Detection of Cognitive Impairment in the Population of Persons Older than 64 Years: First Phase of the Cuida'l Project

E. Limón Ramírez, J.M. Argimon Pallàs, J. Vila Doménech, T. Abos Pueyo, C. Cabezas Peña and E. Vinyoles Bargalló

Objective. To know the proportion of people with positive result in test.
Design. Cross sectional study in 53 health centers.
Setting. Primary care.
Participants. Aleatory sample of non-institutionalised, elder than 64 years patients attended in the 53 health centers.
Measurements. Variables: age, sex, civil status, and educational level. The detection of cognitive deterioration (CD) was carried out in primary care units with Folstein's Mini Mental Test (MMT) and the Isaacs Set-Test in case of illiteracy. Cut-off points 24 and 27 respectively. CD predictor variables analysis with logistic regression.
Main results. The tests were applied to 4,467 individuals (56.1% females). There were found as possible cases of CD 399 patients (72.2% with MMSE). Positive percentage was 7.78% (95% CI, 5.69%-10.99%) in males and 9.45% (95% CI, 7.31%-12.43%) in female, adjusting with indirect method, according to the 1996 Catalonia list of inhabitants. Significant predictor factors were found with the multivariate analyses: primary educational level in front of illiteracy (OR = 1.40, 95% CI, 1.13%-1.74%) and age-groups: 74-79 years, 75-79 years and y ≥ 80 years in front of < 70 years old (OR = 1,48, 95% CI, 1.02%-2.14%, OR = 2.29; 95% CI, 1.60%-3.28% and OR = 5,02; 95% CI, 3.59%-7.03% respectively).
Conclusions. The cognitive deterioration prevalence increases with age and it is less frequent in individuals with higher studies Using MMSE and Set-Test we found several possible cases of cognitive deterioration in our population.

Key words: Prediction. Screening. Cognitive deterioration. Dementia.

DETECCIÓN DEL DETERIORO COGNITIVO EN POBLACIÓN MAYOR DE 64 AÑOS: PRIMERA FASE DEL PROYECTO CUIDA'L

Objetivo. Estudiar la prevalencia de positivos a un test de detección de deterioro cognitivo (DC) en la población > 64 años de Cataluña y sus factores determinantes.
Diseño. Estudio transversal multicéntrico.
Ámbito. Cincuenta y tres centros de atención primaria.
Sujetos. Muestra aleatoria de 5.300 individuos (100 por centro) de población adscrita, no institucionalizada > 64 años.
Mediciones. La detección de DC se realizó en las consultas de atención primaria mediante el test Mini Mental State Examination de Folstein (MMSE), y el Set-test de Isaacs en caso de analfabetismo. Puntos de corte, < 24 (MMSE) o < 27 (Set-test). Análisis de variables predictoras (edad, sexo, estado civil y nivel de estudios) de posible DC mediante regresión logística.
Resultados. Se administró el test a 4.467 individuos (56,1%, mujeres). Se diagnosticaron como posibles casos de DC 399 pacientes (72,2% por MMSE). La prevalencia de positivos se estimó en 7,78% (IC del 95%, 5,69-10,99%) en varones y 9,45% (IC del 95%, 7,31-12,43%) en mujeres, ajustando por el método indirecto según el padrón de Cataluña de 1996. En el análisis multivariado resultaron factores predictores los estudios primarios respecto al analfabetismo (OR =1,40; IC del 95%, 1,13-1,74%) y los grupos de edad: 74-79 años, 75-79 años y ≥ 80 años respecto a los < 70 años (OR = 1,48; IC del 95%, 1,02-2,14%, OR: 2,29; IC del 95%: 1,60-3,28% y OR = 5,02; IC del 95%, 3,59-7,03%, respectivamente).
Conclusiones. La prevalencia de posible deterioro cognitivo aumenta con la edad y es menos frecuente en los individuos con mayor nivel de estudios. Mediante el MMSE y Set-test se detecta un gran número de posibles DC en la población.

Palabras clave: Predicción. Cribado. Deterioro cognitivo. Demencia.

Spanish version available at
www.atencionprimaria.com/83.067

A commentary follow this article (pág. 13)

Introduction

Of the health problems that most often affect the population of older people, cognitive disorders in behavior and dementia are important because of their magnitude and seriousness, as well as because of their impact on the quality of life of patients, their relatives and their care-givers. Because of the steady aging of the population, these problems, and the resources devoted to coping with them, are expected to increase.

Especially in its early stages, dementia syndrome is diagnosed with detailed neuropsychological tests of the patient´s mental state and an evaluation of his or her functional status, in an attempt to rule out reversible causes of cognitive impairment.

Because of the complexities of evaluating mental state, short screening instruments have been developed for use with patients thought to suffer from cognitive impairment. The Mini-Mental State Examination (MMSE),[1] one of the most widely used tests internationally, has been translated and validated for use with Spanish-speaking persons.[2] Depending on which version and cut-off score are used, sensitivity of the test can be very high (close to 100%) and specificity can reach 86%.[3] For these reasons the National Institute of Neurological and Communicative Disorders and Stroke-Alzheimer´s Disease and Related Disorders Association (NINCDS-ADRDA) recommends the MMSE for use as a screening instrument to detect possible cognitive impairment in epidemiological studies.[4]

The aim of this study was to calculate the prevalence of patients with a positive result on a test used to detect possible cognitive impairment in a sample of persons older than 64 years who received primary care at public health system centers in Catalonia.

