Arq Neuropsiquiatr 2005;63(2-A):207-212

PREVALENCE OF COGNITIVE AND FUNCTIONAL IMPAIRMENT IN COMMUNITY-DWELLING ELDERLY

Importance of evaluating activities of daily living

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ABSTRACT - The study aims to evaluate the prevalence of cognitive/functional impairment in community-dwelling elderly above 60 years of age (n= 870; m=297, f=573) and the relationship of age, gender, and functional impairment with cognitive impairment using Mini-Mental State Examination (MMSE) and Pfeffer Functional Activities Questionnaire (PFAQ). Chi-square and Student´s tests were used to compare cognitive and functional deficits. Linear regression assessed MMSE/PFAQ relationship. Stratified analysis assessed confounding factors. Logistic regression assessed the relationship among age/gender/functional status with cognitive impairment ($p<0.05$). Prevalence of cognitive/functional impairment was 19.2%. Functional and cognitive impairment are negatively correlated (Pearson= 0.737), despite educational level (illiterate/literate: OR=15.60; p=0/OR = 16.40; p=0). Age and gender (female) were associated with cognitive/functional impairment. Functional impairment is highly correlated to cognitive impairment. Family/health professionals may recognize functional impairment more easily than cognitive impairment. Thus, the use in combination of cognitive and functional scales is important when screening for dementia.

KEY WORDS: functional status, cognitive impairment, epidemiology, prevalence, risk factors

Prevalência de comprometimento cognitivo e funcional em idosos residentes em uma comunidade: importância da avaliação das atividades de vida diária

RESUMO - O estudo objetivou avaliar a prevalência de comprometimento cognitivo/funcional em idosos acima de 60 anos (n= 870; m=297, f=573) residentes na comunidade e avaliar a relação entre idade, gênero e comprometimento funcional com o comprometimento cognitivo. Utilizou-se o Mini-Exame do Estado Mental (MEEM) e o Questionário de Atividades Funcionais de Pfeffer (PFAQ). Comparou-se relação de deficits cognitivo e funcional (MEEM e PFAQ). A prevalência de comprometimento cognitivo/funcional foi 19,2%. Há relação entre comprometimento cognitivo e funcional (Pearson=0,737), independente do nível educacional (analfabetos/alfabetizados: OR=15,60; p=0/ OR = 16,40; p=0). Idade e gênero são fatores associados a comprometimento cognitivo/funcional ($p<0,05$). A prevalência de comprometimento cognitivo/funcional é mais alta que a encontrada em outro estudo brasileiro. Idade, gênero feminino e comprometimento funcional estão diretamente associados a comprometimento cognitivo. O reconhecimento de comprometimento funcional pode ser mais fácil por familiares/profissionais de saúde. Isso reforça a idéia do uso combinado de escalas em rastreamentos de demência.

PALAVRAS-CHAVE: Status funcional, comprometimento cognitivo, epidemiologia, prevalência, fatores de risco

Illiteracy and poor schooling is still a major problem in developing countries. As life expectancy is increasing steadily, these countries have many illiterate elderly at risk of developing dementia. In fact, illiteracy has been considered a risk factor for dementia, along with age, female gender, and living

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Received 2 August 2004, received in final form 15 October 2004. Accept 1 December 2004.

