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RESUMO

A Demência é caracterizada pelo declínio progressivo da memória e de outras funções cognitivas, que pode interferir com as atividades de vida diárias. Testes cognitivos são aplicados para avaliação do estado de demência e depressão. Objetivo: Este é um estudo piloto de avaliação cognitiva em pacientes acima de 50 anos. As escalas utilizadas foram Clinical Dementia Rate(CDR), Mini Mental Exame State (MMSE), Clock Drawing Test (CDT) e Geriatric Dementia Rate (GDS-15), Atividades Básicas de Vida (ABV) e Atividades Instrumentais de Vida Diária (AIVD). O estudo foi realizado num Centro de Cuidados Primários em Portugal. Análise estatística foi efetuada com SPSS. Resultado: 56 utentes participaram e a média de idade foi 70,4±8,1. Este estudo piloto mostra que o CDR é o teste que apresenta alteração cognitiva mais elevada, seguido do CDT e MM. O GDS apresenta-se como uma ferramenta importante para avaliação de depressão.

Palavras-chave: Demência; CDR; GDS; MMSE; CDT; AIVD.

ABSTRACT

Dementia is associated with memory decline and deficits in other cognitive functions, which interfere with activities of daily life. Cognitive tests can be applied to screen for dementia and depression. Objective: This is a pilot study of cognitive evaluation of patients 50 years or older. Tests used were Clinical Dementia Rate (CDR), Mini Mental State Examination (MMSE), Clock Drawing Test (CDT) Dementia and Geriatric Rate (GDS-15), Basic Activities of Life (ABV) and Instrumental Activities of Daily Living (IADL). The study was performed at a Center for Primary Health Care in Portugal. Statistical analysis was performed with SPSS. Results: 56 individuals participated and the mean age was 70.4 ± 8.1 This pilot study reveals that: CDR was the cognitive test that presents more alterations in patients' cognitive skills, followed by CDT and MM tests. GDS presents itself as an important tool in the assessment of depression.

Keywords: Dementia; CDR; GDS; MMSE; CDT; AIVD.

1. INTRODUCTION

Typically dementia is defined based on the criteria as set out in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV): in which symptoms must include memory decline and difficulties in at least one of the following cognitive abilities: 1 language; 2. Gnosia; 3. Praxia; 4. the ability to think abstractly make sound judgments, and plan and carry out complex tasks. The decline in cognitive capabilities thus registered must be sufficiently severe to interfere with daily life activities¹.

However, patients can often present characteristics that do not fit well in the diagnostic criteria for dementia, although they exhibit some cognitive manifestations. In this case, patients are termed as having mild cognitive impairment (MCI)².

Differential diagnosis of dementia should discern between Alzheimer's disease (AD), vascular dementia (VD), dementia with Lewy bodies (DLB) and frontotemporal dementia (FTD), Parkinson's disease (PD) with dementia, among other neuropathologies^{3,4}.

AD is a multifactorial disorder where many contributing factors have thus far been identified, with advancing age being the greatest risk factor. Other AD risk factors include family history, genetic makeup (APOE ϵ 4 gene), education, occurrence of cardiovascular disease, social and cognitive engagement also appear to contribute⁵.

Cognitive assessment is carried out by applying neuropsychological tests. The Clinical Dementia Rate (CDR) was used in the Washington University longitudinal cohort study of memory loss and patients were classified according to the severity of decline. Assessment involved a semi-structured interview of the client/patient and the caregiver and scored in a scale⁶

Others tests routinely used include the Mini Mental State Examination⁴, Clock Drawing Test (CDT). In these cases, not only is dementia severity assessed but also multiple cognitive domains, such as abstract thinking, semantic knowledge, executive functioning, and visuospatial construction as well as depression. The success of CDT in assessing dementia has been well established⁷.

The tests that evaluate the functional capacity of the elderly are known as daily life activities and are subdivided into: basic activities of daily living (BDL) and instrumental activities of daily living (IADL). The BDL's include activities related to self-care, including feeding, care for their personal hygiene, dressing, mobilize and maintain sphincter control. The second indicates the capabilities of the individual to have an independent life in the community where he lives: preparing meals, making purchases, using transport, housekeeping, telephone use, manage their own finances and take and take care of their own medication^{8,9}.

The Geriatric Depression Scale (GDS) is composed of a total of 15 questions, and each has a unit value. Cutoff points adopted in the original work are: 0-5 points, including the value 5, the patient is classified "no depression" and 5 points above the patient is classified "depression." This test may offer added value in the primary care detection of late-life depression^{10,11}.

The aim of this study is to apply a battery of distinct cognitive tests to a pilot study group in Portugal, in a population 50 years old or more, and to compare the putative dementia diagnosis obtained for each test. Data will also be crossed with epidemiological and clinical information.