Population and method

This study was done as part of the *Cuida´l* Project[5], and reports the findings obtained in the first phase of the project.
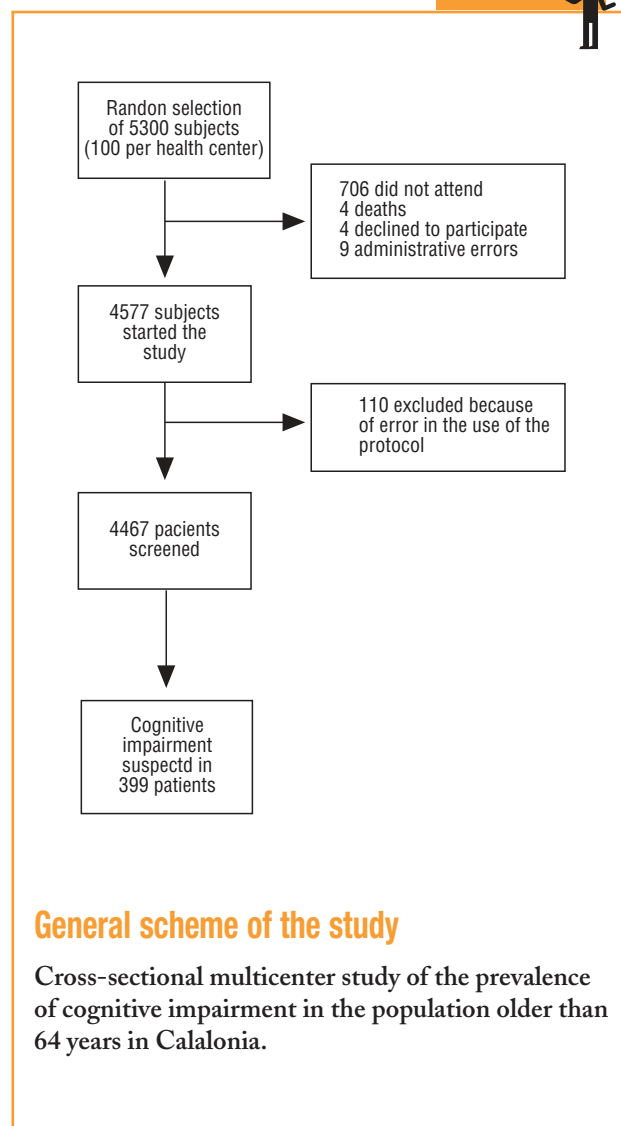
Design

This cross-sectional study was done in a random sample of persons older than 64 years who were on the list of patients served by 53 primary health care centers in Catalonia.

Inclusion and exclusion criteria

We randomly selected a total of 5300 patients (100 patients per center). Participants were recruited with phone calls (three calls at different times of the day, one on the weekend) or when they came to the center for other reasons. We excluded institutionalized patients and itinerant patients with a temporary home address (and who were expected to be at this address for less than 6 months). Participation in a home care program was not an exclusion criterion.

Material and methods


```
Randon selection
of 5300 subjects
(100 per health center)
        |
        |------------------->  706 did not attend
        |                       4 deaths
        |                       4 declined to participate
        v                       9 administrative errors
4577 subjects
started the
study
        |
        |------------------->  110 excluded because
        |                       of error in the use of the
        v                       protocol
4467 pacients
screened
        |
        v
Cognitive
impairment
suspectd in
399 patients
```

General scheme of the study

Cross-sectional multicenter study of the prevalence of cognitive impairment in the population older than 64 years in Calalonia.

The number of subjects included allowed us to estimate an expected prevalence of approximately 10% in different subgroups, at a 95% level of confidence and a precision of 2%, based on a study design that stipulated selection by primary care center (design effect).[6]

Measurement of variables

The measurement instrument was the MMSE; for patients who indicated they could not read or write we also used Isaacs Set Test.[7]

Practitioners were trained in the use of these measurement instruments in sessions with standardized cases to ensure that a common set of criteria was used. The tests were given by members of the patient´s usual primary care team (physician or nurse).

Information about age, sex, highest level of education and marital status was also recorded. All data were obtained during the period from January to June, 1999.

Criteria used to determine positive results

Patients were considered to have possible cognitive impairment if their MMSE score was lower than 24. If the patient was illiterate, possible cognitive impairment was considered to exist when the Set Test score was below 27 or when the MMSE score was lower than 19.

Strategy for data analysis

Because participants were selected randomly from the patient lists of each center, the effect of this design was taken into account when we calculated the prevalence of possible cognitive impairment. We defined the variance as the sum of variances within each center.[6] The resulting figure was then adjusted by the indirect method for the population of Catalonia as determined from the 1996 census.[8]

Bivariate analysis was done with the chi-squared test and Student's *t* test or analysis of variance (ANOVA). Multivariate analysis was based on a logistic regression model with presence of cognitive impairment (code 0, no impairment; code 1, impairment) as the dependent variable and all other variables as prognostic factors. The variables age (with 60-64 years as the reference category), marital status (with married as the reference category) and level of education (with primary education or lower as the reference category) were also included.

TABLE 1 — Characteristics of the patients

| | | Cognitive impairment | | |
		Negative (N=4068)	Positive (N=399)	All
Sex:	Men	1799 (44.2%)	161 (40.4%)	1960 (43.9%)
Marital status:	Married	2548 (63.1%)	195 (49.1%)	2743 (61.8%)
	Unmarried	180 (4.5%)	25 (6.3%)	205 (4.6%)
	Widowed	1260 (31.2%)	173 (43.3%)	1433 (32.3%)
	Separated/divorced	53 (1.3%)	4 (1.0%)	57 (1.3%)
Education	Illiterate/Functional illiterate	1988 (49.1%)	171 (43.4%)	2159 (48.6%)
	Primary	1649 (40.7%)	199 (50.5%)	1848 (41.6%)
	Higher than primary	412 (10.2%)	24 (6.1%)	436 (9.8%)
Screening test:	MMSE	2674 (65.7%)	288 (72.2)	2962 (66.3%)
Age	65-69 years	1088 (27.2%)	48 (12.3%)	1136 (25.9%)
	74-79 years	1204 (30.2%)	80 (20.5%)	1284 (29.3%)
	75-79 years	938 (23.5%)	97 (24.9%)	1035 (23.6%)
	≥80 years	763 (19.1%)	165 (42.3%)	928 (21.2%)

MMSE indicates Mini-Mental State Examination.

