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Original article

Prevalence of diabetes and depressive symptomatology and their effect on mortality risk in elderly Italians: The Italian Longitudinal Study on Aging

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Abstract

Aim. – This study assessed the prevalence of depressive symptomatology (DS) in older individuals with diabetes to determine whether diabetes and DS are independent predictors of mortality, and if their coexistence is associated with an increased mortality risk.

Methods. – Analyses were based on data from the Italian Longitudinal Study on Aging (ILSA), a prospective community-based cohort study in which 5632 individuals aged 65–84 years were enrolled. The role of diabetes and DS in all-cause mortality was evaluated using the Cox model, adjusted for possible confounders, for four groups: 1) those with neither diabetes nor DS (reference group); 2) those with DS but without diabetes; 3) those with diabetes but no DS; and 4) those with both diabetes and DS.

Results. – Type 2 diabetes mellitus (T2DM) was present in 13.8% of the participants; they presented with higher baseline rates of DS compared with the non-diabetic controls. During the first follow-up period, participants with DS but not diabetes had a 42% higher risk of all-cause mortality compared with the reference control group (HR = 1.42; 95% CI: 1.02–1.96), while participants with diabetes but not DS had an 83% higher risk of death than the reference group (HR = 1.83; 95% CI: 1.19–2.80). The risk of death for those with both disorders was more than twice that for the reference group (HR = 2.58; 95% CI: 1.55–4.29). Analyses of deaths from baseline to the second follow-up substantially confirmed these results.

Conclusion. – The prevalence rate of DS is higher in elderly people with diabetes and their coexistence is associated with an increased mortality risk.

Keywords: Diabetes mellitus; Depressive symptomatology; Elderly; Prevalence; Mortality risk

1. Introduction

In 2011, there were 366 million people with diabetes in the world, and this number is expected to reach 552 million by 2030 [1]. Also, in 2011, 4.6 million people aged between 20 and 79 years died as a result of diabetes [2].

According to World Health Organization (WHO) estimates, around 350 million people worldwide suffer from depression. While depression is the leading cause of disability in both genders, the burden of depression is 50% greater in women [3]. Both type 1 (T1DM) and type 2 diabetes mellitus (T2DM) have a high prevalence of depression. Two important studies have shown that patients with T2DM have a 17.6% prevalence of depression, a significantly higher figure compared with that detected in people without T2DM (9.8%), while in patients with T1DM, there is a prevalence of clinical depression of 12.0% compared with 3.2% in the normal population [4,5]. A recent systematic review and meta-analysis of 11 studies involving 172,521 participants reported that, overall, people with T2DM have a 24% increased risk of incident depression compared with people without T2DM; this increased risk may be higher in those who have had a previous depressive episode or diabetes-related complications. Moreover, the risk of incident depression in those with T2DM appears to be increasing over time: on meta-analysis, it emerged that the year of publication of the study was a significant predictor of depression incidences, which increased in the more recent studies [6]. Three systematic reviews and meta-analyses reported that depression and depressive symptoms are associated with an increased risk of incident T2DM [7–9]. Several studies suggest a complex, bidirectional relationship between diabetes and depression [9,10].

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The diabetes and depression combination is associated with higher mortality rates. Recently, two studies examined the risk of mortality in people with comorbid depression and diabetes over time by carrying out a review and meta-analysis of the most important longitudinal studies. van Dooren et al. [11] examined both all-cause and cardiovascular mortality in 16 studies involving a total of 109,406 participants with diabetes; of these, 21,443 were also suffering from depression. After adjusting for demographic variables and micro- and macrovascular complications, depression was associated with an increased risk of all-cause mortality (HR = 1.46, 95% CI: 1.29–1.66) and cardiovascular mortality (HR = 1.39, 95% CI: 1.11–1.73). In addition, a meta-analysis of 10 studies involving 42,363 respondents with diabetes by Park et al. [12] reported that comorbid depression is associated with an approximately 1.5-fold increase in the risk of all-cause mortality.

The aims of the present study were to assess the prevalence of depressive symptomatology (DS) in older individuals with T2DM, to determine whether DS and T2DM are independent predictors of mortality, and to evaluate whether their coexistence is associated with an increased risk of mortality.

