

Burden and health-related quality of life of Spanish caregivers of persons with multiple sclerosis

Multiple Sclerosis
15(11) 1347–1355
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DOI: 10.1177/1352458509345917
msj.sagepub.com



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MS) Study Group

Abstract

Little information exists about caregivers of persons with multiple sclerosis (MS). Our aims were to describe the characteristics of a sample of caregivers of persons with MS, assess their perceived burden, health-related quality of life, and investigate factors influencing this burden. We studied 278 caregivers of persons with MS, recruited from a Spanish cross-sectional survey, measuring health-related quality of life by the 36-Item Short-Form Health Survey (SF-36) and burden by the Zarit Caregiver Burden Interview. Of the caregivers, 56.8% were female and their mean age was 50.1 ± 12.6 years. Their main relationship with the person with MS was spouse/partner (52.9%) and son or daughter (25.9%). Caregiver General Health, Mental Health, Bodily Pain, and Role-emotional Functioning were the most affected dimensions on the SF-36. Multiple regression analysis showed that independent and significant predictors of burden were Role-emotional Functioning and Vitality dimensions SF-36 scores of caregivers, and the Expanded Disability Status Scale scores. The total adjusted variance explained by these variables (adjusted R^2) was 0.512. Emotional factors and the disability of the person with MS were major predictors of burden. Psychological and social support should be considered to reduce caregiver burden.

Keywords

Caregivers, health-related quality of life, burden, multiple sclerosis

Date received: 7th May 2009; accepted: 28th June 2009

Introduction

Multiple sclerosis (MS) is one of the most common chronic neurological disorders among young adults.^{1,2} The broad spectrum of symptoms of MS require the patient to adjust and cope with new lifestyle changes and restrictions;^{3,4} in addition, this condition has a considerable impact on the health-related quality of life (HRQoL) experienced by their families.⁵ Family members are usually burdened with a variety of direct and indirect caregiving tasks that may disrupt normal family life as well as daily work.^{6–9} In addition to the strain caused by providing personal care, the changing needs and losses associated with an uncertain and unpredictable outcome may enhance the burden experienced by caregivers.^{10–16} The ability of caregivers to effectively cope with and mobilize support resources in order to assist with the demands and strains of the caregiving situation may affect their own personal health and satisfaction with their family and lifestyle.^{17–19}

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In general, the literature focusing on the burden and HRQoL outcomes of caregivers of persons with MS is still limited. It is important to understand caregiver characteristics and explore the relationship of their level of burden with their HRQoL. This will optimize the use of support and intervention measures and help reduce the negative effects on caregivers' lives. An improved understanding of the severity and correlates of caregiver burden in the population of persons with MS may allow clinicians to better prioritize treatment strategies and be more aware of caregivers' needs.

We previously described the profile of a sample of 91 caregivers of persons with MS from Madrid (Spain).^{12,20} However, this study was restricted to a specific geographic area and we did not analyze the general caregiver HRQoL.^{12,20} The objective of the current study is to describe characteristics of a broader geographic sample of Spanish caregivers of persons with MS and assess their perceived burden and HRQoL, as well as investigate factors that influence this burden.

Materials and methods

General study design

Our sample of patients was derived from 19 Spanish MS outpatient clinics. These outpatient clinics were situated in 13 cities throughout Spain (Madrid city, Móstoles, Fuenlabrada, Getafe, Leganés, Alcorcón, Alcalá de Henares, Segovia, Alcazar de San Juan in Central Spain; Valladolid and Palencia, in North-western Spain; and Badajoz city and Don Benito, in Western Spain), therefore representing a broad geographic sampling. We chose these MS outpatient clinics because they maintain a computer-based registry of persons with MS. In these computer-based registries, basic demographic data of the persons with MS (e.g. age, gender) and clinical variables were recorded. We asked the neurologist of the MS outpatient clinics neurologists to randomly select 15–18 persons with MS from their datasets. These persons should have been formally diagnosed with a minimum disease duration of 6 months, using the Poser criteria,²¹ and be 18 years of age or older. We also asked the neurologist of the MS outpatient clinics to supply medical information related to these persons, including age, gender, Kurtzke Expanded Disability Status Scale (EDSS),²² disease duration (years), time (years) since diagnosis, and any medications.

