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Quality of life across three groups of older adults differing in cognitive status and place of residence

Beatriz León-Salas,¹ Alba Ayala,² Vendula Blaya-Nováková,³ Marina Avila-Villanueva,¹ Carmen Rodríguez-Blázquez,⁴ Fermina Rojo-Pérez,⁵ Gloria Fernández-Mayoralas,⁵ Pablo Martínez-Martín,⁴ Maria João Forjaz,² on behalf of the Spanish Research Group on Quality of Life and Aging

¹Alzheimer Disease Research Unit, CIEN Foundation, Carlos III Institute of Health, Alzheimer Center Reina Sofia Foundation, ²National School of Public Health, Carlos III Institute of Health and REDISSEC, ³Department of Preventive Medicine and Quality Management, Gregorio Marañón General University Hospital, ⁴National Center of Epidemiology, Carlos III Institute of Health and Consortium for Biomedical Research in Neurodegenerative Disease (CIBERNED), and ⁵Institute of Economics, Geography and Demography, Center for Human and Social Sciences, Spanish National Research Council, Madrid, Spain

Background: Health-related quality of life (HRQOL) in older adults is determined by personal conditions, as well as by the social and physical environment. The purpose of the present study was to describe the factors related to health conditions and residential environment that influence HRQOL of older adults.

Methods: Data from 1815 cases came from three cross-sectional surveys on quality of life in older adults in Spain: non-institutionalized older adults ($n = 1106$), institutionalized older adults without dementia ($n = 234$) and institutionalized older adults with dementia ($n = 475$). Assessment instruments used were: Barthel Index, Short Portable Mental Status Questionnaire, Comorbidity Index, EQ-5D-3L (5 dimensions, EQ-index and EQ-VAS), and information about sociodemographic characteristics and social networks. Partial correlation and multivariate logistic regression analyses were carried out.

Results: In group comparisons, institutionalized older adults showed a higher percentage of problems in the EQ-5D-3L dimensions than the non-institutionalized ones. Also, older adults with dementia presented less pain/discomfort and anxiety/depression than the other groups, but showed more problems in mobility, self-care and usual activities. EQ-Index showed a high association with functional independence, perceived health status and comorbidity. According to the logistic regression models, the Barthel Index was the most common determinant for most of EQ-5D-3L dimensions in all groups.

Conclusion: Institutionalized older adults with dementia presented lower HRQOL than the other groups. Functional independence, comorbidity and cognitive status were the main HRQOL determinants in all groups. Maintenance and improvement of the functional condition might be translated into a higher HRQOL of older adults. **Geriatr Gerontol Int 2015; 15: 627–635.**

Keywords: dementia, EQ-5D-3L, health-related quality of life, place of residence.

Introduction

Older adults are a growing segment of the population in Europe. In Spain, adults aged 60 years and older represent 20.8% of the total population, and this figure is

estimated to increase to 31.4% by 2025.¹ The study of health-related quality of life (HRQOL) in older adults has become a high priority.²

Dementia causes tremendous burden to patients, their families and the society as a whole.³ In older adults, the most common cause of dementia is Alzheimer's disease, which is responsible for 60–75% of all dementias in Western countries.⁴ In Spain, there are approximately 600 000 persons with dementia, 400 000 of them with Alzheimer's disease.⁵ As dementia is a chronic and disabling neurodegenerative syndrome

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Correspondence: Dr Maria João Forjaz PhD, Instituto de Salud Carlos III, Escuela Nacional de Sanidad, Monforte de Lemos 5, 28029 Madrid, Spain. Email: jforjaz@isciii.es

lacking curative treatment, the well-being and HRQOL of these patients is considered a priority.^{6–8} Therefore, HRQOL assessment should be systematically included in the evaluation of any treatment or care program in dementia.^{8,9}

Although there have been recent developments in disease-specific HRQOL measures for dementia,^{7,10,10–13} such instruments have not been validated for populations without dementia and, as such, do not enable direct comparisons between populations with and without dementia. In contrast, several generic instruments have proved their usefulness both in healthy older people and in people with cognitive impairment or dementia. One of the most widely used is the EQ-5D-3L,¹⁴ translated into 68 languages and validated in 123 different cultural settings, and frequently applied in studies on older populations and dementia.¹⁵

There are several difficulties associated with the collection of HRQOL data in older adults with cognitive impairment or dementia.^{14,16,17} Because of cognitive dysfunction, patients with dementia lose insight, memory for recent experiences, capacity for understanding questions and for expressing feelings, making self-assessment difficult and unreliable. Therefore, there is often a need to rely on proxy evaluations assuming that their reports can provide acceptable information on the status of the subject.

Previous studies comparing HRQOL between older adults living in the community and those living in a nursing home showed higher HRQOL in the community-dwelling group.^{18–20} Furthermore, the determinants of HRQOL in older adults were different between these populations.²¹ A study in non-institutionalized and institutionalized older adults showed that the EQ-Index was a useful measure in these groups.²⁰

The purposes of the present study were: (i) to investigate the influence of place of residence and of presence versus absence of dementia on the HRQOL of older adults; (ii) to compare the HRQOL in three groups of adults differing in cognitive status and place of residence; and (iii) to analyze the influence of functional status, health status and impaired cognition on the HRQOL dimensions (mobility, self-care, usual activities, pain/discomfort and anxiety/depression) in these three groups (community-dwelling and institutionalized older adults with and without dementia).