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in rural communities[1-4]. Studies in Brazil, Mexico and China were able to recruit 35.6%, 36,87%, and 60.6% illiterate people in their sample, respectively, showing that this portion of the population must be taken into account when dementia is discussed in developing countries[1-6]. Few Latin American studies have been conducted focusing on the prevalence of dementia in the community. In Brazil, there is only one thorough study in an urban community in São Paulo State, which assessed cognitive and functional features in the first phase and later on ascertained the prevalence of dementia[5]. The Mini-Mental State Examination (MMSE)[7] is the most widely used instrument to screen for cognitive deficit in epidemiological studies. The influence of cognitive and noncognitive variables, such as education, age, gender and health-related characteristics have been a subject of many studies[6,8-11]. Brazilian studies have attempted to set different cut-off scores according to schooling so that the screening for dementia in people with lower education can be more accurate and sensitive[5,12-14]. The cut-off scores of 13 for illiterates, 18 for 1-8 years of education and 26 for more than 9 years of education were first proposed to screen for dementia but they are now considered to provide a low sensitivity[14]. The cut-off scores proposed by Herrera et al.[5] were as follows: 19 for illiterates, 23 for those with 1-3 years of education, 24 for 4-7 years of schooling and 28 for subjects with more than 7 years of education. In that study, 34.35% subjects presented scores below the education adjusted cut-off scores. Illiterate comprised 42.78% of this below score sample and 30.45 % were within 1-3 years of education.

Cognitive impairment has been underdiagnosed in primary care settings even in developed countries[15]. Declines in functional ability have been consistently related to cognition[16-18]. Indeed, the diagnosis of dementia implies that the patient must have a functional decline besides the cognitive deficit, and functional decline is an important hallmark of Alzheimer´s disease. Also, cognitively impaired subjects without dementia have more functional impairment than people with intact cognition[16].

The Pfeffer Functional Activities Questionnaire (PFAQ)[19] is one of the instruments applied to assess activities of daily living in community-dwelling elderly. The performance in all activities is assessed by 10 questions with the scoring ranging from 0-3, according to increasing severity. The maximum possible score is 30. Subjects who score higher than 5 are considered to have functional impairment. Since it is still difficult to examine people with low educational level in order to ascertain cognitive impairment, the impairment/decline in activities of daily living (ADL) may provide a more sensitive and straightforward measure of suspicion of dementia for family and primary care health personnel. The use in combination of functional and cognitive measures provide more sensitivity to screen for suspected dementia, especially in samples with different educational and economic background, as is the case in Brazil[20]. Information regarding the cognitive difficulties and their relation with cognitive-related activities is scarce, providing large false negative figures in epidemiological surveys[21]. Depending on the source of information, different prevalence rates of cognitive impairment/dementia can be obtained, contributing to various and conflicting results in each study[4,21]. Therefore, increasing functional impairment is consistently associated with increasing risk of cognitive symptoms[21], and it is also highly predictive of death in a 2-year follow-up[22].

The present study aims at reporting data about elderly living at Santo Antonio de Pádua, Rio de Janeiro, regarding prevalence of cognitive and functional impairment. A previous publication showed that 16.51% of 341 community-dwelling elderly were below the MMSE cut-off scores according to schooling[23]. Illiterate who scored below cut-off points were 12.10%, whereas 20.73% literate were considered to have cognitive impairment. We now report on a larger sample of this town, also using the PFAQ in order to assess ADL in cognitively impaired subjects. Our objectives are twofold: 1. to evaluate the prevalence of cognitive and functional impairment in community-dwelling elderly, using MMSE cut-off scores according to education; 2. to assess the relationship of age, functional impairment and gender with cognitive impairment.

METHOD

Sample design and instruments – According to the 2000 national census, there are 38,692 inhabitants in Santo Antonio de Pádua/RJ (male-19,241; female-19,451), 29,415 living in the urban area and 9,277 in the rural area. The population above 60 years of age comprised 4,614 people (11.92% of the total population). Given these figures, the sample size needed to screen for dementia in those aged 60 years or more is 91-155 patients (95%-99% Confidence interval-CI), considering a putative prevalence of 7.1%[5]. Elderly above 60 of age (n= 870; m=283, f=518), mean age = 72.14 + (7.26), living in nine

