disease and other covariates. Also, the degree to which an excessive risk of death caused by a combined effect of being poor social connections and disease has not been well studied. We hypothesized that both social connections and DM are independent predictors of death and that subjects exposed to both risk factors are at a greater risk of death. To test these hypotheses, we used data from the national Second Longitudinal Study of Aging (LSOA II) (18).

METHODS

Study Design and Participants

The LSOA II study design and sample selection procedures have been documented and published elsewhere (18). In brief, the LSOA II is a collaborative effort between the National Center for Health Statistics (NCHS) and the National Institute on Aging. The goals of the LSOA II study are to better understand disability pathways and interrelationships between determinants and functional outcomes among older adults. The LSOA II is a longitudinal study with a nationally representative sample consisting of 9447 civilian noninstitutionalized persons, 70 years and older of age at the time of their baseline interview. This baseline interview, also known as the Second Supplement on Aging, was conducted between 1994 and 1996. The LSOA II followed this cohort of participants through two follow-up interviews during the periods of 1997–1998 and 1999–2000. The study sample has additionally been linked with the National Death Index through December 31, 2002, called the LSOA II Linked Mortality File (2007 Data Release) (18, 19). In the present

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Selected Abbreviations and Acronyms

DM = diabetes mellitus
LSOA II = the Second Longitudinal Study of Aging
NCHS = National Center for Health Statistics
LSC = lack of social connections
PS = propensity score
AA = African American
CI = confidence interval
CVD = cardiovascular disease

study, of the 9447 subjects, 23 cases were excluded because the date of death or date of loss to follow-up was unknown, which made it impossible to calculate survival time. In addition, 318 cases of those who did not identify themselves as white or African American were excluded because each of the remaining minority groups had a small sample size (Asian American = 140, other = 178). Therefore, the final data analysis included a sample size of 9106 (96.4%) participants from the LSOA II. The LSOA studies were approved by the NCHS and National Institute on Aging Institutional Review Board (18).

Baseline Examinations

Information regarding participants' demographic characteristics, education level, health behaviors, and participants' self-rated general health status was obtained by the use of standardized survey instruments. Chronic conditions of DM, hypertension, coronary heart disease, and stroke were defined according to participants' self-reports of physician-diagnosed disease (20). On the measures of social connections, seven questions were asked to measure participants' social communications and activities in the past two weeks. These measures included two subdomains: (i) Social communication domain: two questions were asked, (a) During the past two weeks, did you talk on the phone with friends or neighbors? (b) Did you talk on the phone with relatives? (ii) Social activity domain: five questions were asked, during the past 2 weeks: (a) Did you get together with friends or neighbors? (b) Did you get together with relatives? (c) Did you go to a church or a temple? (d) Did you go to movies or sports? (e) Did you go out to a restaurant? These social connection measures have been validated and reported in the Second Supplement on Aging and LSOA II studies (8, 20–23).

Follow-up and Outcome Variables

In the present study, follow-up time (years of survival) and participant survival status (alive or deceased) were the outcome variables. All-cause mortality was recorded and confirmed by the use of National Death Index system (19). Person-years of follow-up were calculated from baseline interview (1994) to the end of follow-up (December 31, 2002) or to the date of death if a participant died during the follow-up, whichever occurred first.

Creation of the Social Connection Score

We applied logistic regression analysis to estimate the regression coefficients and odds ratios for the associations between each social connection and risk of mortality. Parameter estimates (regression coefficients or odds ratios) from this logistic model were then used to derive a weighted sum score (24). Each parameter estimate represented the strength of the association between the individual measure and the risk of mortality as an outcome. These estimates were then added together to form the weighted sum social connection score. This approach has the advantage by taking the consideration that different measures may carry different weights pertaining to their associations with the study outcome. The basic concept of using a weight sum index has been applied in previous studies (24–26). In our study, we added values of the individual odds ratios to generate the sum score, instead of regression coefficients, because odds ratios are commonly used to express associations in epidemiologic studies (27).

Statistical Analyses

In the first group analyses, we examined differences in demographics, behavior, health conditions, and social connection status by racial/ethnic groups by the use of chi-square analysis for categorical variables and t-tests for continuous variables.

In the second group analyses, to examine the effects of a lack of social connections (LSC) on the risk of mortality, we classified participants into two groups. Because adequate population norms were not available for the classification of LSC status, we defined the cut-off point on the basis of the 90th percentile of the LSC score in the total study sample. Participants with a LSC score $\geq$ the 90th percentile were defined having LSC.

In the multivariate analyses, we applied the propensity score (PS) technique to control for multiple covariates (28–31). The PS, a novel biostatistics method, is defined as the probability of having a particular exposure, conditional on a set of observed covariates. The basic concept of the PS method is that it summarizes all the included covariates' information into a single quantitative score (the propensity score), which is then adjusted or stratified in a multivariate model, resulting in the balance of all included covariate probabilities. The PS method has been increasingly used to control multiple covariates (confounders) in epidemiologic studies (28–32). In the study, we applied logistic regression method to estimate the PS, with LSC (yes/no) as the dependent variable and baseline covariates of age (years), marital status (married, unmarried, divorced/separated), educational attainment ($<$high school vs $\geq$high school), smoking status (nonsmoking vs ever-