

Functional decline in elderly people with mild cognitive impairment

Declínio funcional em idosos com comprometimento cognitivo leve

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ABSTRACT

Introduction: elderly people with mild cognitive impairment (CCL) manifest difficulties in performing daily living activities (AVD), however, there are difficulties related to identification and classification of impaired activities. **Objective:** to assess whether there is evidence in the literature of AVD impairment in older adults with CCL. **Methods:** literature review based on search in the PUBMED and LILACS databases using the keywords: “mild cognitive impairment” AND “activities of daily living” and their correlates in Portuguese and Spanish that resulted in 759 publications. Repeated studies, reviews, validation, editorials, and guidelines studies, and letters to the editor and commentaries were excluded. Clinical trials, descriptive, comparative, and cohorts studies in English, Spanish, and Portuguese, published up to 2012 were selected, whose main objective was to investigate AVD in older adults with CCL. The inclusion criteria were met by 41 studies for this review. **Results:** clinical, cognitive, and functional variables were measured. There was variation in the sample size of individuals with CCL, according to age (from 71.3 to 76.8 years), educational level (2.5 to 15.8 years), and gender of participants, predominantly females. Only two studies were conducted in Brazil. The functional decline was present in all the studies analyzed and measured using different standardized tests and non-standard measurements. **Conclusions:** subtle deficits were identified in advanced and instrumental AVDs, which usually go unnoticed, thereby compromising the quality of life and constituting a risk of pre-dementia stage to develop into Alzheimer’s dementia.

Key words: Alzheimer Disease; Aged; Mild Cognitive Impairment; Activities of Daily Living.

RESUMO

Introdução: idosos com comprometimento cognitivo leve (CCL) manifestam dificuldades no desempenho de atividades de vida diária (AVD), contudo, existem dificuldades relacionadas à identificação e classificação das atividades comprometidas. **Objetivo:** avaliar se há evidência na literatura de comprometimento de AVD em idosos com CCL. **Métodos:** realizada revisão de literatura a partir de busca nas bases de dados PUBMED e LILACS, com as palavras-chave: “mild cognitive impairment” AND “activities of daily living” e seus correlatos em português e espanhol, resultando no total de 759 publicações. Foram excluídos estudos repetidos, de revisão, validação, editoriais, guidelines, cartas ao editor e comentários. Selecionaram-se os ensaios clínicos, estudos descritivos, comparativos e coortes nos idiomas inglês, espanhol e português, publicados até o ano de 2012, cujo objetivo principal foi investigar AVD em idosos com CCL. Os critérios de inclusão foram preenchidos por 41 estudos para esta revisão. **Resultados:** foram medidas variáveis clínicas, cognitivas e funcionais. Houve variação quanto ao tamanho da amostra de indivíduos com CCL, quanto à idade (71,3 a 76,8 anos), nível

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de escolaridade (2,5 a 15,8 anos) e sexo dos participantes, predominando o feminino. Apenas dois estudos foram realizados no Brasil. O declínio funcional esteve presente em todos os estudos analisados e mensurado com diferentes testes padronizados e medidas não padronizadas. Conclusões: foram identificados déficits sutis em AVDs avançadas e instrumentais, que geralmente passariam despercebidos, comprometendo a qualidade de vida e constituindo-se em risco de estágio pré-demencial para demência de Alzheimer.

Palavras-chave: Doença de Alzheimer; Idoso; Comprometimento Cognitivo Leve; Atividades Cotidianas.

INTRODUCTION

Population aging is a global and inexorable phenomenon. Estimates indicate that by 2025 Brazil will have about 34 million people over 60 years old, making it the country with the sixth largest population of elderly in the world. The age group above 80 years shows the highest growth rate.¹

Mild cognitive impairment (CCL) is considered an intermediate state between the typical cognitive changes of physiological aging (senescence) and those caused by dementia.²

The new criteria for the diagnosis of Alzheimer's dementia (DA) revised in 2011 by the National Institute on Aging and Alzheimer's Association (NIA) consider that CCL is the pre-dementia stage of Alzheimer's disease, determining the risk between 10 and 15 % per year of evolution to dementia.^{2,3}

CCL affects, in general, one or more areas of cognition, and is classified in the amnesic and non-amnesic subtypes according to the presence or absence of memory impairment. The amnesic type is characterized mainly by memory complaints and may reflect the DA in the symptomatic stage of pre-dementia. The non-amnesic type is characterized by deficits in any other field of cognition, e.g., executive functioning, thinking, and attention among others, and can progress to two other forms of dementia.⁴⁻⁶