Persons with MS were asked to provide the name of a primary caregiver, defined for this study as anyone who provides unpaid personal assistance on a regular basis.²³ Caregivers were family members who lived with persons with MS or friends in daily contact. In addition, caregivers had to be responsible for caring for the patient at home and could complete the questionnaires.

All procedures were approved by the University's ethical standards committee on human research. Written (signed) informed consent was obtained from all participants upon enrollment.

Instruments

All caregivers of persons with MS were administered a questionnaire which contained demographic, social and labour data, relationship between the caregiver and the individual with MS, characteristics of the care, support or help from other persons in activities of daily life (ADL), type of formal support services, comorbidities, as well as affiliation to MS associations. Moreover, the caregivers were administered the Spanish version of the Zarit Caregiver Burden interview.^{24,25} This self-administered instrument presents caregivers with a series of 22 questions regarding perceived strain in caring for persons with dementia. The degree to which caregivers endorse each item is rated along five-point Likert-type scales. The range of possible Zarit Caregiver Burden interview scores is 0–88, with higher totals reflecting greater burden.^{24,25} In the administration and scoring instructions for the Spanish version of the instrument, the designer suggested that scores of 0–46 should be considered as consistent with no burden, 47–55 with slight burden, and scores of 56–88 with intense burden.²⁵

General caregiver general HRQoL was measured by means of the Spanish version of the Medical Outcomes Study 36-item Short Form Health Survey (SF-36).^{26,27} The SF-36 questionnaire consists of 36 items divided into 8 scales: Physical Functioning (10 items), Role-physical Functioning (4 items), Bodily Pain (2 items), General Health (5 items), Vitality (4 items), Social Functioning (2 items), Role-emotional Functioning (3 items) and Mental Health (5 items). Results of each scale vary from 0 to 100 (worse to best possible status). Higher scores indicate better HRQoL. The adaptation of this scale to the Spanish language proved reliable and internally consistent.²⁷

Data analysis

Statistical analyses were performed in SPSS Version 15.0 (SPSS, Inc., Chicago, IL). Missing data were handled by excluding cases on an analysis-by-analysis basis. All tests were two sided, and significance was accepted at the 5% level ($\alpha = 0.05$). Descriptive statistics, including mean and standard deviation (SD), were used. Correlation between continuous variables was verified using Pearson's correlation coefficient. For variables with non-parametric distribution, Spearman's correlation coefficient was used. The association between the Zarit Caregiver Burden Interview

total score as the dependent variable and independent variables (person with MS and caregiver's ages, caregiver gender, years as caregiver, number of comorbid conditions of the caregivers, SF-36 dimensions scores, disease duration, time since MS diagnosis, EDSS score, and type of MS) was examined further by using multiple (stepwise) regression analysis. In addition, multiple (stepwise) regression analyses were performed to explain the independent impact of clinical and caregiving variables on each SF-36 dimension.

Results

Of the 316 MS patients who were deemed eligible for the study, 278 (88.0%) were chosen. The remaining 38 subjects were lost to the study because of insufficient medical information. We compared the final 278 cases with the 38 cases without reliable medical information and they were similar in terms of age (43.4 ± 12.8 versus 41.8 ± 12.1 , $t=0.58$, $p=0.56$), and gender (183 [65.8%] versus 22 [57.9%] female, chi-square [χ^2]=0.337, $p=0.37$). The final 278 persons with MS were recruited between June 2006 and November 2007. A caregiver was identified in all 278 persons with MS.

Sociodemographic and clinical characteristics of persons with MS are listed in Table 1. Mean patient age was 43.4 ± 12.8 years and 65.8% were female. The mean disease duration was 11.2 ± 7.1 years (range, 1–33 years). The clinical course was categorized as relapsing–remitting MS ($n=161$, 57.9%), secondary-progressive MS ($n=95$, 34.2%) or primary-progressive MS ($n=22$, 7.9%). The median EDSS score was 4.0 and the range was 0–9.0. Most persons with MS were unemployed or inactive due to MS. Of the persons with MS, 72% were receiving disease-modifying treatments for MS.