As dementia and bad health are some of the reasons for institutionalization of older adults,^{22–25} we expect to find the lowest HRQOL in the group of institutionalized older adults with dementia and the highest HRQOL in the community-dwelling group. With the present study, we hope to obtain data that could contribute to the development of strategies aimed at improving the HRQOL of older adults specific for different settings and cognitive states.

Methods

Participants

Data from 1815 cases came from three cross-sectional, nationwide surveys on quality of life in older adults in Spain. The non-institutionalized older adults ($n = 1106$) were recruited from the “Quality of Life in Older adults-Spain” (“Calidad de Vida en Mayores-España”, CadeViMa-Spain) study.²⁶ The inclusion criteria were: (i) men and women aged 60 years or older; (ii) non-institutionalized; (iii) ability to answer the survey questions; and (iv) no or slight cognitive impairment (<4 errors) according to the Pfeiffer’s Short Portable Mental Status Questionnaire (SPMSQ).

The sample of institutionalized older adults without dementia ($n = 234$) was recruited from a study on quality of life in older adults residing in nursing homes in Spain. The inclusion criteria were the same as in the first group, except for the setting: nursing homes.

The institutionalized older adults with dementia ($n = 475$) were recruited from a convenience sample of 14 nursing homes across Spain.²⁰ The inclusion criteria were similar to the previous group, adding a SPMSQ score ≥ 4 and a diagnosis of dementia according to the Diagnostic and Statistical Manual of Mental Disorders-IV-Text Revised.²⁷

The questionnaires were self-completed by the older adults without dementia, and proxy-completed for all older adults with dementia. A previous study on a subsample of older adults with dementia showed a good interrater reliability between participant-completed and proxy-completed EQ-5D-3L questionnaires.²⁸ The root studies that provided data for the present study were approved by the institutional review board of the Carlos III Institute of Health, and written informed consent was obtained from all respondents or their legal representatives.

Measures

Information about sex, age, marital status and education level was collected, and the following validated rating scales were applied.

The EQ-5D-3L questionnaire is a standardized instrument for use as a measure of health status. It comprises two parts. The first is a “descriptive system” of five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Responses in each dimension are scored in three ordinal levels coded: 1, no problems; 2, moderate problems; and 3, extreme problems. This part provides a descriptive profile indicating problems in each dimension that classifies the respondent into one of 243 health states. There is a formula to convert each profile according to a particular population-based value set of preference weights into a single index (EQ-Index), a continuum where full health

is 1 and being dead 0 (values can also be negative, indicating health states considered worse than death). The EQ-5D-3L also contains a vertical visual analog scale (EQ-VAS), which can be used as a quantitative measure of perceived health status, ranging from 0 (worst imaginable health state) to 100 (best imaginable health state). The EQ-5D-3L has been validated in the Spanish general population,²⁹ and is considered valid and reliable for populations with dementia, with an adequate interrater reliability of 0.72 (intraclass correlation coefficient), moderate internal consistency and good convergent validity with other dementia-specific QOL measures.²⁸

The Barthel Index is a commonly used measure of functional independence, and allows comparisons by population groups.³⁰ It consists of 10 items: feeding, moving from bed to a chair and return, grooming, using the toilet, bathing, walking on a level surface, going up and down the stairs, dressing, and continence of bowels and bladder, with a total score ranging from 0 (totally dependent) to 100 (completely independent).

The Comorbidity Index, adapted from the Cumulative Illness Rating Scale for Geriatrics,³¹ measures the presence of 20 chronic medical conditions.²⁶ The number of chronic medical conditions was obtained through interview with the participant or medical staff at the nursing home.

The Short Portable Mental Status Questionnaire (SPMSQ) is an interviewer-administered screening tool for cognitive deficits in older adults.³² The instrument contains 10 questions on cognitive functioning (orientation, remote memory and concentration). This questionnaire is commonly used for screening of memory problems associated with dementia. The SPMSQ was applied to all participants, and scores (errors) ≥ 4 , which indicate cognitive deficit, were set as a cut-off value in the samples without dementia in order to exclude possible participants with dementia from these two groups. In the sample with dementia, participants with SPMSQ scores < 4 were excluded.

Regarding the family and social networks, we asked if participants had children, and registered the frequency of contacts (face-to-face and others) with family, friends and neighbors (rated from 1, never or less than once a month, to 3, once a week or more).

Data analysis

The main outcome variables did not follow a normal distribution, therefore, non-parametric tests were used. The study variables (sex, age, marital status, education, children, frequency of contacts, comorbidity, Barthel Index, SPMSQ) and EQ-5D-3L scores (presence of problems in mobility, self-care, usual activities, pain/discomfort, anxiety/depression, EQ-VAS and EQ-Index) were compared by groups (non-

institutionalized, institutionalized with and without dementia) using the χ^2 -test or Kruskal–Wallis test. Association between the EQ-Index and the study variables was estimated with a partial correlation coefficient (moderate 0.35–0.50; strong > 0.50),³³ controlling for age.

To compare the determinants of HRQOL in the three groups, logistic regression models (alpha level: 0.05) were built with each of the EQ-5D-3L dimensions (moderate-extreme problems *vs* no problems) acting as a dependent variable, and the following independent variables: functional independence measured by the Barthel Index, cognitive status measured by the SPMSQ and comorbidity, controlling for sex (0 = male, 1 = female), age, marital status (0 = other situation: single, divorced/separated, widowed; 1 = married) and children (0 = no children, 1 = children).

