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Progression and predictors of mild cognitive impairment in Chinese elderly: A prospective follow-up in the Shanghai Aging Study

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Abstract

Introduction: The Shanghai Aging Study is a community-based study aiming to investigate the incidence and progression of cognitive decline in Chinese elderly, with the operational procedures and diagnostic criteria similar to cohort studies in developed countries.

Methods: We prospectively evaluated 362 individuals with mild cognitive impairment (MCI) diagnosed at baseline through a clinical and neuropsychological interview. Diagnoses of dementia and MCI were made using standard criteria via consensus diagnosis.

Results: The conversion rate to dementia was 6.0 per 100 person-years, while the reversion rate to cognitive normal was 7.8 per 100 person-years. Amnestic MCI multiple domains was the most risky type for dementia (conversion rate: 14.2 per 100 person-years). Older age (hazard ratio [HR] = 1.09), apolipoprotein E (*APOE* ε4) (HR = 2.15), and low MMSE score (HR = 1.18) were predictors for dementia.

Discussion: Approximately 6% of elderly with MCI progress to dementia annually. Prospective studies are needed to further examine risk and protective predictors and to seek proper interventions for cognitive decline.

Keywords: Mild cognitive impairment; Progression; Dementia; Conversion; prospective study; Aging; Risk factor

1. Introduction

Mild cognitive impairment (MCI) is an intermediate state between dementia and normal cognitive aging. The definition was later expanded to include other cognitive domains, with the expectation that the initial pattern of impairment predicted various diagnostic outcomes. MCI could provide important information about the population at risk for becoming demented. It is also a stage at which intervention could be effective in reducing conversion to dementia [1–3].

Over the last 20 years, most published data of MCI progression are from Caucasians. A review of cohort studies published before 2002 estimated the annualized conversion rate at approximately 10%, whereas a lower estimate of 7% was reported in a review of selected studies published before October 2008 [4,5]. A recent systematic review summarized published estimates for conversion from MCI or amnestic MCI (aMCI) to Alzheimer's dementia (AD) and indicated that annual conversion rates ranged from 7.5% to 16.5% per person-year for hospital-based studies and from 5.4% to 11.5% per person-year for community samples [6]. The Alzheimer's Disease Neuroimaging Initiative study reported that patients with MCI progressed to AD at a rate of 16.5% per year and regressed to normal at a rate of 8% across a 12-month period [7]. Data from the Asian population have just been reported in recent 2 years in very limited studies, including two studies in Chinese and one study in Arabic population, with the data varying

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between 4% and 23% of the annual conversion rate of MCI to dementia [8–10]. The substantial variation in the data of MCI progression has been considered to be due to differences in detection procedures, implementation of MCI diagnostic criteria, and demographic characteristics of the source populations. Fewer community-based studies reported the progression for MCI subtypes [11–14].

China's population accounts for 21% of the world population and 1/3 of the Asian population. The number of people aged 60 years or more reached 212 million at the end of 2014, which made up 15.5% of the total population [15]. Older population in China will likely swell to 330 million or a quarter of its total population by 2050 [16]. Identifying the MCI progression in Chinese population is crucial for assessments of potential disease burden and therefore the need for interventions to prevent or slow progression of decline to dementia. Additionally, the data can be used to fill the gap of the data shortage in the Asian region.

In 2011, we established a community-based study: the Shanghai Aging Study, to investigate the prevalence, incidence, and progression of cognitive decline in Chinese elderly. Its baseline survey detected the prevalence of MCI with clinical and neuropsychological evaluations of all individuals aged 60 years or older residing in a geographically defined urban community of Shanghai [17,18]. As its second wave, this study aimed to explore the progression and predictors of MCI and its subtypes, through a prospective follow-up in this community-based cohort.

2. Methods

2.1. Ethics statement

The present study was approved by the Medical Ethics Committee of Huashan Hospital, Fudan University, Shanghai, China. All participants or their legally acceptable representative have provided their written informed consent.

2.2. Study cohort with MCI

From January 1, 2010 through Sep 30, 2011, we conducted in-person interviews and clinical examinations for 3141 registered residents aged 60 years or older in Jingansi community in downtown Shanghai, China. We diagnosed 601 individuals with MCI among 2985 nondemented individuals and demonstrated the MCI prevalence of 20% [17]. In the later 3 months, we continued the clinical interview and diagnosed additional 54 individuals with MCI. Thus, we established a cohort with 655 individuals with MCI in the Shanghai Aging Study.

2.3. Baseline characteristics of MCI cohort

At the baseline, demographic, lifestyle characteristics, and medical histories of the participants were collected via an interviewer-administered questionnaire, consisting of the following measures: birth date, gender, education year and level, cigarette smoking, alcohol consumption, physician-diagnosed hypertension, diabetes, stroke, and heart disease. Apolipoprotein E (*APOE*) genotyping was conducted by the TaqMan SNP method. The presence of at least one ε4 allele was treated as being *APOE* ε4 positive. Detailed clinical and neuropsychological assessments and diagnosis procedures were described in the previous report of MCI prevalence [17].

2.4. Follow-up procedure

From March 1, 2014 to Sep 30, 2015, we conducted a follow-up study for this MCI cohort as the second wave of the Shanghai Aging Study. A research coordinator contacted all the individuals with MCI based on their contact information recorded at the baseline survey. Individuals were considered ineligible if they (1) were deceased; (2) had moved from the original resident place; and (3) were suffering with severe mental disorder, impairment of vision, hearing or speaking and were not able to cooperate with clinical interview and neuropsychological tests. For those eligible individuals, an appointment for a clinical interview (either at Huashan Hospital, or at their homes) was made after they agreed to participate. Participants were reminded of the evaluation by a telephone call 1 day before it was scheduled. For those deceased individuals, the cause and date of death were provided by their family members via the telephone call and confirmed by the death certificates from the Center of Disease Control.

2.5. Interview at the follow-up

At the face-to-face interview, participants were firstly asked for their cognitive complaints, which they, their proxy, or a nurse or physician indicated that they had problems with memory or thinking. Also, the time and hospital name were recorded if the individual was diagnosed as dementia by neurologists at other hospitals. Participants were measured the Lawton and Brody Activity of Daily Living (ADL) scale, to elicit physical self-maintenance and instrumental activities of daily living. Functionally intact were considered for whose ADL score was over 16 [19]. Participants who suffered with newly onset of hypertension, diabetes mellitus, stroke, and heart disease were examined and confirmed from the medical records.

Cognitive function of participants was evaluated by using the neuropsychological batteries which were used at the baseline survey. For participants with 6 or more years of formal education, the battery comprised the Mini-Mental State Examination (MMSE), Conflicting Instructions Task, Stick Test, Modified Common Objects Sorting Test, Auditory Verbal Learning Test, and Trail-making Test. For participants with <6 years of education, the battery comprised the MMSE, Conflicting Instructions Task, Stick Test, Modified Common Objects Sorting Test, modified Fuld Object Memory Evaluation, and Renminbi Test. The battery was administered in Chinese by certified study psychometrists within