Correspondingly, 56.8% of caregivers were female and their mean age was 50.1 ± 12.6 years. Eighty-four percent were married or cohabitant, and most of them were employed or homemakers. They reported an average of 0.4 ± 0.7 comorbid conditions (see Table 2). The majority were spouses or partners of the persons with MS, followed by sons or daughters, and parents (mainly mothers). Mean time as caregiver was 8.5 ± 5.9 years. Zarit Caregiver Burden Interview total scores were 22.0 ± 14.6 . The majority of the caregivers (85.6%) reported no burden using this scale (see Table 2). Additional caregivers' characteristics are listed in Table 2.

Table 3 lists mean scores obtained from the SF-36 dimensions for caregivers. The most affected dimensions of caregivers were General Health Status, Mental Health, Bodily Pain, and Role-emotional Functioning (see Table 3). Correlation coefficients between SF-36 dimensions scores for caregivers and

Table 1. Sociodemographic and clinical characteristics of individuals with multiple sclerosis ($N=278$)

Age in years	43.4 (42.0) \pm 12.8 (17–98)
Gender (female)	183 (65.8%)
Type of MS	
Relapsing–remitting	161 (57.9%)
Secondary progressive	95 (34.2%)
Primary progressive	22 (7.9%)
EDSS score	4.4 (4.0) \pm 2.3 (0–9.0)
Disease duration, in years	11.2 (10.0) \pm 7.1 (1–33)
Time from MS diagnosis, in years	9.4 (8.0) \pm 6.2 (1–30)
Disease-modifying treatments for MS	
Yes	200 (71.9%)
No	78 (28.1%)
Labour status	
Employed	101 (36.3%)
Unemployed	13 (4.7%)
Inactive temporarily by MS	27 (9.3%)
Inactive permanently by MS	75 (27.0%)
Student	10 (3.6%)
Other situations	47 (16.9%)
Unknown	6 (2.2%)
Need for assistance with activities of daily living	
Personal care (washing, dressing or eating)	67 (24.1%)
Meal preparation, shopping or housework	64 (23.0%)
Self-sufficient with supervision	147 (52.9%)

EDSS, Expanded Disability Status Scale; MS, multiple sclerosis; Mean (median) \pm standard deviation (range) and frequency (%) are reported.

other clinical and caregiving variables are listed in Table 4. On almost all dimensions, lower HRQoL scores correlated significantly with caregiver's age and gender, number of comorbid conditions of the caregivers, EDSS score, time since diagnosis, and disease duration (see Table 4). There was no statistically significant correlation between most SF-36 dimensions scores and persons with MS age, years as caregiver, type of MS, or disease-modifying treatment (see Table 4).

Table 5 shows the multivariate linear regression models (stepwise) for caregiver SF-36 dimension scores. Gender (female), caregiver comorbidities, age of the caregiver, and EDSS score were the main predictors of caregiver HRQoL, with regression coefficients ranging from -18.18 (Social Functioning) to -5.87 (Vitality) for gender; -12.82 (Role-physical Functioning) to -4.50 (Vitality) for caregiver comorbidities; -0.74 (Physical Functioning) to -0.26 (Role-emotional Functioning) for age of the caregiver;

Table 2. Demographic and characteristics of caregivers of individuals with multiple sclerosis (N = 278)

Age in years	50.1 (50.0) \pm 12.6 (19–85)
Gender (female)	158 (56.8%)
Marital status	
Single	22 (7.9%)
Married or domestic partnership	235 (84.4%)
Widowed	14 (5.0%)
Separated or divorced	5 (1.8%)
Unknown	2 (0.7%)
Educational level	
Illiterate/Can not read and write	26 (9.4%)
Primary school	122 (43.9%)
Secondary school	78 (28.1%)
University studies	49 (17.6%)
Unknown	3 (1.1%)
Occupation	
Employed	144 (51.8%)
Homemakers	87 (31.3%)
Retired	32 (11.5%)
Student	4 (1.4%)
Unemployed	3 (1.1%)
Other situations	5 (1.8%)
Unknown	3 (1.1%)
Type of relationship	
Spouse/partner	147 (52.9%)
Son/daughter	72 (25.9%)
Parents (mainly mothers)	35 (12.7%)
Brother/sister	13 (4.6%)
Other type of relative	7 (2.5%)
Unknown	4 (1.4%)
Live with the person with multiple sclerosis	
Yes	253 (91.0%)
No	17 (6.1%)
Not regularly	7 (2.5%)
Unknown	1 (0.4%)
Receive help from other people*	233 (83.8%)
Number of individuals helping with caregiving tasks*	1.6 (1.0) \pm 1.1 (0–5)
Years as caregiver	8.5 (7.0) \pm 5.9 (1–32)
Formal support for caregiver (help in home or day center)	
Yes	50 (17.8%)
No	226 (81.5%)
Unknown	2 (0.7%)
Type of formal support for caregiver	
Public	22 (44.0%)
Private	22 (44.0%)
Unknown	6 (12.0%)
Presence of disease	84
Number of comorbid conditions per caregiver†	0.4 (0.0) \pm 0.7 (0–3)