Correlation coefficients calculation and logistic regression analyses were carried out separately for each of the three study groups: non-institutionalized older adults, institutionalized older adults without dementia and institutionalized older adults with dementia. All statistical analyses were carried out using the IBM SPSS 20.0 program for Windows (IBM Corporation, Armonk, NY, USA).

Results

Table 1 shows the characteristics of respondents by group (non-institutionalized older adults and institutionalized older adults with or without dementia). The main reason for institutionalization was “bad health state, needs to be taken care of” (75%). Compared with the other two groups, institutionalized older adults with dementia were mostly women, significantly older, had a lower educational level, a higher number of chronic medical conditions, and poorer functional and mental status (as per the Barthel Index and SPMSQ, respectively). Most participants (91.6% of the total sample) showed at least one chronic medical condition. Table 2 presents the EQ-5D-3L dimensions, EQ-Index and EQ-VAS scores by group. The comparison showed significant differences, with the lowest EQ-VAS and EQ-Index values for institutionalized older adults with dementia. Negative scores of EQ-Index were registered in 1.5% of non-institutionalized older adults, 7.7% of institutionalized older adults without dementia and 37.9% of older adults with dementia. Figure 1 shows the distribution of scores in the five dimensions of EQ-5D-3L for the three groups.

Table 3 presents the bivariate correlations between the main study variables (comorbidity, EQ-VAS, Barthel Index, SPMSQ) and the EQ-Index. In the group of community-dwelling older adults, the EQ-Index was strongly associated with the Barthel Index and comorbidity, and moderately associated with EQ-VAS.

Table 1 Characteristics of respondents by group

Variables	Non-institutionalized (<i>n</i> = 1106) % (<i>n</i>)	Institutionalized without dementia (<i>n</i> = 234) % (<i>n</i>)	Institutionalized with dementia (<i>n</i> = 475) % (<i>n</i>)	<i>P</i>
Sex				<0.0001
Female	56.3 (623)	65.4 (153)	83.4 (396)	
Age (years)				<0.0001
Mean ± SD	72.1 ± 7.8	81.0 ± 7.1	85.8 ± 6.8	
Range	(60.0–96.0)	(60.0–97.0)	(60.0–102.0)	
Age by group (years)				<0.0001
60–69	40.1 (443)	6.0 (14)	2.1 (10)	
70–79	40.6 (449)	31.2 (73)	13.5 (64)	
≥80	19.3 (214)	62.8 (147)	84.4 (401)	
Marital status				<0.0001
Single	6.8 (75)	27.8 (65)	16.1 (76)	
Married	58.5 (645)	12.8 (30)	17.5 (83)	
Divorced	3.4 (38)	4.7 (11)	2.3 (11)	
Widowed	31.3 (345)	54.7 (128)	64.1 (303)	
Education level				<0.0001
No education or less than primary	31.6 (349)	42.3 (99)	65.2 (307)	
Primary school	39.1 (432)	31.6 (74)	26.3 (124)	
Secondary school or higher	29.3 (324)	26.1 (61)	8.5 (40)	
Children	89.5 (986)	48.9 (114)	70.9 (337)	<0.0001
Frequency of contacts				<0.0001
Never or less than once a month	36.6 (402)	18.5 (43)	11.8 (55)	
1–2 times per month	18.9 (208)	18.0 (42)	15.6 (73)	
Once a week or more	44.5 (489)	63.5 (148)	72.6 (340)	
Comorbidity				<0.0001 [†]
Mean ± SD	3.3 ± 2.5	6.5 ± 2.8	7.6 ± 2.7	
Range	(0.0–15.0)	(1.0–14.0)	(2.0–15.0)	
1 disease	16.5 (163)	0.9 (2)	0 (0)	
2 diseases	19.3 (191)	6.6 (14)	0.4 (2)	
≥3 diseases	64.2 (635)	92.5 (197)	99.6 (509)	
Barthel Index				<0.0001 [†]
Mean ± SD	95.8 ± 11.1	80.1 ± 24.8	30.7 ± 28.7	
Range	(0.0–100.0)	(5.0–100.0)	(0.0–100.0)	
SPMSQ				<0.0001 [†]
Mean ± SD	0.6 ± 1.0	1.4 ± 1.4	7.3 ± 1.6	
Range	(0.0–4.0)	(0.0–4.0)	(5.0–10.0)	

[†]Adjusted by age. SPMSQ, Short Portable Mental Status Questionnaire.

In the group of institutionalized older adults without dementia, the EQ-Index was moderately associated with the Barthel Index, and in the group of institutionalized older adults with dementia the EQ-Index was strongly associated with the Barthel Index and EQ-VAS, and moderately associated with SPMSQ.

