Research paper

Multimorbidity and functional status in institutionalized older adults

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ABSTRACT

Background: Multimorbidity research has increased progressively, especially in older adults, due to its major consequences such as mortality and reduced functional capacity. The objective of the study was to identify multimorbidity groups and how single, paired, and groups of multiple chronic conditions influence functional status in institutionalized older adults.
Methods: The study is based on two cross-sectional samples of institutionalized people of 65-years-olds or over in Spain, with a total of 887 subjects. Sociodemographic data and functional status (Barthel index) were obtained by a structured interview. The diagnoses of 11 chronic health problems were collected from the medical record.
Results: Ninety-two percent of the sample suffered two or more chronic diseases. Dementia was strongly associated with a reduction in functional independence (OR 3.22, 95% CI 2.33–4.44). In the analysis by pair of conditions, cardiovascular disease and cancer (OR 1.89, 95% CI 1.00–3.58) had the highest association with low functional status. Four multimorbidity groups emerged from the factor analysis: sensory, bone and gastrointestinal; cardiopulmonary and metabolic; dementia, cancer and gastrointestinal; and Parkinson's disease. The dementia, cancer and gastrointestinal disorders group was the only one significantly associated with physical impairment (OR 2.23, 95% CI 1.53–3.25).
Conclusions: The large majority of institutionalized older adults presents multimorbidity and the results confirm the non-random associations between chronic diseases. The identification of multimorbidity patterns most associated with physical function offers the potential to the implementation of preventive strategies and better treatment of multimorbid patients in long-term care facilities.

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1. Introduction

The prevalence of multimorbidity and comorbidity in the general population is growing as a result of different factors, including increase of lifespan and advances in medical care. Multimorbidity refers to the co-occurrence of two or more chronic diseases within one person in a specific period of time [1]. Multimorbidity is usually distinguished from comorbidity, which is the manifestation of one or more chronic diseases in addition to a given chronic condition. The two terms, although different, share the co-occurrence of two or more conditions in the same person, which is the topic of this study.

Prevalence of multimorbidity in older persons ranges from 64.9 to 81.5% with the mean number of conditions increasing significantly with age [2]. However, the lack of a clear consensus on which chronic conditions should be considered in comorbidity or multimorbidity indices makes it difficult to evaluate and compare data.

The presence of multiple chronic health conditions often results in greater disability and worse quality of life (QoL) than expected. The effects of specific combinations of chronic conditions has been

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studied in many multimorbidity studies, with evidence of synergistic effects for some combinations [3]. Moreover, the ability to compensate for one health problem may be affected by multimorbidity conditions [4]. Multimorbidity, especially in institutionalized older people, is associated not only with hospitalizations, disability, mortality and lower QoL but also a significant decline in functional status is common [5].

In accordance with the International Classification of Functioning, Disability, and Health (ICF) model, the reduction in a person's functional status is included in a variety of activity and participation restrictions together with communication, mobility, interpersonal interactions, and self-care [6]. The ability to perform independent living task is a crucial component for active and healthy aging. Good functional capacity allows the performance of activities of daily living (ADL) such as feeding, bathing and/or going to the bathroom, while disability compromises QoL and is associated with higher mortality in older people [7]. The combination of chronic health conditions and increased need for physical assistance is very common in long-term care facilities. Institutionalized older adults have often specific clinical care needs such as management of multimorbidity, polypharmacology, chronic pain, and a decline in cognition and physical function [8].

Given the above, it is important to focus on exploring multimorbidity in relation to functional independence. The aim of the study was to investigate how individual chronic health conditions and their associations in pair or groups affect functional status in institutionalized older adults. The results of this study could be useful to advance our understanding of the consequences of multimorbidity on functional independence and helpful to the practice of evidence-based decision making.