TABLE 2 — Prevalence[a] of cognitive impairment according to age group and sex

| | Men | | | Women | | | |
| | | 95% CI | | | 95% CI | | |
Age group		Lower	Upper		Lower	Upper	*P*
65-69	3.98	2.46	5.51	4.30	2.68	5.92	.784
70-74	6.86	4.70	9.02	5.70	3.52	7.85	.454
75-79	7.67	5.02	10.33	10.64	8.10	13.18	.116
≥80	16.76	12.36	21.16	18.40	14.35	22.46	.592
All[b]	7.78	5.34	10.02	9.45	6.90	12.01	

[a]Adjusted for design effect. [b]Adjusted with the indirect method for the 1996 Catalonia census
CI indicates confidence interval.

Results

Of the 5300 patients selected, 4467 (84%) took part in the study. The reasons for nonparticipation were patient's refusal or inability to locate the patient (710 persons), death (4 persons), or administrative error (9 persons). Of the 4577 remaining persons, a further 110 were excluded later because of errors in the use of the cognitive impairment detection protocol. Persons who did not participate did not differ significantly in age or sex from participants.

Mean age of the patients was 74.5 (6.4) years. All other characteristics are summarized in Table 1.

With the cut-off scores used for the present study, we detected 399 patients as possible cases of cognitive impairment (72.3% with the MMSE). The percentage of positive results was estimated as 7.8% (95% CI, 5.3%-10.0%) in men and 9.5% (95% CI, 6.9%-12.0%) in women, after adjustment with the indirect method for the 1996 Catalonia census. Table 2 shows the results according to age group and sex.

The results of the multivariate analysis are given in Table 3. The risk of possible cognitive impairment increased with age, and was fourfold as high in the group of participants aged 80 years or older in comparison to the 60-64-year-old group. Persons who had been educated past the primary school level had a lower risk (OR, 0.63; 95% CI, 0.41%-0.98%). For unmarried and widowed persons the odds ratio was greater than 1, which was a statistically significant result for both variables.

TABLE 3 Risk factors associated with possible cognitive impairment in a logistic regression model

		OR	95% CI Lower	95% CI Upper	P
Education	Higher than primary	0.63	0.41	0.98	.042
Marital status	Unmarried	1.69	1.07	2.66	.024
	Widowed	1.29	1.02	1.63	.031
	Separated/divorced	1.00	0.35	2.82	.998
Age	74-79 years	1.45	1.00	2.09	.050
	75-79 years	2.18	1.52	3.12	<.001
	≥80 years	4.29	3.04	6.07	<.001

Discussion

The prevalence of possible cognitive impairment in our population of persons older than 64 years was 9.5% in women and 7.8% in men. The epidemiological pattern was similar to that seen in other studies of the prevalence of dementia in other populations in our setting.[9,10] The prevalence increased with age, a finding that was not affected by adjustment for age, marital status or educational level. Jorm et al[11] analyzed this finding and concluded that the prevalence of moderate to severe dementia doubled every 5 years, approximately, according to an exponential model. A systematic review[12] and another Spanish study[13] showed that this tendency toward an exponential increase weakened after the age of 85 years,

and it has thus been suggested that a logistic model would best explain the relationship between the frequency of cognitive impairment and age. According to this model the prevalence of dementia should level off at 40% at the age of 95 years.

Some studies have found a greater prevalence of cognitive impairment in women, which might be explained by the greater incidence of dementia, which is relatively independent of age before 80 years,[14] and by the lower mortality in women.[15] However, in our sample the difference between sexes was not statistically significant in any age group.

The role of educational level in the risk of developing dementia is controversial. In the present study possible cognitive impairment was less frequent in persons with schooling past the primary level, compared to the rest of the participants, after adjustment for age, sex and marital status. This finding is consistent with other studies, which found that higher levels of education were associated with lower probabilities of dementia at old age, especially in women.[16] Several different biological mechanisms may that account for this association,[17] but noteworthy among them is the fact that higher educational level and socioeconomic level are related with lower frequencies of cerebral vascular disease.[18] In fact, most patients with dementia have a combination of vascular and Alzheimer-like diseases.[19] It is assumed that persons with more years of education and a higher socioeconomic level have a healthier lifestyle and receive more and better medical care,[8] and that their brains will acquire fewer lesions, especially in the

TABLE 4 Prevalence of cognitive impairment and dementia in Spanish studies

Authors	Year	Population	Screening instrument/ Diagnostic instrument	Age (older than)	No.	Prevalence impairment/ confirmed dementia (%)
Pérez Gómez[28]	1992	Pamplona	MMSE/DSM III	64 no institutionalized	393	24.9/8.9
Boada[26]	1993	Barcelona	MCE	64 noninstitutionalized	369	8.67
				64 institutionalized	363	56
Pi[9]	1996	La Selva del Camp	MMSE/DSM III	64 noninstitutionalized	440	30.5/14.9
López Pousa[25]	1995	8 towns in Gerona	MCE/CAMDEX	64 noninstitutionalized	244	17.2/13.93
Lobo[30]	1995	Zaragoza	DSM III-R	64 noninstitutionalized	1080	5.5
González Moneo[27]	1997	Barcelona	MMSE	64 noninstitutionalized	329	60.8
			MCE			28
			Set Test			11.3
			MMSE+MCE+Set Test			9.2
Vilalta Franch[29]	2000	8 towns in Gerona	MCE/CAMDEX	74 noninstitutionalized	1460	22.9/16.3
García García[22]	2000	Toledo	MMSE with different cut-off scores	64 noninstitutionalized	3214	22.3/7.6
Bermejo[10]	2001	Margaritas, Lista, Arévalo	MMSE + Pfeiffer	64 noninstitutionalized	5278	56.4

MMSE indicates Mini-Mental State Examination; DSM III, Diagnostic and Statistical Manual of Mental Disorders; MCE, Mini-Cognitive Examination; CAMDEX, Cambridge Mental Disorders of the Elderly Examination.