2. METHODOLOGY

2.1 Methods

Data used in the preparation of this article were obtained from the Centro de Biologia Celular (CBC) / Universidade de Aveiro database. This is a longitudinal, observational trial taking place in Portugal, in which subjects with normal cognition, amnesic MCI, and mild AD are followed up with periodic cognitive tests and subsequently fluid biomarkers evaluation. Here we present a Pilot study of the cognitive tests applied to a group aged 50 old or more. In addition to cognitive tests, epidemiological and clinical data were also collected.

2.2 Cognitive Evaluation

Cognitive functions were measured in all participants using the Clinical Dementia Rate (CDR), Mini Mental Exam State (MMSE), Clock Drawing Test (CDT), Geriatric Depression Scale (GDS), Basic Activities Life (BAL) and Instrumental Activities Daily Life (IADL). Criteria and set points applied had previously been validated for the Portuguese population from work carried out by the Study Group on Aging and Dementia (2008), Second edition.

2.3 Subjects

Fifty-six patients who had subjective complaints of memory disorder or other changes of cognition were evaluated. Exclusion criteria were chemotherapy or radiotherapy treatment or the previous diagnosis of psychiatric disorders, such as bipolar or schizophrenic conditions. Patients were seen at a Health Primary Care Center in Portugal.

2.4 Statistical Analysis

Statistical analysis was performed using SPSS version 15.0. The group was characterized based on data of epidemiologic and clinical nature, as well as on cognitive functions.

2.5 Ethic Aspects

Ethic principles were respected. The informed consent was presented to and signed by participants or their legal representatives. This project was approved by the Committee's Ethic of the Regional Health Administration Center – Coimbra – Portugal.

3. RESULTS

Fifty six patients were evaluated, with a mean age of 70,3±6.9 (range 55-87).

Table 1 presents the relevant epidemiologic and clinical characteristics and table 2 the values of the cognitive tests stratified by sex: Male: n= 10 (17,9%); Female: n= 46 (82,1%).

Table 1. Baseline characteristics of patients in the study group.

Variable	Male (n = 10) (17,9%)	Female (n = 46) (82,1%)	Total (n = 56) (100%)
Age	70,4 ± 8,12	69,4 ± 6,74	70,32 ± 6,88
Education (1)	1 (1,8%)	12 (21,4%)	13 (23,2%)
Education (2)	9 (16%)	31 (55,4%)	40 (71,4%)
Education (3)	0 (0%)	3 (5,4%)	3 (5,4%)
DM	3 (5,4%)	5 (8,9%)	8 (14,3%)
HT	6 (10,7%)	34 (60,7%)	40 (71,4%)
Hyperlipidemia	5 (8,9%)	27 (48,2%)	32 (57,1%)

Education (1): 0-2 years of study; Education (2): 3-6 years of study; Education (3): above 7 years of study;
DM: Diabetes Mellitus; HT: hypertension;

From table 1 we can draw several conclusions. With respect to gender, 4,6 times more women were evaluated and the mean age diminished by 1 year for the women. By collecting clinical data it was possible to deduce that a significant number of individuals suffer from hypertension (71,4%) and approximately half of the study group (57,1%) from hyperlipidemia. Individuals with diabetes mellitus were less so; 3 men and 5 women.

In the CDR scale, 0 indicated normal function; 1.0 indicated significant loss almost always a clear correlation with dementia, and a transition level, 0.5 (termed questionable dementia), indicated some very mild loss that may or may not be classified as dementia, 2 indicated loss of moderate cognitive

function and 3 indicated severe loss¹². This study considered cognitive dysfunction, when $CDR \geq 0,5$ ¹³. Table 2 shows the CDR results.

Table 2. Clinical Dementia Rate in Patients Primary Care above 50 years.

Clinical Dementia Rate (CDR)	N	%
Normal (CDR=0)	33	58,9
Suspect (CDR=0,5)	8	14,3
Mild (CDR=1)	6	10,7
Moderate (CDR=2)	9	16,1
Severe (CDR=3)	0	0,0
Total	56	100%

More than half of the study group, 58,9% (table 2) presented normal cognitive capacities based on the CDR. Furthermore, no severe cases were detected and the remaining participants fell into the classes of suspect, mild or moderate cases. Subsequently this data is presented as two groups; normal (CDR=0 - 33 individuals) and cognitive dysfunction ($CDR \geq 0,5$ - 23 individuals).

In Table 3 the results of individual tests used in this study are presented. As mentioned above, with respect to the CDR, 41.1% of the study group revealed cognitive dysfunction. This value fell dramatically to 12.5% when the MMSE test was applied. However a much higher value, corresponding to 14 (25%) patients with cognitive dysfunction, was obtained with respect to the CDT. In this case difficulties were prevalent and appear to be closely associated with educational level; this will be further pursued. Of particular note is the fact that 15 patients (26.8%) also exhibited depression symptoms. The majority of the study group was active with 5.4% scoring dependence on the BAL scale and 21.3% on the IADL scale.

