Experimental Gerontology 75 (2016) 42–47

Contents lists available at ScienceDirect

Experimental Gerontology

journal homepage: www.elsevier.com/locate/expgero

Mild cognitive impairment is associated with falls among older adults: Findings from the Irish Longitudinal Study on Ageing (TILDA)

Stefanos Tyrovolas [a,b,*], Ai Koyanagi [a,b], Elvira Lara [a,b], Ziggi Ivan Santini [a], Josep Maria Haro [a,b]

[a] Parc Sanitari Sant Joan de Déu, Universitat de Barcelona, Fundació Sant Joan de Déu, Dr. Antoni Pujadas, 42, Sant Boi de Llobregat, Barcelona 08830, Spain
[b] Instituto de Salud Carlos III, Centro de Investigación Biomédica en Red de Salud Mental, CIBERSAM, Monforte de Lemos, 3-5, Pabellón 11, 28029, Madrid, Spain

ARTICLE INFO

Article history:
Received 17 August 2015
Received in revised form 15 December 2015
Accepted 16 December 2015
Available online 18 December 2015

Section Editor: Holly M. Brown-Borg

Keywords:
Mild cognitive impairment
Falls
Gait speed
Muscle strength

ABSTRACT

Introduction: The role of mild cognitive impairment (MCI) on falls among older adults remains under-investigated. The aim of this study was to evaluate the association between MCI and number of falls or occurrence of non-accidental falls among older adults.

Methods: Data from the first wave of the Irish longitudinal Study on Ageing (TILDA) was analysed. The analytical sample consisted of 5364 individuals aged ≥50 years. MCI was defined as: Montreal Cognitive Assessment (MoCA) score < 26; the presence of subjective cognitive complaints; Mini-Mental State Examination (MMSE) score ≥ 14; and no limitations in activities of daily living (ADL). Multivariable Poisson and logistic regression analyses were conducted to assess the association between MCI and number of falls or the presence of non-accidental falls in the past 12 months.

Results: The prevalence of MCI was 10.1%. In the fully-adjusted model, MCI was associated with a higher rate of falls (PR = 1.41 95%CI = 1.05–1.89) and odds for non-accidental falls in the past 12 months (OR = 1.67 95%CI = 1.07–2.61). Muscle strength and performance indicators, and medical health conditions were influential factors in the association between MCI and falls but did not fully explain the association.

Conclusion: MCI is related with higher rates of falls and the occurrence of non-accidental falls among older adults. Future studies are warranted to clarify the underlying mechanism linking MCI and falls, and to establish interventions targeting MCI to reduce the risk of falls.

1. Introduction

The European commission has recognized population aging as one of the most challenging policy issues of this century in Europe (European Commission 2006). Advanced age is accompanied by various co-morbidities that affect health status and quality of life including falls (Janssen et al., 2002; Landi et al., 2013; Newman et al., 2006). Falls are a major health care problem for the elders. Almost 30% of the older population have been reported to experience a fall accident at least once per year (Muir et al., 2012). Moreover, falls are associated with a higher risk of loss of independence, autonomy, and confidence. Falls are one of the major contributors to the increased need for specialized care and hospitalization among older adults, while it is also associated with higher rates of morbidity, mortality, and institutionalization (Tinetti et al., 1995; Tinetti and Williams, 1997). Additionally, the cost of falls for the public health services is high. For example, in the UK, the cost of fall-related hospitalizations among older adults is almost £1 billion per year (Scuffham et al., 2003).

Various factors such as vision and hearing problems, abnormal blood pressure, mobility limitation, neuropsychiatric disorders, sarcopenia, and frailty have been associated with falls (Tinetti et al., 1986; Robbins et al., 1989; Shumway-Cook et al., 1997; Vellas et al., 1997; Mühlberg and Sieber, 2004). Among neuropsychiatric disorders, decline in cognitive function has been related with greater risks of falls in the older population. Recent studies have reported an increased frequency of falls with lower Mini-Mental State Examination (MMSE) scores (i.e., loss of global cognitive ability) (Gleason et al., 2009). Impairments in attention (Amboni et al., 2013), processing speed (Chen et al., 2012), and executive functions (Banich, 2009) have been proposed as a set of interrelated factors in the pathway between cognitive impairment and falls. Based on these previous findings, some researchers have proposed that fall and injury prevention strategies may benefit from focusing on the early prevention of cognitive decline (Montero-Odasso et al., 2009). In particular, in recent years, mild cognitive impairment (MCI), which is considered an intermediate state between normal aging and dementia, is gaining further attention from the viewpoint of prevention of dementia or cognitive decline. However, despite the potentially important role that cognitive function plays in the occurrence of falls, the association between MCI and falls among older adults still remains under-investigated (Delbaere et al., 2012).

* Corresponding author at: Parc Sanitari Sant Joan de Déu, Fundació Sant Joan de Déu, CIBERSAM, Dr. Antoni Pujadas, 42, 08830 Sant Boi de Llobregat, Barcelona, Spain.
E-mail address: s.tyrovolas@pssjd.org (S. Tyrovolas).

http://dx.doi.org/10.1016/j.exger.2015.12.008
0531-5565/

Given the rapid aging occurring in Europe, the scarcity of studies on MCI and falls, and a complete lack of studies on this topic from Ireland, the aim of the present work was to evaluate the associations between MCI and frequency of falls or occurrence of non-accidental falls in a large, nationally-representative sample of non-institutionalized older Irish individuals.