2. Methods

The data outlined here are based on the Italian Longitudinal Study on Aging (ILSA), a prospective community-based cohort study [13]. A random sample of 5632 individuals aged between 65 and 84 years, including both community-dwelling and institutionalized participants stratified according to age and gender using an equal-allocation strategy, was identified from the demographic lists of the registry offices of eight municipalities (urban, suburban and rural) located in the north, centre and south of Italy. In all, 88 participants of each gender belonging to four age groups (65–69, 70–74, 75–79 and 80–84 years) from each municipality were included in our study sample. The ILSA design included cross-sectional and longitudinal components. Baseline evaluation had two phases: screening; and clinical confirmation. The screening phase, involving all participants, included a fasting blood sample, a personal interview on self-reported conditions and selected risk factors, physical examinations, and diagnostic tests such as the Mini-Mental State Examination (MMSE), neurological tests, the Geriatric Depression Scale (GDS), Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) scales, spirometry and electrocardiography. Clinical diagnoses, formulated on the basis of assessment by a geriatrician or neurologist, were made for participants who screened positive for heart failure, angina, arrhythmia, hypertension, myocardial infarction, T2DM, stroke, parkinsonism, distal symmetrical neuropathy of the lower limbs and dementia. Baseline evaluations were carried out in 1992, and the follow-up assessments in 1996 and 2000.

2.1. DS and T2DM assessment

DS was assessed by means of the GDS, a self-reported 30-item assessment tool designed specifically to identify DS in the elderly [14]. Items are answered by yes or no; one point is assigned to each answer and corresponds to a scoring grid. A score ≥ 10 is indicative of DS.

In the screening phase, T2DM assessment was based on a self-reported diagnosis or fasting glycaemia value ≥ 140 mg/dL (the latest criteria for a diagnosis of T2DM [15] was not applied because prevalence rates of the disorders were calculated in 1994); in the clinical confirmation phase, the diagnosis was made by a physician on the basis of a review of clinical records (previous glycaemia and glycosuria determinations, diagnostic tests, symptoms and signs, therapy, complications), with confirmation of the diagnosis by the participant's physician.

2.2. Statistical analysis

To generalize the ILSA sample to the Italian population, a set of weights was defined according to gender, age distribution of the reference population (Census 1991, available at demo.istat.it) and sample fraction, and applied to the analyses. A Cox proportional hazards model, with all-cause mortality as the outcome at the first follow-up, was defined, considering T2DM and DS as independent variables; the model also included an interaction term between T2DM and DS. As the interaction term showed a trend towards significance ($P = 0.08$), it was decided to classify participants into four groups:

- those with neither T2DM nor DS (reference control group);
- those with DS but without T2DM;
- those with T2DM but without DS;
- those with both DS and T2DM.

The association in our groups of participants with sociodemographic and lifestyle characteristics, and other main diseases, was assessed using the Chi^2 or Fisher's exact test. As for quantitative variables [age, body mass index (BMI), MMSE score, GDS score, HbA_{1c} levels], differences between mean values were evaluated using the generalized linear model procedure, testing for homoscedasticity by Levene's test, while Welch's analysis of variance (ANOVA) was used in cases of heteroscedasticity; post-hoc analyses and Bonferroni adjustment were applied to compare data.

The first Cox proportional hazards model with all-cause mortality as outcome from baseline to first follow-up (1996) was adjusted only for gender and age; the second model was corrected for other factors such as level of education, marital status, parity, smoking status, myocardial infarction, angina, congestive heart failure, hypertension, stroke, distal symmetrical neuropathy, disability in ADL, BMI classification (defined according to quartile of BMI distribution) and fibrinogen. The assumption of proportionality was assessed using analysis of Schoenfeld residuals of the covariates introduced into the models, and time-dependent covariates were added when the proportionality assumption was violated. For deaths observed between baseline and the second follow-up (2000), all-cause mortality was analyzed using the same analytical procedure. All analyses were performed using SAS/STAT software, release 9.2 (SAS Institute, Inc., Cary, NC, USA).