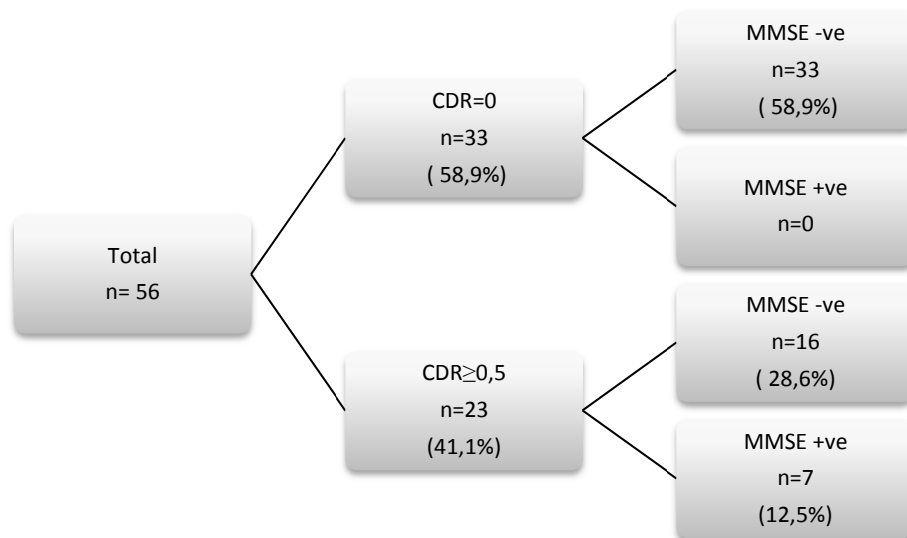
Table 3. Results of the cognitive tests applied to the study group.

Variable		Male n = 10 (17,9%)	Female n = 46 (82,1%)	Total n = 56 (100%)
CDR	Normal	7 12,5%	26 46,4%	33 58,9%
	Cognitive Dysfunction	3 5,4%	20 35,7%	23 41,1%
MMSE	Normal	9 16%	40 71,4%	49 87,4%
	Cognitive Dysfunction	1 1,8%	6 10,7%	7 12,5%
CDT*	Normal	9 16%	29 51,8%	38 67,8%
	Cognitive Dysfunction	1 1,8%	13 23,2%	14 25%
GDS	Normal	9 16%	32 57,1%	41 73,1%
	Depression Symptoms	1 1,8%	14 25%	15 26,8%
BAL	Normal	9 16%	44 78,5%	53 94,5%
	Dependent	1 1,8%	2 3,6%	3 5,4%
IADL	Normal	6 10,7%	8 14,3%	14 25,0%
	Dependent	4 7,1%	8 14,2%	12 21,3%

CDR: Clinical Dementia Rate; MMSE: Minimental; CDT: Clock Drawing Test; GDS= Geriatric Depression Scale; Kartz: BAL: Basic Activities Life; IADL: Instrumental Activities Diary Life.

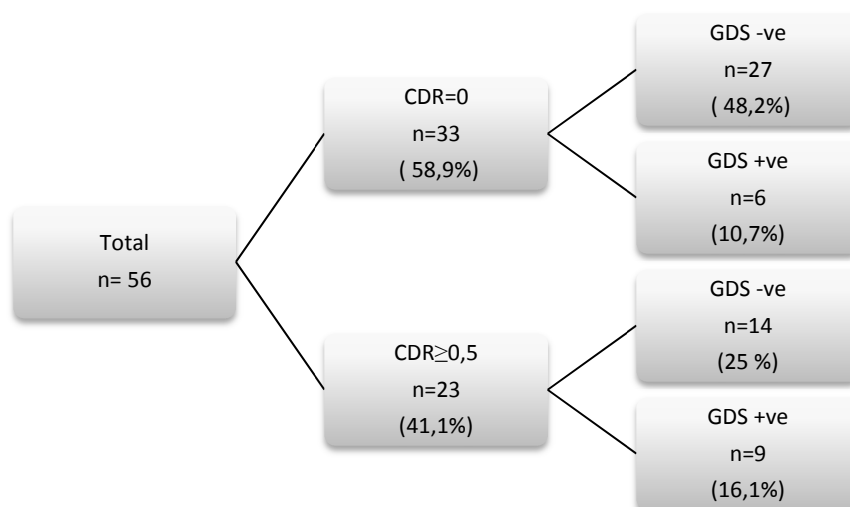
* Four patients no Drawing.