sections of Santo Antônio de Pádua, Rio de Janeiro, were evaluated with MMSE and PFAQ by consecutive inclusion since may/2000 in an observational cross-sectional study. Three hundred and forty one subjects were evaluated in the community and were previously described in a recently published paper[23]. All the other subjects (n=529) were evaluated at a public neurology outpatient unit, where they had gone to because of various noncognitive clinical complaints or just as caregivers of other subjects. We decided to join all the available data into one group because both groups share the same demographic, social, educational and age characteristics (Table 1). The subjects were further subdivided into groups according to schooling with respective MMSE cut-off scores, as follows: illiterate, MMSE-18; 1-8 years of schooling, MMSE-18; 9-11 years of schooling, MMSE- 24; above 12 years of schooling, MMSE-27. Also, a score above 5 in the PFAQ included the subjects into the group considered at risk for dementia[19].

A neurologist (EMRB) and a team of psychologists living in Santo Antônio de Pádua were trained to assess the subjects with the MMSE and PFAQ.

Statistical analysis – Prevalence rates of cognitive and functional impairment were obtained for the total sample and for the above 65-year-old subjects. Subjects with MMSE scores below the education adjusted cut-off and with PFAQ score above 5 were considered cognitively or functionally impaired. In order to compare the presence or absence of cognitive and functional deficits we used Chi-square for nominal variables and t test for numerical variables. Linear regression was used to assess the relationship between MMSE and PFAQ. Stratified analysis was also performed to assess confounding factors. The relationship among age, functional status and gender with cognitive impairment was assessed with logistic regression for education adjusted MMSE cut-off scores criteria ($p<0.05$).

The study was approved by the local Ethics Committee. All subjects agreed on participating in the research and signed the informed consent form.

Table 1. General demographics of the total sample according to age, gender and schooling.

		Age		
		60 to < 65	≥ 65	Total
Schooling	Illiterate	43	306	349
	1-8 yrs	70	395	465
	9-11 yrs	6	40	46
	>12 yrs	2	8	10
Gender	Male	50	247	297
	Female	71	502	573
Total		121	749	870

RESULTS

Table 2 shows the distribution of MMSE and PFAQ scores according to schooling.

Cognitive and functional impairment was observed in 19.2% of the total sample (141/735). Functional impairment without cognitive decline was found in 5.3% (n=39) subjects. The prevalence rate of cognitive and functional impairment in the sample above 65 years of age was 20.0% (126/630). Among illiterate subjects above 65 years of age, prevalence of cognitive and functional impairment was 28.6% (n=71/248). There is a close correlation among functional and cognitive impairment (Pearson= 0.737). The linear regression between PFAQ and MMSE shows R2 of 54.3% (Table 3).

The stratified analysis showed that functional and cognitive impairment maintained a high correlation when the sample was adjusted for illiteracy. The presence of illiteracy shows an Odds Ratio (OR) of 15.6 (95%CI-6.0-40.0; p=0), whereas being literate shows an OR of 16.4 (95%CI- 9.5-28.4; p=0). Thus, illiteracy is not a confounding factor in this sample.

Table 2. MMSE & PFAQ scores according to schooling.

		MMSE			PFAQ		
		N	Mean	95%CI	N	Mean	95%CI
Schooling	Illiterate	349	16.73	16.22-17.25	280	6.07	4.97-7.02
	1-8 yrs	465	22.13	21.65-22.62	408	3.97	3.26-4.68
	9-11 yrs	46	26.77	25.65-27.88	40	2.35	0.46-4.24
	>12 yrs	10	26.90	23.89-29.91	7	3.00	4.34-10.34
Total		870	20.27	19.86-20.67	735	4.67	4.09-5.24

95% CI, 95% confidence interval

Table 3. Distribution of subjects with and without cognitive impairment by gender and schooling.

