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Frailty and mortality or incident disability in institutionalized older adults: The FINAL Study

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ABSTRACT

Background: Little is known about frailty in institutionalized older adults, and there are few longitudinal studies on this topic.
Objectives: To determine the association between frailty and mortality or incident disability in basic activities of daily living (BADL) in institutionalized Spanish older adults.
Design: Concurrent cohort study.
Setting: Two nursing homes, Vasco Núñez de Balboa and Paseo de la Cuba, in Albacete, Spain.
Participants: Of the 324 institutionalized adults older than 65 years enrolled at baseline, 21 (5.5%) were lost during the one-year follow-up. Of the 303 remaining, 63 (20.8%) died, 91 (30.0%) developed incident disability, and 140 (49.2%) were free of both events. 16 participants were not suitable for analysis due to incomplete data.
Measurements: Frailty was defined by the presence of three or more Fried criteria: unintentional weight loss, low energy, exhaustion, slowness, and low physical activity. Incident disability in BADL was considered when new onset disability in bathing, grooming, toileting, dressing, eating or transferring was detected with the Barthel index. Logistic regression models were constructed adjusted for age, sex, body mass index (BMI), previous Barthel index and Minimental State Examination (MMSE), and high comorbidity (Charlson index $\geq$3).
Results: 287 participants with valid data. Mean age 84.2 (SD 6.8), with 187 (65.2%) women. 199 (69.3%) were frail, and 72 (25.1%) had high comorbidity. Mean BMI 27.6 (SD 5.2), Barthel index 53.4 (SD 37.1), and MMSE 14.2 (SD 9.7). At follow-up, 43 (21.6%) frail participants and 15 (17.0%) non-frail ones died. 73 (46.8%) frail participants and 16 (21.9%) non-frail ones developed incident disability in BADL ($p < 0.001$). Frailty was associated with incident disability or mortality (OR 3.3; 95% CI 1.7–6.6) adjusted for all study covariables.
Conclusion: In a cohort of institutionalized older adults, frailty was associated with mortality or incident disability in BADL.

1. Introduction

Physical frailty is a medical syndrome with multiple causes and contributors that is characterized by diminished strength, endurance, and reduced physiologic function that increases an individual's vulnerability for developing increased dependency and/or death [1,2]. Different cohort studies have found prevalences between 4% and 59.1% in different settings and countries [3,4], but most of them have only included community subjects, excluding older adults at institutions. Only three studies in Spain [5–7], two in Canada [8–10], and one in Poland [11] have included institutionalized older adults, with frailty prevalence between of 29.2% and 53.7%.

Frailty is an important predictor of adverse outcomes in older adults, such as death, institutionalization, falls, mobility decline, increased disability in basic (BADL) and instrumental (IADL) activities of daily living and hospitalization [12–15]. However, it is not yet well known if frailty is a valid construct for institutionalized older adults and if the pattern of association between frailty and health geriatric adverse outcomes is similar in institutionalized

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and community subjects, because all these associations have been described in community populations. Until now, only two longitudinal studies in Canada [8,10] and one in Spain [5] have analyzed the association between frailty and health outcomes in institutionalized or assisted living older adults.

Institutionalized older adults are a heterogeneous population in disability rates, multimorbidity, quality of life and vulnerability. Interventions on this population should be individualized, and it is still not well known if the detection and treatment of frailty could be of use to prevent disability, mobility decline, falls and mortality [9]. Different studies have demonstrated that clinical interventions can be effective in treating or preventing frailty [16], although any of them have been conducted in institutions. However, longitudinal studies addressing the association between frailty and adverse events are needed in institutionalized subjects, before conducting clinical trials with valid interventions as exercise or nutrition support in this population.

Due to this lack of knowledge, we designed the FINAL Study to analyze the association between frailty and mortality or incident disability in a cohort of institutionalized Spanish older adults.

2. Methods

2.1. Design

Concurrent cohort study in subjects older than 65 years, residents in two nursing homes from Albacete city, Spain.

2.2. Objective

The objective of this study was to analyze the association between frailty and mortality or incident disability in BADL.