Recent studies have shown great interest in establishing the link between cognitive decline and functionality in older adults with CCL. It is observed that these patients manifest subtle difficulties in performing complex activities of daily living (AVD) that can be defined as voluntary activities, specific to each individual, and are influenced by socio-cultural and motivational factors such as work, leisure, hobbies, or social activities.⁷⁻⁹ This fact determines more difficulty in identifying functional decline and also the diagno-

sis of this condition. Progression may occur according to the integrity of cognitive functions, regression, stabilization, or functional impairment.⁷

The impairment of functionality classified into three levels – basic (ABVDs), instrumental (AIVDs), and advanced or complex (AAVDs) – constitute *sine qua non* conditions for the diagnosis of dementia. According to Bagen et al.,⁷ despite the interest in the subject, researchers are often engaged in researching cognitive functioning over deepening the study of the functionality of individuals with CCL.¹⁰

Considering the importance of the subject matter, and the controversies about it, the objective of this study will be to review and discuss the literature on the subject of a functional decline in older adults with CCL.

METHODS

The search for relevant articles for this review was conducted in the MEDLINE and LILACS databases, and in the PubMed and BIREME searching engines using the keywords: “mild cognitive impairment” AND “activities of daily living” and their correlates in Portuguese and Spanish. Clinical trials, descriptive, comparative, and cohort studies published in English, Spanish, and Portuguese were eligible. Repeated articles or whose language was different from the described criteria, and review, validation, editorials, and guidelines studies, and letters to the editor and commentaries were excluded. Abstracts were read in all final articles; those published by 2012 whose main objective was to describe or investigate the decline in AVDs in older adults with CCL were selected, as shown in Figure 1.

RESULTS

The search resulted in 759 articles using the cited keywords. A total of 437 articles were excluded based on specific criteria, and 49 articles were selected after reading their titles. Of these, abstracts were read, and those whose main objective was to describe or investigate AVD in older adults with CCL were selected. The 41 selected articles were read in full and critically analyzed considering the type of study, publication year, sample characteristics, used measurements, diagnostic criteria for CCL, and main outcomes.

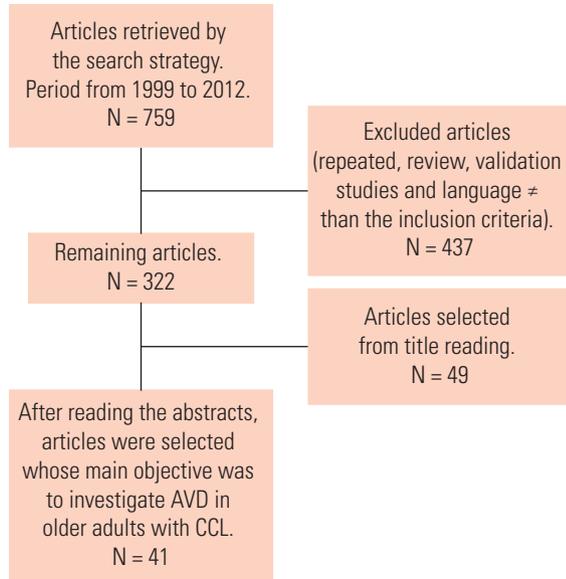


Figure 1 - Process for article selection.

Cross-sectional comparative studies prevailed from a methodological point of view. All selected papers presented descriptive statistical analyzes of cognitive, functional, and sociodemographic variables.

Most published articles correspond to research conducted in the United States; and only two in Brazil.¹⁴⁻⁴⁷ The diagnostic criteria of Petersen^{6,24} were used to classify the CCL population in most studies.

In relation to the characteristics of the studied population with CCL, it can be observed that there was variation in sample size (14-1108 individuals), age (from 71.3 to 76.8 years old), education (2.5 to 15.8 years), and gender, with a predominance of females.

Among the instruments used for cognitive assessment, the most frequent were: Mini-Mental State Examination (MMSE),^{11-20,23} A and B tracks test^{11,14-16,19}, verbal fluency test^{14-17,19,22}, and auditory-verbal learning test (AVLT).^{11,17,20}

Several authors^{12,13,16,18,23} conducted various neurological evaluations of elderly patients with CCL; neuroimaging was used to aid in the differential diagnosis of CCL, DA, and subjects with normal cognition in three studies^{10,11,13}. The Geriatric Depression Scale (GDS) was most often used in different versions^{11,12,17} to assess symptoms of depression while the Neuropsychiatric Inventory (NPI) was applied in one research.¹⁴