		Not impaired N (%)	Impaired N (%)	Total N (%)
Gender	Male	219 (40.4)	78 (23.8)	297 (34.1)
	Female	323 (59.6)	250 (76.2)	573 (65.9)
Schooling	Illiterate	130 (24.0)	219 (66.8)	349 (40.1)
	1-8 yrs	364 (67.2)	101 (30.8)	465 (53.4)
	9-11 yrs	40 (7.4)	6 (1.8)	46 (5.3)
	>12 yrs	8 (1.5)	2 (0.6)	10 (1.1)
Total		542	328	870

Table 4 shows the (OR) among cognitive impairment and age, gender and functional impairment for the education adjusted sample. Age, female gender, and functional impairment are highly correlated to cognitive impairment in our sample.

DISCUSSION

The prevalence of cognitive and functional impairment in our data is 19.2%. As for the different educational levels, 36.07% illiterate and 23.34% lower grade subjects are thought to be impaired using MMSE cut off scores according to schooling. Our previous publication showed that 16.51% of our sample was cognitively impaired by the less sensitive cut-off MMSE scores according to education[12,23]. However, this former sample comprised only elderly above 65 years of age. The present data show a prevalence rate of 20% for cognitive and functional impairment in the sample above 65 years. Impaired illiterate subjects constituted 28.6% of the sample.

A Chinese study recruited 398 subjects (366 of which went on to the second phase of the study) out of 2015 community elderly in Taiwan using cut-off scores of less than 16 for illiterate, less than 21 for grade-school literate and less than 24 for junior-high-school and higher education literate. This means that 19.75% of the subjects had cognitive impairment. The study of the Hispanic population[6] used a cut-off score of 18 and found that most (86.8%) illiterate subjects were within the range of cognitive impairment, in comparison to 24.8% of those who were literate. Their overall prevalence of cognitive impairment was 36.7%.

Regarding only cognitive impairment, the Brazilian study[5] showed that 34.35% of the subjects presented scores below the education adjusted cut-off scores, with an overall prevalence of 14.1%. Illiterate comprised 42.78% of this below score sample and 30.45 % of the 1-3 years of education group. Finally, the prevalence rate of dementia in the Chinese study was 3.7%, higher than other Chinese studies and lower than the Brazilian study (7.1%).

The figures found in the Chinese and Hispanic studies are similar to ours, and higher than the rate found in the Brazilian study. We considered 60 years as the minimum age to be enrolled in the study, whereas the other studies used 65 years of age as one of the inclusion criteria. However, our prevalence rates in subjects above 65 years are similar to the other studies. Since this is still the first phase of the epidemiologic survey carried out in

Table 4. Odds Ratio (OR) for cognitive impairment according to schooling assessed by logistic regression model.

Variables	OR	95% CI	P
Female	3.02	2.19-4.73	0.000
PFAQ (dichotomous)	17.49	10.60-28.87	0.000
Age (continous)	1.05	1.02-1.08	0.001
Illiterate (dichotomous)	8.91	5.87-13.53	0.000

95%CI, 95% confidence interval.

the town, the second phase will be able to process data both from the senile and the presenile groups at risk for dementia.

Age, functional impairment and female gender were positively correlated to cognitive impairment in this sample (Table 4). Several studies have found an inverse association between low educational level and dementia/cognitive impairment[1,24-25]. The Brazilian epidemiologic study[5] found dementia in 16.6% subjects with lower education, 12.2% of whom were illiterate. Our data do not permit such an association, since the population screened so far in Santo Antonio de Pádua does not have enough subjects with more years of education. However, we also found higher figures regarding the association between low education and cognitive impairment (66% for illiterates). Age was directly associated with cognitive decline (Table 4). Since the mean age of the sample was 72.34 (sd=7.47), younger than in other studies, and 13.90% of our subjects were below 65 years of age, the comparison with Herrera´s[5] study can show a lesser prevalence of dementia at the second phase of this study.

