Correlation between functionality, mobility and risk of falls in elderly people with Alzheimer's disease

Correlação entre funcionalidade, mobilidade e risco de quedas em idosos com doença de Alzheimer

Hudson Azevedo Pinheiro[1]
https://orcid.org/0000-0003-1081-4174
Jaquelynne Dourado Mendes Brandão[2]
https://orcid.org/0000-0002-3541-6669
Aline Laginestra e Silva[1,3]
https://orcid.org/0000-0001-6810-4293

Abstract – To evaluate functional capacity, mobility and balance in elderly patients with Alzheimer's Disease (AD), in its mild, moderate and severe forms, verifying the existence of correlation among these parameters. Eighty-eight elderly patients (81.79 ± 6.54 years) diagnosed with AD treated at an elderly care reference center in Taguatinga-DF were selected, and information was collected between November 2018 and March 2019. Data collection was initially made by filling in the evaluation form. Subsequently, two questionnaires were administered to caregivers (Clinical Dementia Rating-CDR and Disability Assessment for Dementia -DAD) and two tests to demented patients (Southampton Assessment of Mobility-SAM-Br and Timed Up and Go-TUG). Variables were correlated using the SPSS software version 22 using Pearson's correlation, with significance level p≤0.05. The following results were obtained: 1. weak correlations between CDR and DAD (p = 0.04; r = -0.31) with significant difference; 2. strong correlation and significant difference between CDR and TUG (p = 0.02; r = 0.87); 3. weak and non-significant correlation between CDR and SAM-Br (p = 0.14; r = -0.24); 4. significant difference and highly strong correlation between SAM-Br and TUG (p = 0.01; r = 0.70). Older adults with Alzheimer's disease present decreased functional capacity, mobility and risk of falls associated with the disease progression. SAM-Br and TUG tools showed strong correlation and, although it is a generic measure, TUG showed strong correlation with AD progression, and may be a predictive test for the risk of falls in this population.

Key words: Alzheimer disease; Mobility limitation; Postural balance.

Resumo – *Avaliar a capacidade funcional, mobilidade e equilíbrio em pacientes idosos com Doença de Alzheimer (DA). Foram selecionados 88 pacientes idosos (81,79±6,54 anos) diagnosticados com DA atendidos em um centro de referência atendimento a idosos, e estas informações foram coletadas entre janeiro e junho de 2019, com o preenchimento da ficha de avaliação. A seguir, aplicaram-se dois questionários aos cuidadores (Clinical Dementia Rating-CDR e Disability Assessment for Dementia -DAD) e dois testes aos idosos dementados (Southampton Assessment of Mobility-SAM-Br e Timed Get Up and Go-TUG). A correlação das variáveis foi feita no software SPSS versão 22 com o uso da Correlação de Pearson, considerando-se o nível de significância p≤0,05. Obtiveram-se correlações fracas entre CDR e DAD (p= 0,04; r= –0,31) com diferença significativa; correlação forte e diferença significativa entre CDR e TUG (p= 0,02; r= 0,87); CDR teve correlação fraca e não significativa com SAM-Br (p=0,14; r=–0,24); diferença significativa e correlação altamente forte entre SAM-Br e TUG (p=0,01; r= 0,70). Os idosos com doença de Alzheimer apresentam diminuição da capacidade funcional, mobilidade e risco de quedas associada ao avanço da doença. As ferramentas SAM-Br e TUG apresentaram correlação forte estre elas e, apesar de ser uma medida genérica, o TUG apresentou forte correlação com o avanço da DA, podendo ser um teste preditivo para o risco de quedas nesta população.*

Palavras-chave: *Doença de Alzheimer; Equilíbrio postural; Limitação da mobilidade.*

INTRODUCTION

During the natural aging process, declines are observed in the various body systems, including the central nervous system, with neuronal loss and decreased synthesis of neurotransmitters, which causes changes in postural control and balance and cognitive decline involving judgment, calculation, visual-spatial skills and recent memory, increasing the risk of falls[1-3].

The decline in functional capacity is related to the inability or difficulty of performing basic or more complex physical tasks, necessary for independent living resulting from the interaction between physical and mental health, independence in daily life, social integration, family support and economic independence[4].

Dementias are understood as a tripod of changes: cognitive, behavioral and impairment in activities of the daily living (ADL), the most frequent being Alzheimer's Disease (AD), which contributes to about 60% to 70% of cases. It is estimated that the number of people with dementia will reach 65.7 million in 2030 and 115.4 million in 2050, which is a global health concern for governments and policy makers[5,6].