2. Methods

2.1. Study design and sample

Data from the first wave of the Irish Longitudinal Study on Ageing (TILDA) was analyzed. The full description of the survey and the sampling procedures can be found elsewhere (Cronin et al., 2013). Briefly, TILDA was an Irish nationally-representative, cross-sectional study on the economic, health, and social status of the non-institutionalized population, and was conducted between 2009 and 2010 by Trinity College in Dublin (Cronin et al., 2013). The sample included a total of 8504 people [individuals aged ≥50 years (n = 8175) and their spouses or partners younger than 50 years (n = 329)]. Of these individuals, 5895 completed a health assessment. Information was obtained by face-to-face interviews conducted by trained professionals using Computer Assisted Personal Interviewing (CAPI). The response rate was 62% (Whelan and Savva, 2013).

The Trinity College Dublin approved the design and procedures of the study. Informed consent was obtained from all participants. Individuals were not eligible for inclusion if they reported a doctor's diagnosis of dementia. Furthermore, individuals who were not able to consent personally because of severe cognitive impairment (at interviewer's discretion) were also excluded.

2.1.1. Number of falls and the presence of non-accidental falls

The number of falls in the past 12 months was assessed by the question “How many times have you fallen in the last year?” Information on the presence of non-accidental falls in the past 12 months was assessed by the question “Were any of these falls non-accidental, i.e., with no apparent or obvious reason?” among those who had fallen in the past 12 months. The answer options were “Yes” or “No”.

2.1.2. Mild cognitive impairment

The case definition of MCI was based on the core criteria outlined by the National Institute on Aging-Alzheimer's Association (Albert et al., 2011):

1) Concern about a change in cognition: subjective cognitive complaints were assessed by the question “How would you rate your day-to-day memory at present time?” with answer options: excellent, very good, good, fair, and poor. Those who replied fair or poor were considered to have subjective cognitive complaints.
2) Objective evidence of impairment in one or more cognitive domains, typically including memory: cognitive function was assessed with the Montreal Cognitive Assessment (MoCA) (score range: 0–30). This tool has been demonstrated to be sensitive to mild cognitive deficits when applied in cognitively intact older adults (Kenny et al., 2013), and includes measures of executive function, language, memory, attention, orientation, calculation, and visuospatial ability. Cognitive impairment was defined as a MoCA score < 26 (Freitas et al., 2013).
3) Preservation of independence in functional abilities: the participants were presented with a list of six basic standard ADLs on dressing, walking, bathing, eating, getting in or out of bed, and using the toilet (Katz et al., 1963), and were asked if they have difficulty with these activities. They were also asked to exclude any difficulties that are expected to last for less than three months. Those who claimed to have difficulty with any of the six abovementioned ADLs were excluded from the analysis.
4) Not demented: individuals who obtained a score <14 on the MMSE were excluded from the analytical sample (Shigemori et al., 2010).

2.1.3. Sociodemographic and lifestyle characteristics

Sociodemographic and lifestyle characteristics included age (50–59, 60–69, 70–79, ≥80 years), gender, education (primary, secondary, tertiary), wealth, living arrangement (alone or not), residence [urban (Dublin city or county/another town or city) or rural], physical activity, and problem drinking. Wealth (financial strain) was assessed by the statement “shortage of money stops me from doing the things I want to do” with answer options never, rarely, sometimes, and often. Physical activity was measured using the short form of the International Physical Activity Questionnaire, which converts levels of physical activity of various domains into predicted kilocalories expended per week (Craig et al., 2003). Problem drinking was assessed by the CAGE screening test with scores of ≥2 being used as a cut-off for problem drinking (Mayfield et al., 1974).

2.1.4. Muscle strength and performance

Handgrip strength and gait speed were considered indicators of muscle strength and performance respectively (Tyrovolas et al., 2015). Grip strength was assessed using a dynamometer. Two readings from the dominant hand were taken, and the mean strength was calculated. Gait speed was measured using the GAITRite portable electronic walkway system (CIR Systems, Inc., Havertown, PA). Participants walked at their usual pace along a 4.88-m (16 ft) walkway with an extra 2.5 m at each end to allow for acceleration and deceleration. Gait speed was then calculated as meters per second and then transformed to centimeters per second.

2.1.5. Obesity and medical health conditions

Weight and height were measured using standard procedures. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Obesity was defined as BMI ≥ 30 kg/m^2. The presence of medical conditions was assessed by asking the respondents about whether they were ever told by a doctor that they have angina, arthritis (including osteoarthritis and rheumatism), congestive heart failure, diabetes or high blood sugar, heart attack (including myocardial infarction and coronary thrombosis), stroke (cerebral vascular disease), or Parkinson's disease. Heart disease referred to having at least one of: angina, congestive heart failure, and heart attack. Depression was measured with the 20-item Center for Epidemiologic Studies Depression (CES-D) (Radloff, 1977) based on symptoms experienced in the past week, and was defined as a CES-D score of ≥16 (Beekman et al., 1997).

2.2. Statistical analysis

A descriptive analysis was conducted to characterize the study sample (overall and by the presence of MCI). The differences in sample characteristics by the presence of MCI were tested by chi-squared tests and student's *t*-tests for categorical and continuous variables respectively. Poisson and logistic regression analyses were done with number of falls and the presence of non-accidental falls in the past 12 months as the outcome respectively. MCI was the main covariate of interest. Since it is possible that the inclusion of different blocks of control variables in the model affects the association between MCI and falls in different ways, we conducted hierarchical analyses where three different models were constructed for each outcome: Model 1 — adjusted for sociodemographic and lifestyle characteristics; Model 2 — adjusted for covariates in Model 1 and grip strength and gait speed; Model 3 — adjusted for covariates in Model 2 and obesity and medical health conditions. All variables were included in the models as categorical variables with the exception of grip strength and gait speed (continous variables). The selection of the covariates was based on past literature (Muir et al., 2012; Tinetti et al., 1995; Tinetti et al., 1986; Robbins et al., 1989). In order to assess the influence of multicolinearity, we