Discussion
Key points

What is known about the subjec

- The detection of cognitive impairment requires complex testing, which has favored the development of short screening instruments.

- The risk of possible cognitive impairment is associated with age according to an exponential function.

- The frequency of possible cognitive impairment seems to be lower in persons with higher levels of education.

What this study contributes

- The results of our study are similar to those of earlier published studies.

- In an extensive sample, we confirmed the epidemiological pattern reported earlier for possible cognitive impairment.

- Pragmatic, multicenter research done in actual conditions of the primary care setting reveals both the problems and the potential advantages of such studies.

small vessels where they contribute to the appearance of dementia.[19] However, other autopsy-based[20] and epidemiological studies[21,22] have failed to find any relationship between level of education and the frequency of dementia.

Some epidemiological studies have also found that unmarried persons, in comparison to married persons, have a greater risk of dementia or Alzheimer´s disease.[23] It remains to be established whether this association is spurious or whether it has a plausible explanation. In this connection, another study found that dementia is less frequent in older persons with an active social life with their family and friends (even if they live alone) than in persons who live alone but who have no close social or family ties.[24] It should be recalled that personality traits and especially moods such as depression are confounders in scoring psychometric tests, and we could not control for such factors (depressed patients respond worse in the test). In addition, any initial phase of dementia involves a component of reactive depression, making it uncertain whether what the test really measures is actual cognitive impairment or depression.

Comparison with other studies
The epidemiological data published to date[9,10,22,25-30] are variable regarding the prevalence of cognitive impairment and dementia in our population, with estimates ranging from 8.7 to 56.4%. The large range of figures is due to im-

portant methodological differences in the screening instruments used in different studies, in the age of the population, and in the inclusion or exclusion of institutionalized patients.[22] Table 4 summarizes the main findings in these studies.

Limitations of the study
Although it was not a major aim of the *Cuida'l* Project, the first phase of the study detected possible cases of cognitive impairment that will later need to be verified with detailed neuropsychological examination. However, no patient with a cut-off score on the screening tests above the figure we used to identify possible cases of cognitive impairment was referred for further testing. As a result, the exact likelihood ratio for dementia in our study population cannot be determined.

The range of scores on the MMSE is influenced by the level of education, and is higher for subjects with higher levels of education. If a single cut-off score is used, the number of false negatives among persons with more years of schooling increases, as does the number of false positives among persons with fewer years of schooling. In the present study this effect was offset in part by using two instruments (one specifically for illiterate patients) and two different cut-off scores for the MMSE.

A further limitation might be the large number of researchers involved, and hence interobserver variability, although we tried to reduce this to a minimum with previous training in the administration of the MMSE and the Set Test.

Future lines of research
A number of questions regarding the detection and diagnosis of cognitive impairment remain unanswered: the tests we used are sensitive, but the results we obtained are closely linked to age and educational level. Moreover, because these tests are not designed to diagnose dementia, they cannot take the place of more extensive neuropsychological studies for persons suspected of suffering cognitive impairment. In addition, more reliable tests are needed for the illiterate population; analysis of the agreement between the results of the Set Test and the MMSE might well shed light on this issue.

[1]Cuida'l Project researchers
ABS Badalona 4 (J. Forcada, A. Llibre, E. Borlan, M. Llorens, A. Martínez); ABS Badalona 5 (I. Oliva, M.M. Domingo, S. Mas, ML. García, C. Palazuelo, C. Piñol, M. Puche, J. Llussà, S. Zamora); ABS Badalona 6 (C. Seco, A. Díaz, J. Fariña, V. Roger, N. Puig, P. Escobedo, A. Robles, A. Girona, M.J. Toribio, P. Laporta, C. Batlle, T. Rama, F. García-Faria, M. Brugada, I. López, R. Cabello, E. Galindo, C. Torán, M.J. Ulldemolins, C. Albaladejo, E. Gejo, A. Martín, M. Castaño, P. Beato, S. Mateu, G. Pizarro); ABS Badalona 7 La Salut (J. Milozzi, M. Ruiz, J. Teruel, M. Giné, I. Barrio, J. Comín, M. Murt, M. Sánchez, A. Muñoz,