In the logistic regression models, created for the comparison of the factors affecting the HRQOL in the three different populations, the factors most frequently associated with the EQ-5D-3L dimensions were the Barthel Index, comorbidity and SPMSQ (Table 4). In non-

institutionalized older adults, the factors associated with problems in EQ-5D-3L dimensions were a lower Barthel Index (OR range 0.86–0.97), a higher number of diseases (comorbidity, OR range 1.30–1.61) and more errors in SPMSQ (OR range 1.27–1.45). Furthermore, older age was associated with more problems in mobility, usual activities and pain/discomfort (OR range 1.05–1.06); women had more problems than men in pain/discomfort (OR 1.71, 95% CI 1.27–2.32) and anxiety/depression (OR 1.80, 95% CI 1.22–2.66); being married was associated with fewer difficulties in usual activities

Table 2 EQ-5D dimensions, EQ-VAS score and EQ-Index by group

Variables	Non-institutionalized (n = 1106)	Institutionalized without dementia (n = 234)	Institutionalized with dementia (n = 475)	P
	% (n)	% (n)	% (n)	
EQ-5D dimensions: presence of problems in:				<0.0001
Mobility	22.0 (243)	60.5 (135)	79.4 (369)	
Self-Care	9.1 (101)	46.0 (103)	97.2 (454)	
Usual activities	17.6 (195)	44.2 (99)	95.3 (445)	
Pain/discomfort	50.5 (558)	66.1 (148)	35.9 (168)	
Anxiety/depression	21.4 (236)	50.9 (114)	37.3 (174)	
EQ-VAS				<0.0001
Mean ± SD	66.2 ± 20.9	62.8 ± 21.8	50.3 ± 21.5	
Range	(0.0–100.0)	(0.0–100.0)	(0.0–100.0)	
EQ-Index				<0.0001
Mean ± SD	0.83 ± 0.25	0.57 ± 0.36	0.09 ± 0.37	
Range	(–0.5–1.0)	(–0.7–1.0)	(–0.7–1.0)	
Negative EQ-Index scores	1.5 (17)	7.7 (18)	37.9 (180)	

EQ-VAS, visual analog scale of health status.

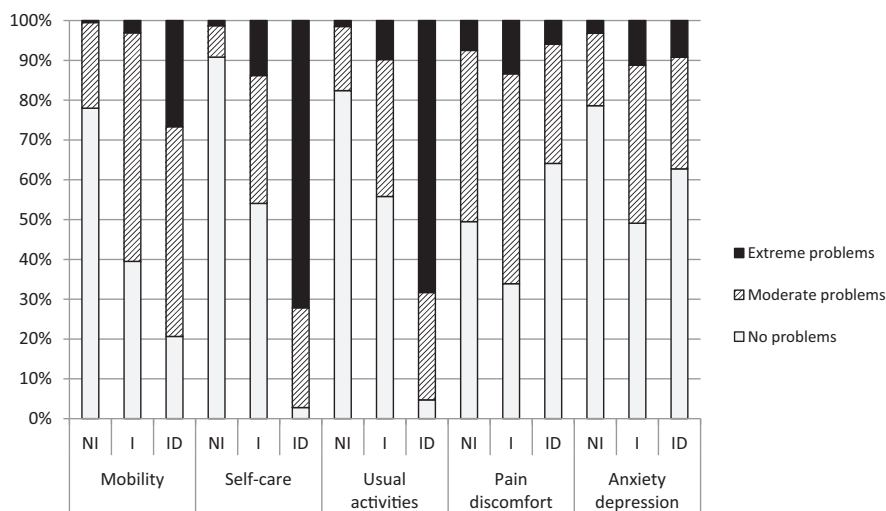


Figure 1 Distribution of problems by dimension of EQ-5D perceived in the groups. I, institutionalized without dementia; ID, institutionalized with dementia; NI, non-institutionalized.

(OR 0.58, 95% CI 0.36–0.94) and anxiety/depression (OR 0.52, 95% CI 0.35–0.77) than being single, separated/divorced or widowed.

For institutionalized older adults without dementia, EQ-5D-3L dimensions were associated with more functional dependence as per the Barthel Index (OR range 0.93–0.94) and a higher number of chronic medical conditions (comorbidity, OR range 1.23–1.31). In addition, more errors in SPMSQ were associated with fewer problems with mobility (OR 0.75, 95% CI 0.59–0.95). Women experienced more pain/discomfort than men (OR 2.45, 95% CI 1.25–4.81), as did persons with no or infrequent social contacts (OR 2.17, 95% CI 1.04–4.56).

Finally, Barthel Index (OR range 0.92–0.99), SPMSQ (OR 0.76, 95% CI 0.62–0.94) and older age (OR 1.08, 95% CI 1.03–1.13) were associated with problems in several dimensions of the EQ-5D-3L in institutionalized older adults with dementia. The regression models for the dimensions of self-care and usual activities were the ones with the highest explained variance (Nagelkerke's R^2 of 0.60 and 0.51, respectively).

Discussion

The EQ-5D-3L is a generic measure of quality of life and health status that allows comparing different populations. We applied the EQ-5D-3L tool in three groups

Table 3 Partial correlation coefficients between variables of study and EQ-Index, while controlling for age, for each group

Variables	EQ-5D index Non-institutionalized (<i>n</i> = 1106)	Institutionalized without dementia (<i>n</i> = 234)	Institutionalized with dementia (<i>n</i> = 475)
EQ-VAS	0.45**	0.28**	0.59**
Comorbidity	-0.51**	-0.20*	-0.14*
Barthel Index	0.53**	0.44**	0.77**
SPMSQ	-0.21**	0.06	-0.45**

***P* < 0.01 **P* < 0.05. EQ-VAS, visual analog scale of health status; SPMSQ, Short Portable Mental Status Questionnaire.

of older adults: non-institutionalized and institutionalized residents without dementia, and institutionalized residents with dementia. The present results suggest that cognitive status and place of residence have an influential role in HRQOL.