(continued)

Table 2. Continued

Zarit Caregiver Burden Interview total score	22.0 (21.0) \pm 14.6 (0–72)
Zarit Caregiver Burden Interview	
No burden (0 to 46)	238 (85.6%)
Slight burden (47 to 55)	12 (4.3%)
Intense burden (56 to 88)	4 (1.4%)
Incomplete questionnaire	24 (8.6%)

Mean (median) \pm standard deviation (range) and frequency (%) are reported.

*Mainly to replace them in their caring activities when they needed to be absent.

†Most frequently found conditions: musculoskeletal disease ($n=24$), hypertension ($n=20$), depression ($n=11$), cardiac disease ($n=9$), diabetes mellitus ($n=7$), visual deficit ($n=6$), dyspeptic symptoms ($n=5$), thyroid diseases ($n=4$), multiple sclerosis ($n=3$), cephalalgia ($n=2$), chronic obstructive pulmonary disease ($n=2$), cerebral vascular disease ($n=1$), chronic liver disease ($n=1$), malignancy ($n=1$), obesity ($n=1$), psoriasis ($n=1$), idiopathic thrombocytopenia ($n=1$), kidney disease ($n=1$), essential tremor ($n=1$), toxic oil syndrome ($n=1$), and bilateral deafness ($n=1$). A subject could have more than one condition.

Table 3. Scores of SF-36 dimensions of caregivers

Dimension	Scores
Physical Functioning	81.9 (90.0) \pm 22.6
Role-physical Functioning	80.2 (100) \pm 35.7
Bodily Pain	65.5 (72.0) \pm 24.0
General Health	59.3 (60.0) \pm 21.0
Vitality	77.5 (87.5) \pm 23.4
Social Functioning	70.7 (100) \pm 41.4
Role-emotional Functioning	65.6 (68.0) \pm 20.2
Mental Health	62.3 (62.0) \pm 20.6

Mean (median) \pm standard deviation is reported.

and -5.51 (Social Functioning) to -1.11 (Role-emotional Functioning) for EDSS score. Some SF-36 domains scores were also predicted by type of MS (General Health and Social Functioning), age of the individual with MS (Bodily Pain), and disease-modifying treatments (General Health) (see Table 5).

Correlation coefficients between the Zarit Caregiver Burden Interview and SF-36 dimensions scores and other clinical and caregiving variables for caregivers are listed in Table 6. Most clinical and caregiver aspects, but caregiver gender, correlated with the Zarit Caregiver Burden Interview (see Table 6). However, when testing these parameters in further

Table 4. Correlation coefficients between SF-36 dimensions scores of caregivers and other clinical and caregiving variables