A. Utgés, S. Gutiérrez); ABS Badia Del Vallès (C. Yuste, P. Torres, M. Montasell, R. Azagra, M. Fuentes, J.F. Doz, Q. Figueras, L. Mengual, C. Lluma, G. Gasulla, L. Mayordomo, P. Roura, E. Gutiérrez, M. Iglesias, M. Ruiz, J.M. Bonet, D. García, F. Solé, F. Tarrago, J. Llonch, M. Pons); ABS Raval Sud (D. García, M.V. Pitarch, P. Escobar, L. Ibáñez, M. Ferran, J. Casas, B. Casabella, R. Ruiz, J. Pertiñez, A. Hervàs, M. Sánchez, M. Canet); ABS Trinitat Nova (N. Castells, C. Munar, M. Estruch, J. Ametlla, A. Roig, X. Flor, C. González, M. Mas, L. Sánchez, J. Guerrero, A. Buendia, M. Delgado, M.J. Pujol, J. Garbayo, D. Pérez, R. Melió, M.M. Fraga, N. Castells); ABS Barcelona 9-D (M. Godall, J.M. Carpio, A. Moretó, A. Díez, A. Rosas, E. González, M.C. Mateu); ABS Barcelona 9-E (Ll. Llosà, D. Granés, R. Espona, M.C. del Olmo, A. Cano, A. López, A. Alario, F. López, F. Mateos, M.C. García, J.J. Rodríguez, M. Mayorga, S. Martínez, N. Matilla); ABS Barcelona 9-F (J. Juvanteny, I. Angulo, I. Feijoo, I. Giner, A. Broto, J. Galindo, G. Planas, M. Barrachina, A. Aymar, N. Aramendía, M.A. Fuertes); ABS Barcelona 9-G (M. Roura, C. Font, T. Cervelló, C. Ramon, X. Corpas, V. Miralles, E. Olivé, J.L. Losada); ABS Besalú (C. Pou, I. Fernández, C. Pérez, R. Guixà, P. Zacarías, E. Bayona); ABS Capellades (A. Brugués, P. de Millan, P. Salat, J. Martí, I. Colomer, A. Garriga, X. Solé, M. Garriga); ABS Castelldefels (M. González, C. Moliner, J.C. Contel, P. Reig, J. Gené, A. Baulies, J. Gil); ABS Cornellà La Gavarra (J. Martorell, C. Padin, F. Borrell, R. López, S. Espluga, E. Florensa, O. Moreno, C. Bayona, C. Martí, A.M. Aceituno); ABS Cornellà 2 (E. Sánchez, M. Lacoste, I. Montaner, O. Ortiz, A. Jurado, M.E. Galan, J. Pacet, M.I. Martín, C. Busquier); ABS Cornellà 4 (J. Toll, M. Rodríguez, M. Server, H. Pi, P. Barreto, M. Porta, V. López, L. Ribas, L. Pérez, C. Muñoz); ABS El Prat 3 (C. Batalla, T. Graell, A. Ezpeleta, F. González, E. Comín, M. Miñano, E. López, A. Alfonso, A. Cuenca, O. Mazeres, J. Riba); ABS Esplugues 1 (T. Julia, I. Porta, C. Mateo, C. Romero, M. Varona, I. Monte, T. Cabases, F. Alguacil, P. Monge, J. Rodríguez, P. Forgas, M.J. Cerain, M. Cardona); ABS Esplugues (A. Serra, C. Torró, A. Morales, M. Llagostera, P. Wemberg, M. Arriola, D. Marginet, P. Pérez, D. Tornos, J. Ventura, C. Truque, E. Bleda); ABS Garraf-Rural (A. Pérez, J.M. Benet, J.C. Caballero, P. Sabaté, J. Hernández, E. Cuesta, P. Torrecilla, B. Federio, J.R. García, P. Foz, M. Duran, R. Sáez, R. Cañizares, X. Castro); ABS Gavà 2 (C. Almirall, A.M. Oliveira, E. Caramés, C. Galera, I. García, T. Vintró, A. Espín, L. Gonzalo, M. Soler, D. Benítez, E. Linares); ABS Girona-1 (C. Bou, M. Clot, C. Serra, M.A. Agüero, C. Sais, M. Salvans, A. Massaguer, M.C. Asensio, S. García, J.M. García, P. López, F. Carulla, P. Rigall, M. Collantes, E. Calvet, N. de Puig, M.A. Agüero, J. Portas, R. Sánchez, M.R. Carbó, M.A. Hereu, M. Martínez); ABS Igualada-Urbà (M. Ortinez, C. Espinós, D. Basas, C. Riera, M. Vilarrubias, T. Higuera, J. Zambudio, N. Solà, P. Fusté, C. Castelló, R. Chinarro, M. Canals); ABS L´Hospitalet-Centre (A. Ribas, R. Carrasco, M. Boada, J. Solé, R. Canal, D. Pérez, C. Morató, F.J. Millet, A. Traite, M.J. Megido, S. Milian, S. Copetti, V. Sahonero, E. Juncadella, N. Maymó, J.M. Fandos, M. García, N. Fernández, M. Martos, E. Rodero, C. Mateos, E. Serra, M. Murcia, T. Rubio); ABS L´Hospitalet-Gornal (M. Hernández, A. Siurana, X. Alba, C. Santiago, G. Fanlo, C. Cortina, J. Mercader, C. Blanco, F. Benavente); ABS L´Hospitalet-Sant Josep (C. Lafuente, A.M. Lafuente, S. Alia, J. Vilaseca, P. Garcés, M.A. Méndez, L. Sandé, A. Fuentesauco, A.M. Gil, V. Cabré, M. Bielsa, A. Gaitano, J. Mena, A.M. de las Mestas, M. Rico); ABS L´Hospitalet-Sta. Eulàlia (N. Borrell, C. Añaños, I. Sánchez, T. Meix, A. Evangelio, F. Torralba, S. Berlanga, A. Sanz, X. Mas, M.M. Forés, R. Viñas, J.A. Hernández,