2. Method

2.1. Participants and measures

In order to increase external validity, we used data from two surveys on institutionalized older adults aged 65 years or older. The first included 759 persons from 14 long-term care facilities in 10 provinces of Spain, more details of this survey may be found in two previous publications [9,10]. Since this study did not include residents who were hospitalized at the moment of data collection, a second survey was used, with subjects enrolled in a multicenter study in the six hospitals from the Basque Health Service (Osakidetza), aged 65 years or older and living in long-term care facilities. A total of 161 (participation rate 99.1%) patients who attended one of the six public hospital emergency departments, after a fall with hip or wrist fracture, were enrolled. Additional information could be found in a previous article [11]. A final number of 891 participants were considered suitable to be included in the analysis (two subjects were excluded due to incomplete or inconsistent data from questionnaires and 27 were excluded from the analyses due to age < 65 years).

In the nationwide study, persons with a score of 5 or more in the Pfeiffer's Short Portable Mental status Questionnaire were excluded. The following information was collected in both surveys: age, gender, educational level, functional status and the presence of chronic conditions. Both surveys were administered through structured interviews by trained interviewers with medical background under the supervision of the research team. Subjects with low to mild cognitive impairment who had difficulties answering the questionnaires were helped by the interviewer and included in the survey [12]. In the Basque survey, data was collected during the first week after subjects had fallen, referring to the week before the fall (retrospectively).

The Barthel Index was used in both studies to assess functional status [13]. This 10-item instrument measures a person's daily functioning, specifically ADL and mobility. Items include feeding, moving from wheelchair to bed and back, grooming, transferring to and from a toilet, bathing, walking on a level surface, going up and downstairs, dressing, continence of bowels and bladder. The scores range between 0 and 100, where higher scores reflect greater independence.

The chronic medical conditions common in both surveys and investigated in this study were:

- bones disease (arthritis, arthrosis, osteoporosis);
- visual impairment;
- hearing impairment;
- dementia (Alzheimer's disease and other forms);
- Parkinson's disease;
- pulmonary disease (chronic bronchitis, asthma);
- cardiovascular disease (CVD: myocardial infarction, circulatory problems, heart failure);
- diabetes mellitus;
- hypertension;
- cancer;
- gastrointestinal (GI) disease (ulcers, liver disease, hemorrhoids).

The diagnoses were collected from the medical record by the trained interviewers in the Basque region sample and by medical staff in the nationwide one.

The study adhered to the Declaration of Helsinki principles and was approved by the ethics committee of the Carlos III Institute of Health and the ethics committees of all participating hospitals. All participants gave informed consent and patient anonymity was preserved.

2.2. Statistical analysis

Due to non-normal distribution of the data, the Barthel index was dichotomized into ≤ 40 (from total dependence to severe dependence) and > 40 (from moderate dependent to totally independent) [14]. Several logistic regression models with the Barthel index as dependent variable were used to analyze the relationship between functional status and multimorbidity.

The expected prevalence was computed as (prevalence of disease A) × (prevalence of disease B) [15]. In order to estimate conditional probabilities of combinations, the observed/expected ratio of prevalences (ratio O/E) was computed. For each of the 10 most prevalent pairs, single logistic regression models were run adjusting for all other single conditions and confounding factors (age, gender and educational status and sample). To explore the presence of a multiplicative synergistic effect, potential two-way interactions were added to the main effects model using a forward stepwise process. A statistically significant interaction indicated a synergistic association, in which having both diseases were associated with an essentially higher risk of disability than the expected by multiplying disease-specific risks.

To determine the associations between diseases, an exploratory factor analysis with principal components was used. KMO measure of sampling and Bartlett's test of sphericity were performed to investigate sampling adequacy for conducting factor analysis. Due to dichotomous nature of variables, we used the tetrachoric correlation matrix instead of conventional Pearson correlations, which leads to greater validity [16]. The rotation method used was the oblique direct oblimin, which allows factors to be associated with each other. A factor loading limit of 0.40 was used to define the association of variables to a factor. The resulting factors can be interpreted as multimorbidity groups where each factor loading represents the association of the disease with a group. Subjects were assigned to a group if they were diagnosed with at least half