Cognitive decline due to AD is closely related to the loss of the ability to perform instrumental activities of the daily living (IADL) and, later, basic activities of the daily living (BADL), leading the individual to the sequential loss of autonomy, making him / her submissive to the care and supervision of others, whether formal or informal caregivers[7,8].

The literature has shown that in mild stages of AD, the risk of falls is comparable to that of healthy older adults; however, motor processes regulated by complex cortical mechanisms, such as sitting and getting up from the chair, may already be affected, predisposing them to falls and, in advanced stages, this risk is probably high as a result of visual impairment and cognitive changes, which also interfere with ADL[9].

In this context, the present study aimed to evaluate functional capacity, mobility and balance in elderly patients with AD, in its mild, moderate and severe forms, checking if there is correlation among these parameters.

METHODS

This is a cross-sectional study with convenience sample composed of elderly patients with AD with diagnosis being established by geriatric physicians who are part of the geriatric and gerontology outpatient clinic, Taguatinga-DF, according to the diagnostic and statistical manual of mental diseases and ICD- 10 - International Classification of Diseases. The research was carried out between January and June 2019. The study was approved by the Ethics Research Committee of the Catholic University of Brasília under protocol 2.788.564.

Inclusion criteria for elderly people with AD in the sample were: residents in the community; to carry out at least home gait; presence of informal or formal caregiver, who establishes frequent contact with the

patient. Exclusion criteria were: total mobility disability; causes of dementia other than AD; subjects from long-term care facilities for the elderly; other associated neurological disorders; and those who used orthoses and / or prostheses.

After signing the informed consent form, caregivers answered two questionnaires. Subsequently, patients were evaluated using a scale and a test, both in a single moment, performed by the main researcher, previously trained to apply these assessment instruments.

A form was used to record data (age, schooling, marital status and income), and to assess the stage of the disease, the Clinical Dementia Rating (CDR) validated in Brazil was used[10].

The disability assessment for dementia (DAD-Br) scale was applied to the caregiver to determine the degree of functional independence for BADL and IADL in a percentage that the patient with dementia was able to perform without help or without being remembered by the caregiver in the last two weeks[11].

For assessing mobility, the Southampton assessment for mobility (SAM-Br) was used, being a specific instrument for elderly people with dementia to estimate the risk of falls through four simple tasks: moving from sitting to standing, staying in foot, walk and moving from standing to sitting, validated and adapted in Brazil[12].

To assess functional mobility and balance indirectly, the Timed Get Up and Go (TUG) test was used[13]. It measures, in seconds, the time spent by the individual to get up from a chair with arms, walk a distance of 3 meters, go around, walk towards the chair and sit again. Less than 10 seconds corresponds to low risk, 10 to 20 seconds to medium risk and, above 20 seconds to high risk of falls[14]. Thus, if the individual does the journey in up to 20 seconds, he / she is considered to be within the normal range and independent in BADL.

The SPSS software version 22 was used for statistical analysis, and the Shapiro-Wilk test indicated that data were not normal, opting for non-parametric tests and, in the case of the present study, Pearson correlation tests were used, always taking into account significance level of p≤0.05.

RESULTS

Eighty-eight elderly people living in the community participated in this study, all of whom had clinical diagnosis of AD, and information regarding their profile is described in table 1.

Table 2 shows the results of Spearman's correlation tests showing associations between tests used. There were statistically significant differences between CDR and DAD-Br and strong correlation between these tests, that is, disease staging and functionality.

There were no differences between disease staging and mobility and balance, although there was a tendency to point out difference between CRD and TUG (p = 0.09).

Table 1. Categorization of the sample of elderly people with AD

Sex	N (%)
Female	28 (31.1)
Male	60 (67.3)
Age (years)	Mean (SD)
81.7	6.54
Schooling	%
Illiterate	16.3
Elementary School	46.5
High School	25.6
Higher Education	11.6
Functional Tests	Mean (SD)
CDR	2.00±1.00
SAM-Br	15.47±2.64
DAD-Br	42.69±16.18
TUG	30.29±24.13

Note. CDR = Clinical Dementia Ratio; SAM-Br = Southampton assessment for mobility; DAD-Br = Disability Assessment for Dementia; TUG = Timed Get up and go.

Table 2. Correlation between disease staging tests and functional assessment in AD

Tests	p	r
CDR	0.09	0.54
TUG		
CDR	0.0001*	-0.69
DAD-Br		
CDR	0.19	-0.19
SAM-BR		
SAM-Br	0.01**	-0.70
TUG		

Note. * p <0.01. CDR = Clinical Dementia Ratio; SAM-Br = Southampton assessment for mobility; DAD-Br = Disability Assessment for Dementia; TUG = Timed Get up and go.

