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Evolution of dementia diagnosis over time (1988–2013): Evidence from French and English cohorts. Implication for secular trends analyses

Leslie Grasset[a,*], Fiona E. Matthews[b], Karine Pérès[a], Alexandra Foubert-Samier[a,c], Catherine Helmer[a], Jean-François Dartigues[a,c], Carol Brayne[d]

[a]University of Bordeaux, Inserm, Bordeaux Population Health Research Center, UMR 1219, Bordeaux, France
[b]Institute of Health and Society, Newcastle University, The Baddiley-Clark Building, Newcastle Upon Tyne, UK
[c]Bordeaux University Hospital, Memory Consultation, CMRR, Bordeaux, France
[d]Department of Public Health and Primary Care, Cambridge Institute of Public Health, Forvie Site, University of Cambridge, School of Clinical Medicine, Cambridge Biomedical Campus, Cambridge, UK

Abstract

Introduction: The aims of this study are to examine the evolution of clinical dementia diagnosis over 3 decades and to investigate secular trends of dementia.
Methods: Four cohorts covering a period from 1988 to 2013 were used: the Personnes Agées Quid and Three-City-Bordeaux studies, and the Cognitive Function and Aging Study (CFAS) I and II. Mini–Mental State Examination scores at clinical diagnosis were evaluated over a 24-year follow-up period in French studies. An algorithmic approach was applied to CFAS I and II to provide dementia prevalence and incidence estimates.
Results: A significant increase of the Mini–Mental State Examination score at diagnosis was observed until 2000 and a significant decrease after. We reported a prevalence of 8.8% for CFAS I (1990–1993) compared with a prevalence of 6.5% in CFAS II (2008–2011). The 2-year incidence rate was estimated at 31.2/1000 (95% confidence interval = 28.0–34.8) for CFAS I and 15.0/1000 (95% confidence interval = 13.5–16.7) for CFAS II.
Discussion: Applying a stable algorithm to different cohorts across time can provide a robust method for time trends estimation.

Keywords: Dementia; Secular trends; Diagnosis; Incidence; Prevalence

1. Introduction

Dementia is a syndrome consisting of deterioration in cognitive functions sufficient to impair a person's daily life and activities. To describe the extent of dementia as a public health priority, many population-based studies following older people over time have been undertaken during the past 30 years [1,2]. Research on the descriptive epidemiology of dementia has identified several challenges in the field: standardization of diagnostic approaches for dementia subtype and mild forms of cognitive decline; dealing with participant selection and attrition, differential mortality, and incidence for prevalence estimations; dementia at the end of life and terminal decline; substantial underdiagnosis by the health care system [3]. Diagnosis of the dementia syndrome is sensitive to such challenges [4,5]. Recently researchers have evaluated changes in dementia prevalence and incidence over time [6–14]. However, to provide accurate estimations, consistent dementia diagnosis across studies and time is required. The relationship of both clinical and consensus diagnosis of dementia can be examined across time, and also in relation to other types of measurement. The diagnosis of dementia, a clinical syndrome, is based on a

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*Corresponding author. Tel.: (33) 5 57 57 13 93; Fax: (33) 5 57 57 14 86.
E-mail address: Leslie.Grasset@u-bordeaux.fr

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diagnostic process, usually a version of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) [15]. These diagnostic criteria do not have clear thresholds or specific measures to define the level of cognitive decline and its consequences, leaving the ultimate decision to clinical judgment or consensus diagnosis. Although diagnostic criteria have not fundamentally changed, there have been substantial societal and clinical shifts in dementia awareness, likely to have resulted in interclinician and intraclinician variability.