Variables	Physical Functioning	Role-physical Functioning	Bodily Pain	General Health	Vitality	Social Functioning	Role-emotional Functioning	Mental Health
Age of the caregiver	-0.425^{***}	-0.217^{***}	-0.231^{***}	-0.159^{**}	-0.158^{**}	-0.050	-0.184^{**}	-0.279^{***}
Caregiver gender (female)	-0.189^{**}	-0.181^{**}	-0.225^{***}	-0.181^{**}	-0.154^{*}	-0.193^{**}	-0.224^{***}	-0.173^{**}
Years as caregiver	-0.083	-0.045	-0.093	-0.015	-0.107	-0.038	-0.047	-0.087
Caregiver comorbidities	-0.268^{***}	-0.302^{***}	-0.294^{***}	-0.220^{***}	-0.187^{**}	-0.121^{*}	-0.105	-0.378^{***}
Age of the person with MS	-0.113	-0.043	-0.176^{**}	-0.097	-0.155^{*}	-0.050	-0.109	-0.100
EDSS	-0.214^{***}	-0.169^{**}	-0.159^{**}	-0.185^{**}	-0.270^{***}	-0.145^{*}	-0.119^{*}	-0.161^{**}
Type of MS	-0.102	-0.112	-0.038	-0.062	-0.174^{**}	-0.061	-0.077	-0.124^{*}
Time from MS diagnosis	-0.214^{***}	-0.140^{*}	-0.189^{***}	-0.101	-0.265^{**}	-0.142^{*}	-0.118	-0.119^{*}
Disease duration	-0.219^{***}	-0.137^{*}	-0.195^{***}	-0.100	-0.220^{***}	-0.141^{*}	-0.105	-0.134^{*}
Disease-modifying treatments	-0.082	-0.048	-0.127^{*}	-0.116	-0.121^{*}	-0.045	-0.092	-0.122^{*}

EDSS, Expanded Disability Status Scale; MS, Multiple sclerosis. Correlation values are Pearson correlations coefficients, with the exception of the association between caregiver gender, EDSS, type of MS, and disease-modifying treatments with SF-36 dimensions, which are expressed in Spearman correlations coefficient.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5. Multivariate linear regression models (stepwise) explaining the independent impact of clinical and caregiving variables on each SF-36 dimension

Variables	Physical Functioning	Role-physical Functioning	Bodily Pain	General Health	Vitality	Social Functioning	Role-emotional Functioning	Mental Health
Age of the caregiver	-0.74*** -0.96, -0.52	-0.48** -0.83, -0.12	-0.33** -0.57, -0.09	-	-	-	-0.26* -0.47, -0.06	-0.42*** -0.61, -0.22
Caregiver gender	-	-9.24* -17.75, -0.73	-7.81** -13.62, -2.0	-8.50** -13.70, -3.30	-5.87* -11.64, -0.10	-18.18** -28.34, -8.02	-8.75** -13.78, -3.72	-
Years as caregiver	-	-	-	-	-	-	-	-
Caregiver comorbidities	-5.45** -9.0, -1.90	-12.82*** -18.55, -7.10	-7.11*** -11.0, -3.23	-5.58** -9.14, -2.03	-4.50* -8.43, -0.56	-	-	-9.63*** -12.89, -6.37
Age of the person with MS	-	-	-0.31** -0.54, -0.08	-	-	-	-	-
EDSS	-	-	-	-2.90*** -4.44, -1.30	-2.48*** -3.73, -1.23	-5.51** -8.61, -2.41	-1.11* -2.20, -0.02	-
Type of MS	-	-	-	8.08** 2.13, 14.03	-	12.12* 0.82, 23.41	-	-
Time from MS diagnosis	-	-	-	-	-	-	-	-
Disease duration	-	-	-	-	-	-	-	-
Disease-modifying treatments	-	-	-	-7.23* -13.06, -1.41	-	-	-	-
Total adjusted R ²	0.210	0.136	0.159	0.115	0.091	0.072	0.087	0.204

EDSS, Expanded Disability Status Scale; MS, multiple sclerosis. Results represent regression coefficients and their 95% confidence intervals (CI) for variables which were retained into each multiple regression model.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 6. Correlations between Zarit Caregiver Burden Interview total score, dimensions of 36-Item Short-Form Health Survey and other clinical and caregiving variables

Clinical and caregiving variables	Zarit Caregiver Burden Interview total score	p-value
SF-36 dimensions (caregivers)		
Physical Functioning*	−0.364	<0.001
Role-physical Functioning*	−0.299	<0.001
Bodily Pain*	−0.355	<0.001
General Health*	−0.539	<0.001
Vitality*	−0.570	<0.001
Social Functioning*	−0.405	0.001
Role-emotional Functioning*	−0.576	<0.001
Mental Health*	−0.443	<0.001
Caregiver aspects		
Age of the caregiver*	0.161	0.011
Caregiver gender**	−0.037	0.563
Years as caregiver*	0.184	0.005
Caregiver comorbidities*	0.159	0.011
Person with MS aspects		
Age of the person with MS*	0.301	<0.001
EDSS**	0.440	<0.001
Type of MS**	0.289	<0.001
Time from MS diagnosis*	0.308	<0.001
Disease duration*	0.323	<0.001
Disease-modifying treatments**	0.132	0.036

EDSS, Expanded Disability Status Scale; MS, multiple sclerosis.