I. Zamora, D. Riera, M.L. Tarrida); ABS L´Hospitalet-Pubilla Cases (A. Planas, J.M. Veciana, E. Gavilán, F. Rodríguez, I. Vega, R. Tosquella, M. López, A. López, G. Sánchez, L. Velázquez, L. Velázquez, F. Segril, M. Martín); ABS La Jonquera (P. Pujol, C. Ruiz, Y. Massó, L. Boix, A. López, D. Pérez, J. Domènech, M. Bonet, M. Forès, X. Lecumberri, J. Isard, M. Pous, J.L. Yecora); ABS Lleida 4 (R. Sánchez, X. Alcalde, P. Navarro, E. Domínguez, Ll. Marco, M. Martínez, P. Santafe, T. Oliver, D. Ferrer); ABS Manlleu (E. Castell, A. Costa, J. Fontarnau, J. Sierra, J. Deniel, E. Casellas, M. Vilamú, A. García, S. Suriñach, A. Llagostera, V. Canal, D. Casadesús, C. Olmedo); ABS Martorell (Ll. Esteve, F. López, F. García, T. Badia, F. de Cabo, J. Peligro, C. Herráez, T. Alonso, C. Baiget, A. Oliete, L. Pérez, M. Fuentes, I. Vergès, E. Pérez, M. Moreno, L. Oliveras, M. Canals, C. Rovira, C. Luna); ABS Penedès-Rural (A. Cererols, J. Llach, J. Flórez, M. Elías, P. Piñeiro, M. Costa, R. Manuel); ABS Piera (J. Solanellas, R. Torremorell, H. Cortés, J.D. Guevara, S. Caballero, R. Ribas, S. Marcelo, N. Carré, A. Lloses); ABS Roses (F. García, T. Bosch, P. Morcillo, P. Viedma); ABS Sant Adrià 1 (C. Ferré, C. Valladares, A. Plaza, C. Roser, M. Portes, E. Dura, M.J. Lorente, M. Lladó, R. Caro, M.A. Rocabayera, Ll. Vilalta); ABS Sils-Vidreres-Maçanet (A. Teixidor, M.C. Fondon, C. Pons, A. Sanchís, M. Boldú); ABS La Mina (R. Ciurana, L. Alejandro, C. Espel, M. Vilà, M. Mata, I. Bobé, J. Davins, A. Sáez, M. de la Figuera, A. Salvadó, C. Pareja, F. Soriano, E. Vinyoles, C. Royo, J.M. Mendive, E. Zabaleta, C. de Juan, M. Castillo, R. Centelles, J. Rengel, S. Calvet, J. Agudo, A. Ramos, M. Canals); ABS St. Boi de Llobregat 2 (M. Muñoz, A. Rourera, C. Alvarado, A. Fernández, C. Espelt, MJ. Gracia, M. Via, M. Dordal, E. Steiner, R. Rodrigo, J. Alegre, E. Conesa); ABS St. Boi de Llobregat 3 (C. Tamayo, S. González, A. Espinola, T. Arnau, A.R. Hernández, R.M. Marcos, A. Val, R. Giner, C. Barrio, C. Rubio, F. de la Torre, C. Gorrindo, I. Vázquez, M.R. García); ABS St. Feliu de Guíxols (R. Herrero, T. Planas, P. Carreras, J. Rovira, L. Cinos, M. Muñoz, D. Torres, C. Xargay, C. Comas, M.A. Oliveras, J. Lafont, M. Félez); ABS St. Just Desvern (J. Muniesa, N. Aresté, X. Serra, R. Rabaneda, Ll. Morató, D. Ruenz, A. Wilke, L. Crespo, F. Ridao, S. Granollers, C. Marcos); ABS Sta. Coloma de G. 1 (T. Morató, A. Muñoz, M.M. Ansaldo, M. Tramuns, I. López, M. Fuentes, J. Vidal, A. Vidal, M. Roset, E. Sabaté, M.J. Polo, A. Vilanova, A. Sancho, E. Corral, A. Taboada, T. Sala, P. Rodríguez, D. Molina, E. Martínez); ABS Sta. Coloma de G. 4 (R. de León, C. García, R. Forés, A. Gallart, C. Vela, R. Escolar, M. Alzamora, A. Fuentes, B. López, M. Puente, R. González, R. Ferrero, M. Sorribes, F. Margarit, M. Monsó); ABS Sta. Coloma de G. 6 (M.J. Martínez, J. Hernández, M. Pozo, O. Martínez, C. Lisicic, C. Aguilera, X. Dauder, M.M. Isnard, D. Olmos); ABS Sta. Eugènia de Berga (A. Ribas, J. Verdera, A. Planes, J. Oliva, C. Blay, M. Molas, R.M. Salla, D. Rovira, A. Puente, H. Algilaga, T. Iruela, L. Vila, J. Espinàs, E. Caballé, E. García); ABS Tarragona-1 (N. Sarrà, M. Fortín, M. Pollcarpo, M. Henrich, P. Camós, M. Romera, J.M. Roca, J. Monteverde, R. Tigell, M. Juncosa); ABS Tarragona-2 (N. Saun, C.M. Fuentes, B. Rull, E. Satué, R. Canals, M. Barrera, E. Valdivieso, A. Veiga); ABS Terrassa C-Can Parellada (A. Sánchez, R. Camps, A. Casasayas, A. Navarro, O. Grima, M. Nozal); ABS Tortosa Est (J.I. Viloria, J. Clua, M.J. Arasa, J.F. Monclús, J.M. Basart, F. Vallespí, G. García, E. Ciurana, A. Casanova, T. Rupérez, E. Ibáñez, C. Mangrané, E. Gómez, R. Arasa, S. Ponce, N. Beguer, X. Bautista); ABS Vallirana (J. Creixell, E. Castro, C. Càmara, P. Miret, A. Izquierdo, J. Merin, J.M. Olmo, M. Sabaté, R. Llaurador, C. Pujol, A. Balibrea, C. Pérez, N. Casamada, S. González, J. Mata, S. San, V. Bardají); ABS Viladecans 2 (D. del Pino, P. Simonet, A. Pa-

dilla, A. Viniegra, E. Rillo, R. Villafafila, C. Lecumberri, C. Verduras, M.A. Fernández, C. Bentue, M.V. Vico, D. Ruiz, P. Figuera, A. García, D. Mora); ABS Vilafranca Urbana (M.L. Gardeñes, M. Ballester, D. Ferrer, P. Utrilla, R. Manuel, B. Coscollar, R. Rodrigo, R. Marchan, M. Giralt, M. Carrascosa, A. Robledo, J.A. Domínguez, B.M. Dinares); ABS Vilanova 1 (I. Garro, C. Casamayor, M. Navarro, O. Fuster, M. Briva, C. Batet, G. Mendoza, Ll. Gimeno, P. García, M.A. March).