The three studied groups presented important differences. Institutionalized residents were approximately 12 years older than individuals living in the community, with a higher proportion of females, and had more chronic diseases, higher level of functional dependence (Barthel Index) and impaired cognition (higher SPMSQ) than community-dwelling participants.

Institutionalized residents with dementia presented lower HRQOL, translated into more problems in the EQ-5D-3L dimensions (especially in self-care, usual activities and mobility), than older adults without dementia, as hypothesized. Also as expected, the community-dwelling older adults presented higher HRQOL than both institutionalized groups. The logistic regression models explaining EQ-5D-3L dimensions in each group showed that a higher functional independence (Barthel Index) was significantly associated with a higher HRQOL (especially in the mobility, self-care and usual activities dimensions) in all groups. A strong association between HRQOL measured by EQ-5D-3L and Barthel Index has been previously reported,³⁴ and various studies showed that functional ability was an important determinant of HRQOL of older adults living in the community and in residential care settings,^{19,35,36} as well as among older adults with dementia.³⁷⁻⁴⁰ Specific rehabilitation programs, modifications in the living environment to enhance functional independence and mobility aids are of great importance for older adults, and in particular for those living with dementia.

In addition to the functional independence, comorbidity was a determinant factor for all dimensions of HRQOL in community-dwelling older adults. The present results also showed that institutionalized older adults without dementia and with greater comorbidity presented more problems in pain/discomfort and anxiety/depression. Previous studies revealed the influ-

ence of chronic health problems on the HRQOL of elderly people,^{20,21} showing that the chronic health conditions that most influenced HRQOL were depression, followed by arthrosis.²⁰ Treating depression and pain might improve HRQOL in older adults.²⁰

Another determinant factor was impaired cognition, measured with the SPMSQ, which was related to a lower HRQOL in non-institutionalized older adults in general, and to more problems in mobility, self-care, usual activities and anxiety/depression dimensions in particular. In this group, cognition has been described to be associated with incident mobility impairment and mobility decline.⁴¹ Initial cognitive problems might be related to a fear of falls, leading to a self-imposed restriction in walking around.⁴²

In contrast, worse cognitive status was a determinant of fewer mobility problems in institutionalized residents independently of dementia status. Negative correlation coefficients between mental status and functional independence or mobility level were found in previous studies,⁴³ and it has been suggested that motoric function and higher-order functions do not necessarily correlate.⁴⁴ Further studies are required to explain this finding.

Other factors that determined HRQOL were age, marital status and sex. Older age, the lack of a partner and being a woman were associated with lower HRQOL in non-institutionalized older adults, especially in the anxiety/depression, pain/discomfort, usual activities and mobility dimensions. These demographic factors have been commonly associated with HRQOL.² Older widowed women are a vulnerable group that should be assessed and are special targets for intervention.

Although the current study contributed to the understanding of the factors associated with HRQOL by cognitive status and place of residence, some limitations should be noted. First, it is not possible to generalize the findings to the population of older adults with or without dementia living in nursing homes in Spain, because we did not have a nationally representative sample, even if the selected nursing homes proceeded