Recently, a few studies on the evolution of dementia over time have hypothesized that the diagnosis of dementia is likely to have evolved over 20 years and that algorithmic diagnosis could be more stable [16–18]. Changes in prevalence and incidence of any disorder, including dementia, are known to be influenced when diagnostic processes change over time, resulting in systematically different estimations (e.g., diabetes mellitus, hypertension) [19]. The studies presented in this work have determined dementia cases using two different algorithms in place of or in addition to clinical diagnosis: the Automated Geriatric Examination for Computer-Assisted Taxonomy (AGECAT) algorithm, a well-known and validated automated computer algorithm used in the British cohorts in the Cognitive Function and Aging Study (CFAS) I and CFAS II [20,21] and a "Comparative Dementia Algorithm (CDA)" developed from French cohorts [17]. Clinical diagnoses in French cohorts showed no change in dementia incidence over 2 decades, whereas the algorithmic diagnosis revealed a decrease, supporting the evolution hypothesis and highlighting the importance of using a stable diagnosis of dementia.

This study aimed (1) to examine the evolution of clinical dementia diagnosis over 3 decades, by analyzing the cognitive performance of people given a study diagnosis of incident dementia. A comparison of these with the cases diagnosed by a CDA method on French data was also conducted to establish the nature of change, if any; (2) as a validation of this algorithm, an adaptation was also applied to the British data to perform prevalence and incidence analysis, to provide a comparison with the validated AGECAT algorithm.

2. Methods

2.1. Study populations

Participants, aged 65 years and older, from four different population-based cohorts from France (Personnes Agées Quid [PAQUID] and Three-City) and UK (CFAS I and II) have been used in this study (cf. Supplementary Fig. 1).

The PAQUID cohort was formed in 1988–1989 with a representative sample of 3777 participants living at home in the departments of Gironde and Dordogne. The selection was stratified by sex, age, and size of urban unit. Respondents have been followed up for 27 years. The Three-City (3C-Bordeaux) cohort, starting in 1999, recruited 2104 participants from the Urban Community of Bordeaux, within 10 districts. Participants have been followed up for 14 years. For these two French cohorts, standardized questionnaires assessing sociodemographic, medical, cognitive, and functional data were administered by trained neuropsychologists during face-to-face interviews, at baseline and at each follow-up. Participants were followed-up every 2 to 3 years even after institutionalization. At each follow-up, vital status was systematically recorded for all the participants.

The Medical Research Council CFAS I: between 1989 and 1994, baseline interviews were conducted in six geographical areas in England and Wales, and subjects were followed up for 10 years. A two stage process, with screening followed by diagnostic assessment, was used in CFAS I, weighted across the cognitive performance as Mini–Mental State Examination (MMSE) and AGECAT original items in screen. Data from three of the English areas of Medical Research Council CFAS—Cambridgeshire, Newcastle, and Nottingham [22], where interviews were carried out between December 1990 and July 1993—were selected for analyses, providing 7635 subjects, from which a subpopulation of 1459 individuals underwent assessment. Between November, 2008, and October, 2011, new fieldwork in the same geographical areas was carried out to provide CFAS II estimates on 7762 subjects, which could be directly compared with CFAS I. CFAS I and CFAS II had identical sampling approaches, methods, and diagnostic approach apart from the simplification of design from two stage to one stage at baseline and incidence phase through combination of screening and assessment interviews. Full details of the studies have been described elsewhere [16,22–24].

2.2. Diagnostic methods

In the French cohorts, a clinical diagnosis was available, whereas in the British cohorts, the AGECAT algorithm was applied. Moreover, in the four studies, a CDA was applied.

For both PAQUID and 3C populations, the clinical diagnosis was made following a three-step procedure. The first step was a cognitive evaluation made by the neuropsychologist through a series of psychometric tests. Participants who had a high likelihood of dementia, based on their neuropsychological performances or decline relative to a previous examination, were then examined by a senior neurologist. The diagnosis of dementia was based on the DSM-III-R or the DSM-IV criteria. In case of refusal or death between the first and second steps, additional information was gathered from the informant and the medical practitioner. Then, each case was discussed by a validation committee composed of neurologists and geriatricians and directed by J.F.D. to provide a final diagnosis.

In CFAS I and II, the AGECAT algorithm used was based on the Geriatric Mental State Examination that provides relevant information to determine dementia syndrome in older population [20,25]. Missing data within an interview could prevent the algorithmic diagnosis, and for