References

1. 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;12:189-98.
2. Escribano-Aparicio MV, Pérez-Dively M, García-García FJ, Pérez-Martín A, Romero L, Ferrer G, et al. Validación del MMSE de Folstein en una población española de bajo nivel educativo. Rev Esp Geriatr Gerontol 1999;34:319-26.
3. Bermejo F, Morales JM, Valerga C, del Ser T, Artolazábal J, Gabriel R. Comparación entre dos versiones españolas abreviadas de evaluación del estado mental en el diagnóstico de demencia. Datos de un estudio en ancianos residentes en la comunidad. Med Clin (Barc) 1999;112:330-4.
4. McKhann G, Drachman D, Folstein M, Katzman R, Price D, Standlar EM, Clinical diagnosis of Alzheimer's disease. Report of the NINCDS-ADRDA work group under the auspices of Department of Health and Human services task force on Alzheimer's disease. Neurology 1984;34:939-44.
5. Vinyoles E, Copetti S, Cabezas C, Megido MJ, Espinàs J, Vila J, et al. Aspectos metodológicos de un ensayo clínico que evaluará la eficacia de una intervención en cuidadores de pacientes dementiados. Aten Primaria 2001;27:49-53.
6. Bland JM, Kerry S. Statistic notes: Sample size in cluster randomisation. BMJ 1998;316:549.
7. Pascual LF, Martínez JV, Modrego P, Mostadero E, López del Val J, Morales F. El set-test en el diagnóstico de la demencia. Neurología 1990;5:16-21.
8. http://www.idescat.es
9. Pi J, Olivé JM, Roca J, Masana L. Prevalence of dementia in a semi-rural population of Catalunya, Spain. Neuroepidemiology 1996;15:33-41.
10. Bermejo FP, Gabriel RS, Vega S, Morales JM, Rocca WM. Problems and isues with door-to-door, two phase surveys: an ilustration from central Spain. Neuroepidemiology 2001;20:225-31.
11. Jorm AF, Korten AE, Henderson AS. The prevalence of dementia: a quantitative integration of the literature. Acta Psychiatr Scand 1987;76:465-79.
12. Ritchie K, Kildea D. Is senile dementia «age-related» or «ageing-related»? Evidence from meta-analysis of dementia prevalence in the oldest old. Lancet 1995;346:931-4.
13. Manubens JM, Martínez-Lage JM, Lacruz F, Muruzábal J, Larumbe R, Guarch C, et al. Prevalence of Alzheimer's disease and other dementing disorders in Pamplona, Spain. Neuroepidemiology 1995;14:155-64.
14. Seshadri S, Wolf PA, Beiser A, Au R, McNulty K, White R, et al. Lifetime risk of dementia and Alzheimer's disease. The impact of mortality on risks estimates in the Framingham study. Neurology 1997;49:1498-504.
15. Puig X, Gispert R, Puigdefábregas A, Pérez G, Mompart A, Doménech J. Mortalidad por demencia en Cataluña: un problema de salud emergente. Med Clin (Barc) 2002;118:455-9.
16. Letteneur L, Launer LJ, Andersen K, Dewey ME, Ott A, Copeland JRM, et al. Education and the risk for Alzheimer's disease: sex makes a difference. Am J Epidemiol 2000;151:1064-71.
17. Martínez Lage JM, Martínez Lage P. Educación, reserva cerebral y factores de riesgo de demencia y enfermedad de Alzheimer. Med Clin (Barc) 2001;116:418-21.
18. Del Ser T, Hachinski V, Merskey H, Muñoz DG. An autopsy-verified study of the effect of education on degenerative dementia. Brain 1999;122:2309-19.
19. Neuropathology Group of the Medical Research Council Cognitive Function and Ageing Study (MRC CFAS). Pathological correlates of late-onset dementia in a multicentre, community-based population in England and Wales. Lancet 2001;357:169-75.
20. Muñoz DG, Ganaphathy GR, Eliasziw M, Hachinski V. Educational attainment and socioeconomic status of patients with autopsy-confirmed Alzheimer disease. Arch Neurol 2000;57:85-9.
21. Ritchie K, Artero S, Touchon J. Classification criteria for mild cognitive impairment. A population-based validation study. Neurology 2001;56:37-42.
22. García FJ, Sánchez MI, Pérez A, Martín E, Marsal C, Rodríguez G, et al. Prevalencia de demencia y de sus subtipos principales en sujetos mayores de 65 años: efecto de la educación y ocupación. Estudio Toledo. Med Clin (Barc) 2001;116:401-7.
23. Helmer C, Damon D, Letenneur L, Fabrigoule C, Barberger-Gateau P, Lafont S, et al. Marital status and risk of Alzheimer's disease. A French population-based cohort study. Neurology 1999;53:1953-8.
24. Fratiglioni L, Wang HX, Ericsson K, Maytan M, Winblad B. Influence of social network on ocurrence of dementia: a community-based longitudinal study. Lancet 2000;355:1315-9.
25. López-Pousa S, Llinás J, Vilalata J, Lozano L. Prevalencia de las demencias en Girona. Neurología 1995;10:189-93.
26. Boada M. Trastornos cognitivos en la población geriátrica de la ciudad de Barcelona: aproximación clínicoepidemiológica (tesis doctoral). Barcelona: Universitat de Barcelona, 1993.
27. González MJ, Escrivà R, Vinyoles E, Espel C, Davins J, Borrell M. Estimaciones de la frecuencia de déficit cognitivo según el test empleado. Aten Primaria 1997;20:173-9.
28. Pérez JM, Tiberio G. Deterioro cognitivo y demencias en una población geriátrica urbana. Aten Primaria 1992;9:365-9.
29. Vilalta-Franch J, López-Pousa S, Llinàs-Reglà J. Prevalencia de demencias en una zona rural. Estudio de Girona. Rev Neurol 2000;30:1026-32.
30. Lobo A, Saz P, Marcos G, Dia JL, De la Camara C. The Prevalence of Dementia and Depression in the Elderly Community in a Southern European Population: The Zaragoza Study. Arch of Gen Psychiatr 1995;52:497-506.