Dependence in ADL and cognitive impairment are not only signs of impending dementia but can predict death as independent factor in a 2-year follow-up as well (RR for ADL- 3.0; RR for cognition-1.9)[25-26]. Our results show that functional impairment presented a high correlation to the presence of cognitive impairment, despite the educational level. The stratified analysis showed that the functional impairment was correlated to cognitive impairment both for literate and illiterate subjects. However, illiteracy failed to show its modifying effect on cognitive impairment in our sample. This may be explained because of a bias in our data collection, since we were not able to quantify the exact duration of schooling for each subject. Thus, subjects with 1-3 years of schooling may be "functionally illiterate", meaning that they actually behave cognitively as illiterate with the exception that they are able to write and read very simple sentences. We have established a cut-off score of 18 for 1-8 years of schooling in order to solve this issue.

A study in Puerto Rico found overall prevalence rates for cognitive and functional impairment in the elderly of 18.5% and 18.4%, respectively. They also found functional impairment to be associated to cognitive dysfunction (OR- 2.45, 95%CI= 1.84-3.27)[27]. Another study showed that the risk of incident ADL disability over a 7-year period in Hispanic elderly is higher in those with impaired cognition (RR 1.58 (955Ci- 1.18-2.12)[28]. Our data confirm the finding that functional impairment is negatively associated with cognitive status and that the prevalence of dependence in ADL is higher among cognitively impaired subjects[18,17,16].

Many studies have tried to adjust new cut-off scores for the MMSE according to educational level[5,12-14]. However, lowering the threshold on any instrument increases the risk of false negatives[6]. Although different education adjusted MMSE cut-off scores are an important move toward recognizing cognitive impairment within large samples in the community in developing countries where illiteracy is still a problem, our data suggest that screening for functional impairment may strengthen the suspicion of dementia. This approach could improve the early diagnosis of dementia[20], since attention to dysfunction in ADL is easier to recognize than cognitive impairment by the family and people who deal with elderly. This high correlation between functional and cognitive impairment may mean in clinical terms that risk or suspicion of dementia may be better assessed by functional screening rather than by MMSE scores in low education populations, in the first place.

In conclusion, the prevalence rates of cognitive and functional impairment in Santo Antonio de Pádua are similar to those found in Hispanic and Chinese studies, and higher than those found in Brazil. Age, functional impairment and female gender are directly associated with cognitive impairment when MMSE cut-off scores are adjusted for years of education. Functional impairment is highly correlated to cognitive impairment. This may be an easier feature to be recognized by the family and health professionals to screen for dementia, and strengthens the need to assess both cognitive and functional status in combination.

REFERENCES

1. Lin R-T, Lai C-L, Tai C-T, et al. Prevalence and subtypes of dementia in southern Taiwan: impact of age, sex, education, and urbanization. J Neurol Sci 1998;160:67-75.
2. Hoffman A, Rocca WA, Brayne C, et al. The prevalence of dementia in Europe: a collaborative study of 1980-1990 findings. Int J Epidemiol 1991;20:736-748.
3. Park JH, Ha JC. Cognitive impairment among elderly in a Korean rural community. Acta Psychiatr Scand 1988;77:52-77.
4. Lopes MA, Bottino CMC. Prevalência de demência em diversas regiões do mundo: análise dos estudos epidemiológicos de 1994 a 2000. Arq. Neuropsiquiatr 2002;60:61-69.
5. Herrera E, Caramelli P, Silveira ASB, et al. Epidemiologic survey of dementia in a community-dwelling brazilian population. Alzheim Dis Ass Disord 2002;16:103-108.
6. Black AS, Espino DV, Mahurin R, et al. The influence of noncognitive factors on the mini-mental sate examination in older Mexican-American: findings from the Hispanic EPESE. J Clin Epidemiol 1999; 52:1095-1102.