Quality of life of older adults

Table 4 Logistic regression models for EQ-5D dimensions by group

Variables	Non-institutionalized (<i>n</i> = 1106)	Institutionalized without dementia (<i>n</i> = 234)	Institutionalized with dementia (<i>n</i> = 475)
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Mobility			
Sex (women)	1.21 (0.81–1.80)	1.34 (0.66–2.71)	0.61 (0.26–1.41)
Age	1.05 (1.03–1.08)	1.02 (0.97–1.07)	1.08 (1.03–1.13)
Education level (no education or less than primary)	1.28 (0.87–1.88)	1.06 (0.54–2.06)	1.27 (0.66–2.43)
Children (yes)	1.32 (0.74–2.37)	1.40 (0.70–2.77)	0.80 (0.41–1.56)
Marital status (married)	0.92 (0.61–1.39)	1.31 (0.48–3.54)	0.85 (0.37–1.96)
Frequency of contacts (never or less than once a month)	1.29 (0.88–1.88)	0.85 (0.41–1.76)	0.61 (0.22–1.69)
Comorbidity	1.41 (1.30–1.52)	1.10 (0.97–1.24)	1.05 (0.93–1.18)
Barthel	0.90 (0.88–0.92)	0.94 (0.91–0.96)	0.94 (0.92–0.95)
SPMSQ	1.27 (1.07–1.51)	0.75 (0.59–0.95)	0.76 (0.62–0.94)
R ² Nagelkerke	0.44	0.35	0.49
Self-care			
Sex (women)	1.53 (0.74–3.17)	1.53 (0.73–3.21)	†
Age	1.04 (1.00–1.09)	0.98 (0.94–1.03)	0.95 (0.85–1.05)
Education level (no education or less than primary)	1.44 (0.76–2.73)	1.60 (0.80–3.19)	0.60 (0.15–2.47)
Children (yes)	0.98 (0.34–2.8)	0.98 (0.48–1.99)	0.73 (0.19–2.80)
Marital status (married)	1.08 (0.53–2.18)	1.50 (0.50–4.49)	†
Frequency of contacts (never or less than once a month)	0.69 (0.36–1.32)	0.60 (0.28–1.31)	1.12 (0.16–7.68)
Comorbidity	1.36 (1.21–1.52)	1.09 (0.96–1.23)	1.02 (0.80–1.32)
Barthel	0.86 (0.84–0.89)	0.93 (0.91–0.96)	0.92 (0.89–0.96)
SPMSQ	1.45 (1.14–1.84)	1.06 (0.82–1.35)	0.85 (0.57–1.28)
Nagelkerke's R ²	0.60	0.43	0.46
Usual activities			
Sex (women)	1.23 (0.77–1.96)	1.59 (0.77–3.29)	0.28 (0.06–1.40)
Age	1.05 (1.02–1.08)	1.02 (0.97–1.07)	1.01 (0.92–1.09)
Education level (no education or less than primary)	1.47 (0.95–2.28)	1.35 (0.69–2.64)	1.35 (0.44–4.12)
Children (yes)	1.70 (0.91–3.15)	1.37 (0.69–2.75)	1.61 (0.48–5.36)
Marital status (married)	0.58 (0.36–0.94)	1.27 (0.44–3.64)	0.59 (0.14–2.49)
Frequency of contacts (never or less than once a month)	1.02 (0.66–1.57)	0.98 (0.47–2.07)	0.83 (0.15–4.57)
Comorbidity	1.30 (1.20–1.41)	1.00 (0.88–1.13)	0.98 (0.80–1.20)
Barthel	0.88 (0.85–0.90)	0.94 (0.92–0.96)	0.93 (0.91–0.96)
SPMSQ	1.43 (1.19–1.71)	0.99 (0.78–1.26)	0.81 (0.59–1.13)
Nagelkerke's R ²	0.51	0.37	0.38
Pain/discomfort			
Sex (women)	1.71 (1.27–2.32)	2.45 (1.25–4.81)	1.35 (0.73–2.49)
Age	1.06 (1.04–1.08)	1.02 (0.97–1.07)	0.99 (0.96–1.02)
Education level (no education or less than primary)	0.97 (0.70–1.33)	1.56 (0.82–2.98)	1.06 (0.68–1.64)
Children (yes)	1.48 (0.92–2.40)	1.05 (0.55–2.01)	1.05 (0.64–1.70)
Marital status (married)	1.21 (0.87–1.68)	0.92 (0.36–2.37)	1.43 (0.80–2.55)
Frequency of contacts (never or less than once a month)	0.85 (0.63–1.14)	2.17 (1.04–4.56)	0.82 (0.39–1.73)
Comorbidity	1.61 (1.49–1.75)	1.23 (1.09–1.40)	1.04 (0.96–1.12)
Barthel	0.96 (0.94–0.98)	1.00 (0.98–1.01)	0.98 (0.97–0.99)
SPMSQ	1.08 (0.92–1.27)	0.91 (0.73–1.14)	0.92 (0.80–1.06)
Nagelkerke's R ²	0.38	0.19	0.09
Anxiety/depression			
Sex (women)	1.80 (1.22–2.66)	1.08 (0.57–2.05)	1.21 (0.67–2.19)
Age	0.98 (0.95–1.00)	1.00 (0.96–1.05)	0.98 (0.95–1.01)
Education level (no education or less than primary)	1.24 (0.86–1.79)	0.93 (0.51–1.69)	0.69 (0.45–1.05)
Children (yes)	1.06 (0.61–1.84)	1.38 (0.74–2.56)	1.09 (0.69–1.74)
Marital status (married)	0.52 (0.35–0.77)	2.06 (0.82–5.17)	0.73 (0.41–1.30)
Frequency of contacts (never or less than once a month)	1.09 (0.77–1.56)	1.37 (0.70–2.68)	0.80 (0.39–1.64)
Comorbidity	1.52 (1.40–1.64)	1.31 (1.16–1.48)	0.96 (0.89–1.03)
Barthel	0.97 (0.96–0.99)	1.00 (0.98–1.01)	0.99 (0.98–1.00)
SPMSQ	1.42 (1.21–1.66)	0.94 (0.76–1.17)	0.90 (0.78–1.03)
Nagelkerke's R ²	0.35	0.17	0.04

†Variables were not included in this model due to null value in one of the categories. SPMSQ, Short Portable Mental Status Questionnaire.

from 10 different Spanish provinces. Second, the information is cross-sectional; longitudinal data would allow for a better evaluation of causal effects of the analyzed factors on HRQOL. Third, the main variable (EQ-5D-3L) was completed by-proxy in residents with dementia. Even though a large number of persons experiencing early or moderate cognitive impairment are able to self-report on their quality of life,¹¹ it was decided to use the by-proxy approach for all the participants with dementia irrespective of the severity of their disease in order to make ratings comparable within this sample. This fact might explain some of the differences in the EQ-5D-3L between the groups: family caregivers could underestimate the HRQOL of the patient due to dementia.⁴⁵ Family members also tend to have a more negative view of the HRQOL of the resident than professional caregivers, especially in the more observable dimensions of the EQ-5D-3L tool.¹⁶ However, proxy-completed and participant-completed EQ-5D-3L have been found to have a good interrater reliability.²⁸ For future directions, it might be interesting to design a study with both proxy- and self-reported ratings in each of the three samples. Fourth, we did not have a sample of community-dwelling older adults with dementia. Future studies should include the comparison of the HRQOL in community-dwelling older adults with different cognitive status.