Limón Ramírez E. et al
Detection of Cognitive Impairment in the Population of Persons Older than 64 Years: First Phase of the Cuida'l Project

ORIGINAL ARTICLE

COMMENTARY

The Importance of Epidemiological Studies of Cognitive Impairment

M.A. Benítez del Rosario
Member of the Grupo de Trabajo de Atención al Mayor, semFYC. Unidad de Cuidados Paliativos, Hospital Nuestra Señora de la Candelaria, Santa Cruz de Tenerife, Spain.

Dementia, and specifically Alzheimer´s disease, constitutes a twenty-first century epidemic. Editorials like this one are frequent in the press and in scientific journals, and offer a mostly accurate picture of reality, as graying of the population is expected to increase the number of cases of dementia. As a secondary effect we can expect to see an increase in the number of dependent persons, with a consequent rises in social and health service costs. None of this is anything new; however, although this information has been available for some time, social and health programs aimed at providing solutions to the problem have not been developed. For this reason initiatives such as the *Cuida´l* Project deserve admiration and support, as the results shed light on a number of aspects of the epidemiology of dementias in Spain, and on the efficacy of possible interventions.

The results published by Limón et al confirm data from earlier international studies, but confirmation should not be considered redundant information, as it is important to provide a transcultural view of the situation. It is not a simple matter to identify all general phenomena which occur invariably with aging, or to determine which processes are fomented by age or aging, and how they are affected by socioeconomic conditions. What may be the case for one population within a specific ecosystem may not hold for another population.[1] This is especially important in the study of dementias. Declining cognitive function is a continuous process throughout life, which can give rise to disability or illness when the decline surpasses what are considered the normal thresholds. Multiple protective, predisposing or precipitating factors influence the transformation of a physiological decline in intellectual functioning into disability or dementia.

Epidemiological studies in different populations should help to identify those factors which are essential from those which behave as confounding variables.[2] Education, lifestyle (a difficult factor to define and categorize) and cardiovascular risk factors, all of which are interrelated, have been investigated as independent factors that influence the appearance of dementias. A higher level of education appears consistently as a protective factor in studies of different populations, and the reasons for this have yet to be clarified. Exactly why higher levels of education or previous intellectual work-out protect against cognitive impairment is not known. This may be a characteristic of the cohort effect within a given population; in other words, an effect that reflects exposure of the population to other risk factors in previous years that may or may not influence the development of dementia (the higher the educational level, the fewer unhealthy behaviors). Cognitive impairment may also be more likely to occur in persons whose central nervous system has not been reinforced by prior training. In other words, a situation of «impairment from the nonstimulation of cognitive reserves» might emulate «pathologies arising from disuse» that increase the central nervous system´s susceptibility to the action of other stress factors. Nevertheless, a third hypothesis cannot be ruled out, ac-

cording to which the incidence of dementia is lower in patients with higher levels of education because of their capacity to perform better on short neuropsychological tests.[2,3] Only the results of a series of longitudinal studies will clarify this issue.

It is no surprise that the results of the study by Limón et al confirm earlier findings that established a clear relationship between age and cognitive impairment. Age may be a factor that determines how much time is necessary for noxious factors to damage intellectual functioning. However, the lack of a relationship between cognitive impairment and sex contrasts with earlier findings from other studies. There is no clear biological evidence to account for the difference between sexes, or for the differences between men (or between women) from different populations. This raises questions that justify the need for further epidemiological studies.

Epidemiological studies are always beset by methodological difficulties in establishing a diagnosis of dementia on the basis of the results of a brief neuropsychological examination,[4] and this in turn makes it difficult to compare findings across studies. Of note is the caution Limón et al have used to report their results in terms of «possible cognitive impairment», in view of the methodological limitations. We must await the findings for large series of cases of cognitive impairment diagnosed as dementia, and for all such persons who subsequently develop dementia on the basis of different cut-off scores on the Mini-Mental State Examination. Future stages of the *Cuida'l* study should also make it possible to identify other characteristics of the population, such as the influence of health care branding on consumer behavior, changes in family and care-giver profiles, relationships with other risk factors, and the capacity of the social and health care system to respond to the need for large-scale screening for dementia in primary care.

References

1. McInnes L, Rabbit P. Envejecimiento, salud y habilidades cognitivas. En: Buendía, editor Gerontología y Salud. Perspectivas Actuales. Madrid: Editorial Biblioteca Nueva, 1997; p. 95-114.
2. Ritchie E, Lovestone S. The dementias. Lancet 2002;360:1759-66.
3. Larson EB. Un varón de 80 años con pérdida de memoria. JAMA (ed. esp.) 2000;8:305-13.
4. Salmon DP, Thomas RG, Pay MM, Booth A, Hofstetter CR, Thal LJ, et al. Alzheimer's disease can be accurately diagnosed in very mildly impaired individuals. Neurology 2002;59:1022-8.