Table 1 shows that AVDs were measured based on the following standardized tests: Pfeffer questionnaire of functional activities,¹¹ LSQ – questionnaire on mobility/living space,²⁰ DHQ – questionnaire on mobility/vehicular direction,²⁰ Direct Assessment of Functional

Status Scale (DAFS-R),¹⁴ Disability Assessment in Dementia (DAD),¹⁵ Functional Activities Questionnaire – FAQ,^{19,21} Blessed Dementia Scale,^{18,23} Katz Index^{12,14}, and Lawton scale of instrumental activities of daily living.^{12,14} Reports on AVD^{14,16} were also collected, and their structured observation was conducted.²⁰

AVD deficits were common in all studies in the group of subjects with CCL and DA. The proportion of these deficits, when compared, was lower among elderly with CCL. The impairment in AVD was defined by Brown et al.¹¹ as a small difficulty in performing an activity, but without the need for physical assistance from someone else to finish it, and by Tam et al.¹⁵ as the preserved ability to perform most activities of daily living, but occasionally need to be reminded. These criteria were also adopted by other studies to specify the functional impairment presented by individuals in the CCL group.

The elderly with CCL showed impairment in activities such as shopping, taking medicines, handling finances; remembering appointments, family occasions, and holidays; gathering/assembling books and other documents, driving, and performing dual tasks associated with gait (walk and talk, for example). AVD deficits differ between subjects with the amnesic and non-amnesic CCL type. Patients with non-amnesic CCL were more likely to have little difficulties in ABVD such as feeding, clothing, and continence whereas patients with amnesic CCL showed a greater decline in AAVD and some AIVDs such as those described.²³ A plausible explanation for this would be the higher incidence of memory deficits and executive dysfunction in subjects with amnesic CCL, and deficits in several cognitive domains in individuals with non-amnesic CCL, thus resulting in a decline in the ABVDs.

DISCUSSION

The results of this study show that production on the subject of a functional decline in older adults with CCL is still incipient and growing mainly since 2006, as shown in Figure 2.

Probably, the growing interest in the subject is because the subtle decline in AVDs was recognized as a diagnostic criterion of CCL by the “International Working Group on Mild Cognitive Impairment,” in 2004. Nevertheless, doubts remain about which AVDs are compromised and how best to evaluate them.^{3,25}

Table 1 - Functional tests used by the studies

Tests	Characteristics
Pfeffer Questionnaire	Measurement to evaluate AIVD. It has 10 items, with a total score ranging from (0-30). Applied to the caregiver. Score ≥ 5 suggests the presence of functional impairment.
Katz Index	Descriptive measure that assesses ABVD. Classifies patients in independent, dependent, and in need of assistance. Can be answered by the caregiver or patient. It has no specific cutoff point.
Lawton Scale	Measurement to evaluate AIVD. Consisting of 8 items, with a total score ranging from (8-24). The higher the score obtained the highest level of independence. Can be answered by the caregiver or patient.
Life Space Questionnaire – LSQ	Measurement to evaluate the vehicular driving space (AAVD). It has 9 dichotomous items (yes/no) answer yes each worth 1 point. The total score ranges from (0-9). Higher scores indicate more living space. Applied in the form of an interview with the patient.
Driving Habits Questionnaire – DHQ	Measurement to evaluate the direction of vehicular behavior in 8 cases (AAVD). Difficulty in each case is measured in a 4-point scale ranging from 1 (no difficulty) to 4 (extremely difficult). Applied in the form of an interview with the patient.
Functional Activities Questionnaire – FAQ	Measurement to evaluate the performance of each subject in the last 4 weeks in 10 distinct categories of AIVD. It is administered to an informant. Higher scores in each category denote greater impairment: 0 = normal, 1 = has difficulty, but does alone, 2 = requires assistance or 3 = dependent.
Direct Assessment of Functional Status Scale – DAFS-R	Objective measurement that assesses tasks that simulate ABVD, AIVD, and AAVD. It comprises seven domains which include: temporal orientation, communication skills, ability to deal with finance, shopping, hygiene, food, and transportation. Each domain has sub-domains with different scoring ranges. Higher scores indicate better functional capacity.
Disability Assessment in Dementia – DAD	Measurement to evaluate ABVD and AIVD. Applied in the form of an interview with the caregiver. Refers to observation of the caregiver about the actual performance of patients in the two weeks preceding the test. Each item is considered according to cognitive function covering (initiation, planning and organization, performance). The score is expressed as a percentage, with higher scores indicating better functionality.
Blessed Dementia Scale	Designed to assess cognitive and behavioral functions in patients with dementia, including daily activities, self-care, habits, and personality changes. It is composed of seven items assessing AIVD and three items assessing ABVD. The score ranges from 0 to 16, with higher scores indicating greater functional impairment.