The present study provides novel data in terms of comparing the EQ-5D-3L scores in older adults by cognitive status (normal cognitive status *vs* dementia) and by place of residence (community or institution). Our results contribute to a better understanding of the HRQOL in old age necessary for designing interventions for maintaining and improving older adults' HRQOL tailored to the group characteristics. Even though the present results were obtained in Spain, they might be applicable to other countries with similar cultures, such as Mediterranean and Hispanic populations.

Differences in HRQOL between older adults living at home or in a nursing home, and with or without dementia were observed. Institutionalized older adults with dementia presented lower HRQOL than non-institutionalized and institutionalized older adults without dementia, and presented more problems in the HRQOL dimensions than the rest of the groups, with the exception of pain/discomfort and anxiety/depression. Lower HRQOL was associated with a higher functional dependence, which was the principal determinant of HRQOL in all groups, and a higher number of chronic diseases. Maintenance and improvement of functional ability might be translated into a higher HRQOL of older adults, with or without dementia, living both in nursing homes and in the community. To this end, efforts devoted to increasing the functional condition in the residential and community environment are of great importance, paying special attention to

risk situations among older adults that could affect their basic activities of daily living.

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Disclosure statement

No potential conflicts of interest were disclosed.

References

- 1 World Health Organization. *Active Ageing: A Policy Framework*. Geneva: World Health Organization, 2002.
- 2 Ferrans CE, Zerwic JJ, Wilbur JE, Larson JL. Conceptual model of health-related quality of life. *J Nurs Scholarsh* 2005; **37**: 336–342.
- 3 Wimo A, Jonsson L, Bond J, Prince M, Winblad B. The worldwide economic impact of dementia 2010. *Alzheimers Dement* 2013; **9** (1): 1–11.
- 4 Lim A, Tsuang D, Kukull W *et al.* Clinico-neuropathological correlation of Alzheimer's disease in a community-based case series. *J Am Geriatr Soc* 1999; **47**: 564–569.
- 5 de Pedro-Cuesta J, Virues-Ortega J, Vega S *et al.* Prevalence of dementia and major dementia subtypes in Spanish populations: a reanalysis of dementia prevalence surveys, 1990–2008. *BMC Neurol* 2009; **19**: 55. doi: 10.1186/1471-2377-9-55.
- 6 Lawton MP. Quality of life in Alzheimer disease. *Alzheimer Dis Assoc Disord* 1994; **8** (Suppl 3): 138–150.
- 7 Brod M, Stewart AL, Sands L, Walton P. Conceptualization and measurement of quality of life in dementia: the dementia quality of life instrument (DQoL). *Gerontologist* 1999; **39** (1): 25–35.
- 8 Whitehouse PJ, Orgogozo JM, Becker RE *et al.* Quality-of-life assessment in dementia drug development. Position paper from the International Working Group on Harmonization of Dementia Drug Guidelines. *Alzheimer Dis Assoc Disord* 1997; **11** (Suppl 3): 56–60.
- 9 Moniz-Cook E, Vernooij-Dassen M, Woods R *et al.* A European consensus on outcome measures for psychosocial intervention research in dementia care. *Ageing Ment Health* 2008; **12** (1): 14–29.
- 10 Ettema TP, Droes RM, de Lange J, Mellenbergh GJ, Ribbe MW. A review of quality of life instruments used in dementia. *Qual Life Res* 2005; **14**: 675–686.