Given the reported efficacy of the CDR in diagnosing dementia, some of the different tests applied were correlated with the former (Figure 1 e 2).

Figure 1. Comparison of the CDR results with the MM cognitive tests.

CDR: Clinical Dementia Rate; MMSE: Minimental; +ve = positive; -ve= negative

Comparing the results obtained with the CDR and MMSE, again it is evident that the CDR is more sensitive. In fact the CDR tests identified 23 cases that warrant following up in terms of possible cognitive dysfunction, whereas the MM only identified 7 such cases. It is particularly reassuring that the 33 negative cases for CDR were also negative using the MMSE. There is a strong association between CDR and MM: Cramér coefficient is 73%. As already mentioned above 26.8% of patients revealed depression symptoms, hence this aspect was also considered with respect to the CDR test, figure 2.

Figure 2. Comparison of the CDR results with the GDS tests.

CDR: Clinical Dementia Rate; GDS: Geriatric Depression Scale; +ve = positive; -ve= negative

The correlation of the CDR with the GDS test warrants consideration. Of the 33 CDR negative patients, 6 were GDS positive. In a similar manner of the 23 CDR positive cases, 9 revealed symptoms associated with depression. Thus GDS positive cases were obtained in both groups, albeit a slightly higher number in those putative MCI cases.

4. DISCUSSION

This study was undertaken to compare distinct cognitive test in a pilot study in the Portuguese population. Data was also crossed with epidemiologic and clinical characteristics.

Of all the tests implemented, the CDR revealed more cognitive changes⁸. Previous work¹³ classify a CDR = 0.5 as MCI, applying this to our study group, a total of 8 patients (14.3%) are possible MCI's. However by grouping all individuals exhibiting even the mildest cognitive deficit this test resulted in 23 individuals who should be followed up. Of all the tests we applied the CDR presented the greatest ability to detect small changes in cognition.

The MMSE assesses the same cognitive functions assessed by the CDR, with exception of the social functions performed. Additionally, it assesses visual and constructive praxis patients not evaluated by CDR. However from the 23 patients (41.1%) with changes in CDR, only 7 (12,5%) also exhibited changes in the MMSE. Thus, there were 16 patients (28,6%) who had altered CDR but that were MMSE normal. The MMSE estimates the average cognitive impairment of patients as considerably less pronounced than the CDR. MMSE is, thus, not an instrument that would be recommended, on its own, for the identification of mild cognitive impairment¹⁴. Additionally there were no cases of CDR negative and MMSE positive, rather supporting that the MMSE identifies a subgroup, which is also CDR positive.

Regarding the CDT, in our study 52 individuals agreed to designing the clock, difficulties in drawing the clock may be closely related with the educational level. This will warrant further evaluation. Of the 14 (25%) patients who showed abnormal CDT, 12 also showed CDR \geq 0,5. The disadvantage of this test is that it is unable to detect changes when cognitive impairment is still

mild or moderate. However previous studies have shown it to be a good test to evaluate the evolution of dementia in patients with moderate to severe impairment¹⁵.

When considering the GDS data a different and distinct distribution is observed. In our study, we found that a total of 15 patients (26.8% of total cases) with GDS > 5 points. Of these 15 patients, 6 did not exhibit cognitive deficits, while 9 (60%, considering n=15), show changes in some cognitive characteristic. On the one hand these results speak to the specificity of the GDS tests, given that GDS positive can be CDR negative or positive. However one should also consider that depression and dementia diagnosis may overlap, since changes in cognitive function may be present in patients with Major Depression. Recently, it has been proposed that Major Depression may represent a risk factor for developing AD, with patients that suffer from lifetime depression having a twofold increased risk of developing AD and exhibiting more AD-related neuropathology^{10,16}.

Regarding the IALD and BAL, there was more impairment in activities in society. Compared to cognitive impairment in our study, of the 23 people who had CDR \geq 0.5, 9 (39.1%) they already had some degree of dependence. As for the BAL, only 3 (5.4%) patients had some degree of dependence. The importance of performing both cognitive assessment and the activities of daily living is that the combination of these two tests permits evaluating how cognitive impairment interferes with the social life of the patient. Unfortunately, family members only perceive the signs and symptoms of dementia when the activities of daily life are already severely compromised. Also, combining MCI with IADL impairment may significantly improve the prediction of future dementia and should be taken in consideration¹⁷.

5. CONCLUSION

This pilot study reveals that the CDR was the cognitive test that detects more alterations in patients' cognitive skills, followed by the CDT and MMSE tests. GDS presents itself as an important tool in the assessment of depression

and the later does not necessarily correlate with dementia. Finally the IADL change is faster than the BAL. However, we should have in consideration that the small sample number can be a limitation of the study. The cognitive tests used in this pilot study will be applied to a larger population in order to permit relevant statistical evaluation.

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