ABVD: Basic activities in Daily life; AIVD: Instrumental Activities of Daily Life; AAVD: Advanced Activities of Daily life.

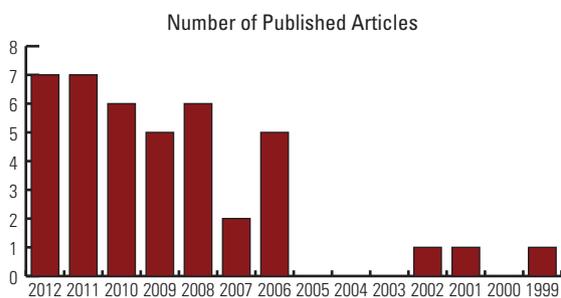


Figure 2 - Number of publications according to years.

The diagnostic criteria for CCL, initially set by Petersen^{6,24}, were the most used by the studies in this review. However, they are purely cognitive (subjective complaint of memory) and consider the functional and socio-occupational activities preserved, making it difficult to identify the functional impairment in that group.²⁵ Recently, these criteria were reviewed, and to address the diagnosis of CCL, the following must be present: change in cognition recognized by the affected individual and/or observers; objective impairment in one or more cognitive domains; absence of dementia and independence in functional activities. Although the last item remains, its operationalization

is more flexible when admitting that AAVDs may be slightly impaired.^{2,3}

In the analyzed studies, older adults with normal cognition and with DA were diagnosed using multiple sources of reliable information and according to standardized and worldwide accepted protocols. However, elderly patients with CCL were identified through different classifications, which caused disagreement regarding the prevalence rates and difficulty in specifying its subtypes, and hence, the characterization of functional decline. According to Saxton⁹, the use of different classification criteria can produce different incidence and prevalence rates of CCL and conversion to dementia, and may also interfere with functional decline rates presented by the individuals.⁹

A comparative analysis regarding the sociodemographic characteristics of the populations included in the various studies was performed between groups of cognitively normal elderly people diagnosed with CCL and DA at an early stage.

Endorsing the literature, the analyzed studies showed that elderly people with CCL were often between 70 and 76 years old and significantly older compared to older adults with normal cognition. However, they were younger than those in the group

with initial DA.^{7,8} This is explained by advanced age being considered a risk factor for DA, considering that the greater the age, the higher the risk of developing chronic degenerative diseases, and therefore, increased functional decline.²⁷

Females were the majority in the studied samples. This condition may be justified by the phenomenon called feminization of old age, in which stands the largest and growing proportional number of women in the total elderly population.²⁶

Clinical, physical, and cognitive variables influence the functional capacity of older adults.²⁷ Among the findings of the studies analyzed in this review, features such as low educational level, advanced age, symptoms of depression, severity of comorbidities, executive dysfunction, and apathy showed strong association with functional decline in the CCL group when compared to controls with normal cognition.¹¹⁻²³ These variables can put elderlies in more vulnerable situations for cognitive decline, and therefore, predispose to functional decline.²⁸

The measurement instruments used to assess functional capacity were quite heterogeneous, complicating any comparison. Performance tests and questionnaires, sometimes self-administered sometimes designed for direct interviews, were used. Non-standardized measurements were also applied (reporting and observation of AVD)²⁹ as described in Table 1.

The most widely used tests are not validated and culturally adapted for the Brazilian population, for example, the Pfeffer and Lawton-Brody scales, which are instruments used by some selected studies in this review to assess AIVDs,^{18,26} and others such as: Life Space Questionnaire, Functional Activities Questionnaire, Driving Habits Questionnaire, and Blessed Dementia Scale. Those just translated and validated in Brazil are the Katz Index, Objective Assessment Scale of the Functional State (DAFS-R), and Impairment Assessment in Dementia Scale (DAD).²⁹

The CDR, used as a global assessment tool, also used for the assessment of dementia severity, was the second most cited classification, which enables the correlation of cognitive losses with the ability of the elderly to perform ABVD and AIVD.³⁰ According to Saxton⁹, CDR is more sensitive to subtle cognition changes compared with neuropsychological criteria. However, it is influenced by demographic and clinical factors resulting in more false positives. It is still very little used in Brazil, although it is part of the Min-

istry of Health's protocol for dispensing special medications for DA (MS-PCDT).³¹