7. Folstein MF, Folstein SE, McHugh PR. mini-mental state: a practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 1975;12:189-198.
8. Crum RM, Anthony JC, Basset SS, et al. Population-based norms for the mini-mental state examination by age and educational level. JAMA 1993;269:2386-2391.
9. Launer LJ, Dinkgreve MAHM, Jonker C, et al. Are age and education independent correlates of the mini-mental state exame performance of community-dwelling elderly? J Gerontol Psychol Sci 1993;48:271-277.
10. Dufouil C, Clayton D, Brayne C, et al. Population norms for the MMSE in the very old: estimates based on longitudinal data. Neurology 2000;55:1609-1613.
11. Bravo G, Hébert R. Age-and education-specific reference values for the mini-mental and modified mini-mental state examinations derived from a non-demented elderly population. Int J Geriat Psychiatry 1997;12:1008-1018.
12. Bertolucci PHF, Brucki SM, Campacci SR, et al. O mini-exame do estado mental em uma população geral. Arq Neuropsiquiatr 1994;52:1-7.
13. Almeida O. Mini exame do estado mental e o diagnóstico de demência no Brasil. Arq. Neuropsiquiatr 1998;56:605-612.
14. Brucki SMD, Nitrini R, Caramelli P, et al. Sugestões para o uso do mini-exame do estado mental no Brasil. Arq Neuropsiquiatr 2003;61:777-781.
15. Löppönen M, Räihä I, Isoaho R, et al. Diagnosing cognitive impairment and dementia in primary health care- a more active approach is needed. Age Ageing 2003;32:606-612.
16. Gill Tm, Richardson ED, Tinetti ME. Evaluating risk of dependence in activities of daily living among community-living older adults with mild to moderate cognitive impairment. J Gerontol 1995;50:235-241.
17. Béland F, Zunzunegui MV. Predictors of functional status in older people living at home. Age Ageing 999;28:153-159.
18. Agüero-Torres H, Thomas VS, Winblad B, et al. The impact of somatic and cognitive disorders on the functional status of the elderly. J Clin Epidemiol 2002;55:1007-1012.
19. Pfeffer RJ, Kurosaki T, Harrah CH, et al. Measurement of functional activities in older adults in the community. J Gerontol 1982;37:323-329.
20. Bustamante SEZ, Bottino CMC, Lopes MA, et al. Instrumentos combinados na avaliação de demência em idosos. Arq Neuropsiquiatr 2003;61:601-606.
21. Pressley JC, Trott C, Tang M, et al. Dementia in community-dwelling elderly patients: a comparison of survey data, medicare claims, cognitive screening, reported symptoms, and activity limitations. J Clin Epidemiol 2003;56:896-905.
22. Ramos LR, Simoes EJ, Albert MS. Dependence in activities of daily living and cognitive impairment strongly predicted mortality in older urban residents in Brazil: a 2-year follow-up. J Am Geriatr Soc 2001;49:1168-1175.
23. Laks J, Batista EMR, Guilherme ERL, et al. O Mini exame do estado mental em idosos de uma comunidade: dados parciais de Santo Antônio de Pádua, RJ. Arq Neuropsiquiatr 2003;61:782-785.
24. Zhang M, Katzman R, Salmon D, et al. The prevalence of dementia and Alzheimer´s disease in Shanghai, China: impact of age, gender, and education. Ann Neurol 1990;27:428-437.
25. Rocca WA, Bonaiuto S, Luciani P, et al. Prevalence of clinically diagnosed Alzheimer disease and other dementing disorders: a door-to-door survey in Appignano, Macerata province, Italy. Neurology 1990;40:626-631.
26. Landi F, Onder G, Catell C, et al. Functional status and clinical correlates in cognitively impaired community-living older people. J Geriatr Psychiatry Neurol 2001;14:21-27.
27. Alonso-Serra ML, Conde JG, Andino RM, et al. Prevalence of cognitive and functional impairment in an elderly Puerto Rican population. P R Health Sci 1995;14:279-283.
28. Raji MA, Al Snih S, Ray LA, et al. Cognitive status and incident disability in older Mexican Americans: findings from the Hispanic established population for the epidemiological study of the elderly. Ethn Dis 2004;14:158-159.