DISCUSSION

In the present study, association was observed between disease stage measured by CDR and increased risk of falls measured by both SAM-Br and TUG.

In the present study, functionality analyzed by DAD evaluated, in the last two weeks, which BADL and IADL the demented patient was able to perform without help or without being remembered by the caregiver. It was found that the more the level of AD severity increased, the more reduced the functional capacity. Such findings corroborate Santos and Lira, who found association between advancing cognitive impairment and reduced functional mobility, thus increasing the risk of falls[15].

These results are also in agreement with Borges et al.[8], who revealed decline in the ability to perform functional activities as a result of the clinical evolution of the disease, reporting that cognitive impairment interfered with functions such as planning and the actual motor execution of the activity and with Zidan et al.[3], who reported that independence in

BADL and IADL was significantly lower as AD symptoms worsened, with the best performance obtained in group with mild AD (CDR1). This author also found that the loss of independence was greater than the physical and cognitive decline objectively assessed in moderate and severe stages of AD[8,3].

Regarding the level of balance and propensity to fall, time in the TUG test greater than 30 seconds indicates that the subject has high tendency to fall[16,17]. In the current research, it was found that the TUG test had mean value above the cutoff point, which is recommended as the risk of falls in the elderly, with strong correlation.

Although SAM-Br is a specific scale to be used in elderly patients with dementia, TUG showed strong correlation with it, and it can be used as an important tool for the evaluation of elderly patients with dementia.

Berry et al.[18], carried out a systematic review on the TUG test as a tool for predicting falls, since the present test was developed to assess functional mobility, and concluded that the TUG test needs a test or tool that can revalidate it to indicate this risk of falls, and as cognitive decline as an intrinsic risk factor is well established in literature, the TUG test can be applied for this purpose[18].

In a study with fragile elderly people without cognitive decline, Clegg et al.[19], used TUG as an indirect tool to estimate muscle strength to stratify training volume and training levels in physiotherapy sessions, demonstrating a new potential for this test, which could be extrapolated to the elderly population with AD[19].

Significant correlation was observed between high results in SAM-Br and low in TUG. The mean value in SAM-Br can be explained by the fact that the majority of individuals in the sample had moderate degree of AD and the lower the degree of the disease, the greater the individual's mobility. Thus, individuals with AD in our sample still had good mobility. Data found here are in agreement with those of Woellner et al.[20], who studied 20 elderly patients and concluded that long time in TUG performance the low score on the Performance Oriented Mobility Assessment (POMA), a test used to assess functional mobility, indicate functional mobility with decreased performance in patients with AD, that is, there is greater predisposition to falls in those with increased score on the TUG test and decreased on the POMA test[20].

However, the current study revealed that, when comparing balance and propensity to fall (TUG) and mobility (SAM-Br) tests, TUG proved to be much more sensitive than SAM-Br.

One of the limitations of this study was the number of elderly patients with AD assessed. A significant number of individuals were invited to participate in the study, but did not attend assessments with their caregivers (formal or informal) due to difficulties in moving from their homes to the place where the research took place.

In the present study, the types of medication used by patients in the sample were also not evaluated, and whether they could interfere with the

functional capacity, mobility and risk of falling or even the fear of falling, as well as issues related to regular physical exercise (dose, intensity) that could influence such results. It is suggested that in further studies, such variables are considered.

CONCLUSION

Elderly patients with Alzheimer's disease have decreased functional capacity, mobility and risk of falls associated with the disease progression. SAM-Br and TUG tools showed strong correlation with each other, and despite being a generic measure, TUG showed strong correlation with the advancement of AD, which can be a predictive test for the risk of falls in this population.

COMPLIANCE WITH ETHICAL STANDARDS

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Ethical approval
Ethical approval was obtained from the local Human Research Ethics Committee –Universidade Católica de Brasília and the protocol (no. 2.788.564) was written in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement
The authors have no conflict of interests to declare.

Author Contributions
Conceived and designed the experiments: HAP, JDMB. Performed the experiments: HAP, ASL. Analyzed the data: HAP. Contributed reagents/materials/analysis tools: HAP, ASL. Wrote the paper: HAP.

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Corresponding author
Hudson Azevedo Pinheiro
Rua 36 norte, Bloco 05, apartamento 401, Águas Claras, Brasília-DF, Brasil.
Zip postal: 71919-180
Email: hudsonap@gmail.com