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Original Study

Diabetes Care and Dementia Among Older Adults: A Nationwide 3-Year Longitudinal Study

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A B S T R A C T

Objectives: To compare diabetes monitoring and the incidence of acute diabetic complications between patients with and without incident Alzheimer's Disease and Related Syndromes (ADRS).
Design: Longitudinal observational study from 2010 to 2014.
Setting: Data from the French national health system database.
Participants: The France-Démence cohort: individuals aged 65 years or older suffering from incident ADRS, based on long-term disease registry, hospitalization for dementia, or antidementia drug delivery. They were matched (1:1) to a pair free of ADRS on age, sex, residence area, and insurance scheme. This study included France-Démence population with known diabetes for at least 2 years.
Measurements: Data related to diabetes control and complications: biological monitoring such as glycated hemoglobin A_{1c} (HbA_{1c}, ≥1/y, ≥2/y), lipid profile, microalbuminuria; eye examination; hospitalization for diabetes-related complications such as coma with ketoacidosis; and hospitalization for hypoglycemia were studied between the year prior to ADRS identification (Y_{-1}) and the 2 following years (Y_0; Y_1). Incidences between the 2 groups (ADRS/non-ADRS) were compared using age-standardized incidence ratios (SIR).
Results: The studied population included 87,816 individuals. HbA1c determination was less frequent in ADRS group, no matter the study period and the minimal annual threshold used. Respectively, 82.6% and 88.5% of ADRS and non-ADRS group had at least 1 HbA_{1c} testing during Y_{-1} [SIR = 0.94, 95% confidence interval (CI) 0.93–0.95], 73.4% and 89.0% during Y_0 (SIR = 0.83, 95% CI 0.82–0.84), and 75.4% and 89.3% during Y_1 (SIR = 0.85, 95% CI 0.83–0.86). Subjects with ADRS were also consistently more hospitalized than non-ADRS peers. The gap was maximal in the year following the diagnosis, as observed for hospitalizations for any cause related to diabetes (SIR Y_{-1}: 2.04, Y_0: 3.14, Y_1: 1.67), diabetes mellitus with coma (SIR Y_{-1}: 3.84, Y_0: 9.30, Y_1: 3.06), and hypoglycemia (SIR Y_{-1}: 4.20, Y_0: 5.25, Y_1: 2.27).
Conclusions: Incident ADRS is associated with a less frequent diabetes monitoring and an increased risk of diabetes complications compared with older people without ADRS. Our study questions healthcare quality offered to participants with ADRS in comorbidity control. Further investigations are required to explain the mechanisms underlying our results and to propose actions to improve care of patients with ADRS.

The prevalence of Alzheimer's Disease and Related Syndromes (ADRS) is growing worldwide.[1] This increase is largely driven by population aging, resulting from continuous improvement in the management of chronic affections such as cardiovascular and metabolic diseases. The prevalence of ADRS among older people with diabetes mellitus is especially likely to rise, as diabetes is a risk factor for vascular dementia and Alzheimer's disease.[2–4] In 2011, a

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nationwide study found a 8.5% prevalence of ADRS in people with diabetes older than 75 years.[5] From another angle, the prevalence of diabetes varied from 6% to 39% in patients with ADRS[6–15] and was about 14% in a large cohort study carried out between 1990 and 2007 in the United Kingdom.[16] Therefore, clinicians frequently have to take care of older adults with multiple comorbidities,[17] compelled to make the best of a complex situation.

ADRS makes diabetes monitoring more challenging by[18,19] compromising the patient's self-management abilities and threatening diabetes control. According to a comorbidity model developed by Piette and Kerr,[20] ADRS may be considered as a discordant comorbidity toward diabetes because it may introduce competing demands and lower diabetes prioritization. When dealing with diabetes control and monitoring of complications, clinicians resort to guidelines applicable to the general population suffering from diabetes,[21] but there is no systematic approach to the management of diabetes and dementia.[22] In particular, no specific guidelines are available regarding the frequency of glycated hemoglobin A_{1c} (HbA_{1c}) test in older adults with ADRS. However, HbA_{1c} still needs to be regularly assessed to avoid acute and chronic diabetic complications.

Few studies have evaluated diabetes monitoring regarding ADRS status. Some suggested lower frequencies of HbA1c test[23–25] or eye examination[24,25] among diabetic patients with prevalent ADRS compared with counterparts who did not suffer from ADRS. Others reported similar diabetes monitoring according to ADRS status.[26] Conversely, some studies found that the presence of comorbidities, even discordant, could be associated with a better healthcare quality among vulnerable older adults.[27] To our knowledge, no study has used a longitudinal approach to examine diabetes monitoring in conjunction to ADRS progression.