Pereira et al.¹⁴ have shown that older adults with CCL present mild changes in the functional state that could only be perceived through objective measurements of the AVDs. However, the authors point out that these measurements, although mitigating the cultural bias, require special conditions for their implementation such as AVD laboratories; they demand time and financial resources; and require training of the evaluator.²⁶ The use of inappropriate tools can generate unreliable results or test scores with ceiling effects, making the early identification of functional decline in this group difficult. It should be noted that the existence of a ceiling or floor effect indicates the limitation of the instrument's ability to discriminate individuals.³² The need to establish standardized and specific evaluation protocols for the elderly with CCL stands out because the tests currently employed were developed for elderly people with dementia and increased impairment for AVD.³³

Weston et al.²³ observed that older adults with amnesic CCL show increased executive dysfunction rate compared to the control group. Marshall et al.²¹ also obtained this finding. However, the decline in their sample presented by individuals with non-amnesic CCL was more significant, leading to greater impairment for basic tasks like feeding and sphincter control. These results support the existence of functional decline in elderly people with CCL compared with controls and show that there are differences, depending on the type of CCL, between the deficits presented.^{14,21}

O'Connor et al.²⁰ followed 2,355 normal and CCL elderlies for five years and investigated the following variables: living space (spatial extension of a person's mobility), vehicular direction, frequency, and level of driving difficulty. The authors ascertained that participants with CCL showed early reduced mobility in all evaluated items as well as more rapid decline in vehicular driving difficulty.²⁰

Gillain et al.¹² determined gait parameters in elderly people with different cognitive profiles (normal cognition, people with CCL, and early DA) using the equipment "Locometrix-3 accelerometer system." They found that this tool is more useful and sensitive than conventional clinical tests (get up and go test, the pull test, and the single-leg balance test) to cognitively differentiate groups. In dual tasks (e.g., walk and read, walk and talk), the gait speed and frequency of steps were positively correlated with the cognitive level of the individual. The authors suggest

that these parameters could be used as a predictor of progression of dementia in this population.¹²

Some authors verified that the functional impairment was associated with reduced hippocampal volume and reduced processing speed in CCL and DA groups. This fact highlights the importance of imaging methods as a diagnostic aid and differentiation between groups.^{11,14} A recent study corroborates this result by showing that the impairment for AIVD is associated with severe cerebral amyloid load measured by the Pittsburgh Compound B – Positron Emission Tomography (PIB-PET CT) in a sample of individuals with CCL.⁸

Regarding the quality of the analyzed articles, most were cross-sectional studies. This type of timely assessment determines limitations in defining causes and consequences of functional decline, which is an oscillating phenomenon influenced by biological, psychological, and social factors.

An identified limitation of this study was the fact that the search has encompassed only studies published by 2012 that evaluated the functionality in CCL, therefore, failing to address, for example, those that correlate alterations in cognitive aspects. In addition, several studies highlight the lack of standardization in the evaluation of AVDs and diagnosis of CCL, which may have caused contamination between the studied groups.

Finally, the results of this review reinforce the hypothesis that there is a functional decline hierarchy in progressive cognitive impairment, whose deficit initially affects AAVD, evolves into AIVD, and reaches ABVDs, corresponding to the most severe levels of incapacitation.²⁷ Even mild degrees of cognitive impairment can have negative effects on the ability to perform AAVD.³⁴ In the case of older people with CCL, although different AVD rating scales were used, the decline in AAVD was identified (role plays and typical social activities of adult life) and AIVD (management of practical domestic and community life). Only Weston et al.²³ observed ABVD impairment in patients with non-amnesic CCL.

Faced with the presented limitations, the development of longitudinal studies and new tools to characterize the functional decline in older adults with CCL are needed.

CONCLUSION

In this study, the use of different classification criteria can produce different incidence and prevalence rates of CCL and hence of functional decline in this population.

The analysis of the assessed studies reveals subtle declines in AAVD and AIVD in patients with CCL. This impairment would usually go unnoticed because it is not so severe as to require assistance from others. However, depending on the task being performed, it can compromise the quality of life and put elderly patients at risk of progression to DA. Generally, individuals with CCL showed intermediate functional performance among the group of older adults with normal cognition and those with early DA. AAVDs may act as predictors of future functional losses in a way that the decline in these activities is an early indicator of the functional capacity reduction.

There was a lack of standardization in both diagnostic classification and functional tests used.

In conclusion, the results show the need for more longitudinal studies with methodological rigor in cognitive and functional assessment to improve the clear establishment of the nature of the functional decline in this population.

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