2.3. Study subjects

Men and women older than 65 years, institutionalized in *Vasco Núñez de Balboa* or *Paseo de la Cuba*, both public nursing homes in Albacete city, Spain. *Vasco Núñez de Balboa* and *Paseo de la Cuba* have 227 and 213 residents, respectively, with different degrees of disability. Each institution has a day center and nursing beds for clinical stabilization of acute diseases. The multidisciplinary team in both centers is composed of one geriatrician, one general practitioner, nurses, social worker, physiotherapists, and occupational therapists. Medication is centrally controlled at the Complejo Hospitalario Universitario de Albacete, with the involvement of pharmacists and nutritionists. Participants had to live in the nursing home at the beginning of the study, and have to sign informed consent previous to the inclusion. In non-capable subjects, the legal tutor was informed and had to sign the informed consent. The only exclusion criteria were the refusal to participate or sign the informed consent.

2.4. Frailty criteria

We used the Fried frailty criteria [17], with some slight modifications. Unintentional weight loss equal to or greater than 4.600 kg or equal to or greater than 5% of body weight in the last year. Weakness as measured by grip strength, using a JAMAR® digital hand dynamometer, in the lowest 20%, adjusted for gender and BMI, according to the Fried's original data and cut-offs. Poor energy and endurance, as indicated by self-reported exhaustion determined by two questions from the Center of Epidemiologic Studies Depression Scale (CES-D), according to Fried's criteria. Slowness, measured as the time taken to walk 4.0 m, within the lowest 20th percentile and adjusted for gender and height, according to Fried's original data and cut-offs. Low physical activity level, determined by calculating the number of kilocalories expended weekly from information given by the patient using the Calcumed® instrument, within the lowest quintile for each gender, with Fried's original cut-off points. To construct the frailty phenotype variable, participants had to have valid values in at least 3 of the 5 criteria. Subjects were considered frail if three or more criteria were present and pre-frail if 1 or 2 were present.

2.5. Study covariables

Age, gender, and body mass index (BMI) in kg/m^2 were determined in the basal visit, and chronic diseases were identified from the medical records of participants. Diseases were codified following the CIE-10 classification, and grouped in homogeneous groups for analysis. Comorbidity was analyzed with the Charlson index [18]. This index contemplates 17 categories of comorbidity recorded via anamnesis, the review of patients' clinical histories or both. Each category has a weighting based on the risk of mortality within one year. The score for each patient was obtained by adding the weighting of each of the comorbid conditions contemplated in the index. High comorbidity was considered when Charlson index score was equal or greater than 3 points, using the cut-off points validated in previous studies [19,20].

Basal disability was determined with the Barthel index that assesses the ability to independently realize 10 BADL: eating, bathing, dressing, grooming, toileting, urinary and fecal continence, transferring, walking and climbing stairs. Barthel index scores range from 0 (total disability in all 10 activities) to 100 (no disability) [21]. The Barthel index is proposed as the standard for measuring disability in BADL, for clinical and research purposes, due to its validity, reliability, sensitivity, and utility [22]. Cognitive status was determined with the Folstein's *Minimental State Examination* (MMSE).

2.6. Outcome

The main outcome variable was the presence of incident disability in any BADL or mortality at one-year follow-up. Mortality was obtained from the institution medical records. For the purpose of incident disability, only eating, bathing, grooming, toileting, dressing, and transferring were determined. Incident disability was considered when either new cases of disability were detected, or when Barthel scores on any of these 6 activities were lower in the follow-up visit than those in the basal visit. Urinary and fecal continence were not considered because of their high prevalence in institutions, and because medical and social factors could be involved in their presentation. Walking and climbing stairs were also not considered because they represent mobility and endurance, but not disability in BADL, and also could interact with the frailty construct in the statistical analysis.

2.7. Information sources

After the informed consent sign, information was collected through a single, one-to-one interview with the participant at the institution. Five trained geriatric nurses conducted the interviews. The information was provided by the participant him/herself or by the legal tutor if the participant was unable to do so. The performance tests were conducted on the same day as the interview by the same nurses. The information on the participants' chronic diseases was collected from the institution medical records and nurse book. Data were anonymized, codified and included in a database for further analysis.