This study assessed whether incident ADRS affects the frequency of diabetes-related health services use: biological monitoring (HbA_{1c}, lipid profile and microalbuminuria tests), eye examination, and hospitalization for diabetes-related complications in French older adults during the year preceding ADRS diagnosis and the 2 following years.

Methods

Data Source

We used administrative data from the French national health system database, SNIIRAM (Système National d'Information Inter-Régimes de l'Assurance Maladie),[28] which covers 97% of the French population in 2011.[29] Reimbursed ambulatory healthcare are exhaustively collected: ambulatory visits to various healthcare providers, laboratory tests (without their results), and drug reimbursements. Every hospital stay is recorded, providing patient diagnoses as well as major procedures performed during the stay. Each hospitalization is associated with 1 main diagnosis (mandatory), 1 related diagnosis, and several potential associated diagnoses that could affect length and cost of stay. Moreover, chronic conditions are registered through the Long-Term Disease (LTD) system. It allows free full healthcare coverage for care related to several costly chronic diseases, including diabetes mellitus and ADRS, granted upon a demand made by the patient's physician to the French Healthcare System. Therefore, it is expected to facilitate an equal financial access to care. Lastly, vital status, including date of death, is also available.

Population — The DIA-FRA-DEM (Diabète-France-Démence) Cohort

FRA-DEM (for France-Démence) is a dynamic exposed/unexposed cohort exhaustively gathering incident cases of ADRS identified through the SNIIRAM since January 2011, paired to people free of ADRS. In this study, dementia was defined by the first recording of one of the following criteria: (1) LTD registration for ADRS [*International Classification of Diseases, 10th Revision* (ICD-10) codes: F00-F03, G30, G31]; (2) hospital stay reporting a diagnosis code of ADRS (similar ICD-10 codes); or (3) reimbursement for at least 1 acetylcholinesterase inhibitor (rivastigmine, galantamine or donepezil) or memantine. Each incident ADRS case was randomly paired (1:1) to a beneficiary without any ADRS criteria, matched on age, sex, residence area, and insurance scheme. For each pair, the first date of ADRS identification in the SNIIRAM defined the index date. In both groups, a 5-year period free of ADRS criteria was required before the index date.

In the DIA-FRA-DEM study, we selected individuals aged 65 years or older with a first ADRS criterion in 2011 or 2012 and with prevalent diabetes mellitus, defined by a LTD registration with ICD-10 codes E10 to E14. Diabetes identification had to have preceded ADRS identification for at least 2 years.

Follow-up

We defined for each participant a 3-year follow-up period: the year before the index date (Y_{-1}) and the 2 following years (Y_0 and Y_1), up to December 31, 2014 (Figure 1). A participant was censored when one of the following events occurred: (1) death, (2) loss to follow-up (6-month period without any ambulatory reimbursement, for ambulatory monitoring exclusively), or (3) incidence of ADRS (in the non ADRS group).

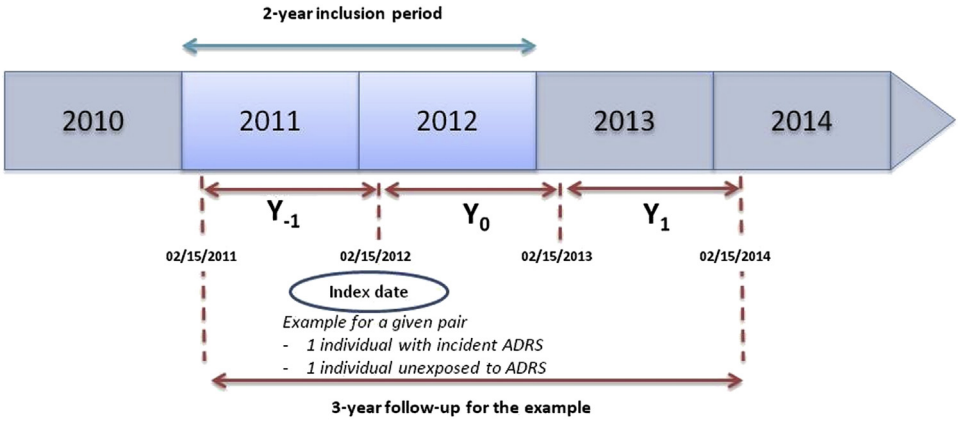

Fig. 1. DIA-FRA-DEM study: 3 years of follow-up of a pair. Example of an individual diagnosed with an incident ADRS identified on February 15, 2012 in the French national health insurance system. Y_{-1}, the year preceding the index date; Y_0 and Y_1: the next 2 years.