- 11 Logsdon RG, Gibbons LE, McCurry SM, Teri L. Assessing quality of life in older adults with cognitive impairment. *Psychosom Med* 2002; **64**: 510–519.
- 12 Terada S, Ishizu H, Fujisawa Y *et al.* Development and evaluation of a health-related quality of life questionnaire for the elderly with dementia in Japan. *Int J Geriatr Psychiatry* 2002; **17**: 851–858.
- 13 Leon-Salas B, Martínez-Martin P. Revisión de instrumentos de calidad de vida utilizados en personas con demencia (2): instrumentos específicos. *Psicogeriatría* 2010; **2**: 69–82.
- 14 Rabin R, de Charro. F EQ-5D: a measure of health status from the EuroQol Group. *Ann Med* 2001; **33**: 337–343.
- 15 Ankri J, Beaufils B, Novella JL *et al.* Use of the EQ-5D among patients suffering from dementia. *J Clin Epidemiol* 2003; **56**: 1055–1063.
- 16 Bryan S, Hardyman W, Bentham P, Buckley A, Laight A. Proxy completion of EQ-5D in patients with dementia. *Qual Life Res* 2005; **14** (1): 107–118.
- 17 Whitehouse PJ. Pharmacoeconomics of dementia. *Alzheimer Dis Assoc Disord* 1997; **11** (Suppl 5): S22–S32; discussion S32–S33.
- 18 Noro A, Aro S. Health-related quality of life among the least dependent institutional elderly compared with the non-institutional elderly population. *Qual Life Res* 1996; **5**: 355–366.
- 19 Rodríguez-Blázquez C, Forjaz MJ, Prieto-Flores ME, Rojo-Pérez F, Fernández-Mayoralas G, Martínez-Martin P. Health status and well-being of older adults living in the community and in residential care settings: are differences influenced by age? *Aging Ment Health* 2012; **16**: 884–891.
- 20 Delgado-Sanz MC, Prieto-Flores ME, Forjaz MJ *et al.* [Influence of chronic health problems in dimensions of EQ-5D: study of institutionalized and non-institutionalized elderly]. *Rev Esp Salud Pública* 2011; **85**: 555–568.
- 21 Borowiak E, Kostka T. Predictors of quality of life in older people living at home and in institutions. *Aging Clin Exp Res* 2004; **16**: 212–220.
- 22 Andel R, Hyer K, Slack A. Risk factors for nursing home placement in older adults with and without dementia. *J Aging Health* 2007; **19**: 213–228.
- 23 Eska K, Graessel E, Donath C, Schwarzkopf L, Lauterberg J, Holle R. Predictors of institutionalization of dementia patients in mild and moderate stages: a 4-year prospective analysis. *Dement Geriatr Cogn Dis Extra* 2013; **3** (1): 426–445.
- 24 Gaugler JE, Duval S, Anderson KA, Kane RL. Predicting nursing home admission in the U.S: a meta-analysis. *BMC Geriatr* 2007; **19**: 13.
- 25 Luppá M, Luck T, Brahler E, König HH, Riedel-Heller SG. Prediction of institutionalisation in dementia. A systematic review. *Dement Geriatr Cogn Disord* 2008; **26** (1): 65–78.
- 26 Fernández-Mayoralas G, Giraldez-García C, Forjaz MJ, Rojo-Pérez F, Martínez-Martin P, Prieto-Flores ME. Design, measures and sample characteristics of the CadeViMa-Spain survey on quality of life in community-dwelling older adults. *Int Psychogeriatr* 2012; **24**: 425–438.
- 27 American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, 4th edn. Washington, DC: American Psychiatric Association, 1994.
- 28 Díaz-Redondo A, Rodríguez-Blázquez C, Ayala A, Martínez-Martin P, Forjaz MJ. EQ-5D rated by proxy in institutionalized older adults with dementia: psychometric pros and cons. *Geriatr Gerontol Int* 2013; **10**: 346–353.
- 29 Badia X, Roset M, Herdman M, Kind P. A comparison of United Kingdom and Spanish general population time trade-off values for EQ-5D health states. *Med Decis Making* 2001; **21** (1): 7–16.
- 30 Mahoney FI, Barthel DW. Functional evaluation: the Barthel index. *Md State Med J* 1965; **14**: 61–65.
- 31 Miller MD, Paradis CF, Houck PR *et al.* Rating chronic medical illness burden in geropsychiatric practice and research: application of the Cumulative Illness Rating Scale. *Psychiatry Res* 1992; **41**: 237–248.
- 32 Pfeiffer E. A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. *J Am Geriatr Soc* 1975; **23**: 433–441.
- 33 Juniper EF, Guyatt GH, Jaeschke R. How to develop and validate a new health-related quality of life instrument. In: Spilker B, ed. *Quality of Life and Pharmacoeconomics in Clinical Trials*. Philadelphia, PA: Lippincott-Raven Publishers, 1996; 49–56.
- 34 Kaambwa B, Billingham L, Bryan S. Mapping utility scores from the Barthel index. *Eur J Health Econ* 2013; **14**: 231–241.
- 35 Ferrer A, Formiga F, Almeda J, Alonso J, Brotons C, Pujol R. [Health-related quality of life in nonagenarians: gender, functional status and nutritional risk as associated factors]. *Med Clin (Barc)* 2010; **134**: 303–306.
- 36 Sullivan MD, Kempen GI, Van SE, Ormel J. Models of health-related quality of life in a population of community-dwelling Dutch elderly. *Qual Life Res* 2000; **9**: 801–810.
- 37 Baquero M, Peset V, Burguera JA *et al.* [Quality of life in Alzheimer's disease]. *Rev Neurol* 2009; **49**: 337–342.
- 38 McGough EL, Logsdon RG, Kelly VE, Teri L. Functional mobility limitations and falls in assisted living residents with dementia: physical performance assessment and quantitative gait analysis. *J Geriatr Phys Ther* 2013; **36**: 78–86.
- 39 Suttanon P, Hill KD, Said CM, Logiudice D, Lautenschlager NT, Dodd KJ. Balance and mobility dysfunction and falls risk in older people with mild to moderate Alzheimer disease. *Am J Phys Med Rehabil* 2012; **91** (1): 12–23.
- 40 Arrighi HM, Gelinis I, McLaughlin TP, Buchanan J, Gauthier S. Longitudinal changes in functional disability in Alzheimer's disease patients. *Int Psychogeriatr* 2013; **25**: 929–937.
- 41 Buchman AS, Boyle PA, Leurgans SE, Barnes LL, Bennett DA. Cognitive function is associated with the development of mobility impairments in community-dwelling elders. *Am J Geriatr Psychiatry* 2011; **19**: 571–580.
- 42 Donoghue OA, Cronin H, Savva GM, O'Regan C, Kenny RA. Effects of fear of falling and activity restriction on normal and dual task walking in community dwelling older adults. *Gait Posture* 2013; **38** (1): 120–124.
- 43 Dirik A, Cavlak U, Akdag B. Identifying the relationship among mental status, functional independence and mobility level in Turkish institutionalized elderly: gender differences. *Arch Gerontol Geriatr* 2006; **42**: 339–350.
- 44 Akbari S, Lyden PD, Kamali M, Fahimi MA. Correlations among impairment, daily activities and thinking operations after stroke. *NeuroRehabilitation* 2013; **33** (1): 153–160.
- 45 Andresen EM, Vahle VJ, Lollar D. Proxy reliability: health-related quality of life (HRQoL) measures for people with disability. *Qual Life Res* 2001; **10**: 609–619.