*Pearson correlation coefficient.

**Spearman correlation coefficient.

multiple linear regression analyses, variables that remained significant in the final model were Role-emotional Functioning and Vitality SF-36 dimensions score of caregivers and the EDSS score. The total adjusted variance explained by these variables (adjusted R^2) was 0.512. The remaining SF-36 dimensions, persons with MS and caregiver's age, caregiver gender, time since diagnosis, disease duration, type of MS, disease-modifying treatment, years as caregiver, and comorbidities made no significant contribution to the variance in Zarit Caregiver Burden Interview total score.

Discussion

This study highlights the significant effect that the progressive physical impairment and other non-motor symptoms (e.g. fatigue, depression, and cognitive impairment) common in MS^{28,29} have on those providing care to persons with MS. In the current study, we observed that the typical caregiver was an

adult female, married to the individual with MS, and who did not benefit from formal support services. The high number of female caregivers in our study may be due to Spanish cultural characteristics, which reinforce the role of the female as the caregiver for all members of the family; something that is gradually evolving, but nonetheless remains a deep-rooted feature of Spanish society.^{12,30}

We used a valid and reproducible specific questionnaire to assess burden of care (Zarit Caregiver Burden Interview)^{24,25} and an instrument to measure HRQoL (SF-36).^{26,27} Specifically, both instruments have been validated in Spanish.^{25,27} With respect to burden, 85.6% of all caregivers reported perceiving no burden. It would seem that caregivers of persons with MS felt less burdened than caregivers of persons with dementia or Parkinson's disease (PD).^{31,32} The possible explanation for this result is that there is more of a cognitive and behavioral effect with dementia and PD than in MS.^{28,31,32} Interestingly, the level of burden in our study was much less than that found in another previous study from Spain.^{12,20} This may be due to the different methodology used. In the other Spanish study,^{12,20} the Zarit Caregiver Burden interview was implemented by a researcher who interviewed the caregiver directly, whereas questionnaires were completed by caregivers in the current study.

Through multivariate analysis, we were able to identify emotional and vitality aspects of caregivers and physical features (i.e. disability) of patients as independent predictors of caregiver burden. These three aspects explained most of the variance in the Zarit Caregiver Burden Interview.^{24,25} The presence of emotional problems in caregivers can have an influence on the burden of disease on their lives and impair their capacity to cope with symptoms of stress, accentuating its effects. In this sense, some studies have shown an association between caregiver depression and negative effects on his or her life.^{33,34}

With respect to HRQoL, the most affected SF-36 dimensions of caregivers were General Health Status, Mental Health, Bodily Pain, and Role-emotional Functioning. Multivariate analysis demonstrated that caregiver gender (female), caregiver comorbidities, age of the caregiver, as well as EDSS score were the main predictors of low levels of HRQoL in the caregiver. Specifically, gender (female) was significantly associated with the majority of SF-36 dimensions. Previous studies investigating the effects of caregiver role and gender have found similar results.^{8,11,35} Patti et al.,⁸ for example, demonstrated that male spousal caregivers had higher scores than female spousal caregivers on almost all SF-36 dimensions. The researchers attributed these results to the fact that men, particularly those involved in spousal caregiving, perceived less

psychological stress or were able to cope better with caregiving than their female counterparts or other caregiving relatives.⁸ In general, results of multivariate analysis are in agreement with previous research on HRQoL of MS caregivers.^{8,11,14,23}

To the best of our knowledge, this is the first study highlighting the relationship between caregiver burden and all SF-36 dimensions, suggesting that decreases in burden would lead to an improvement in the well-being of the caregiver.

There are further caregiver features worthy of mention. First, social support, by means of other family members in caring for the persons with MS, is an aspect that has been scarcely described.^{12,20} In the current study, the family structure continues to be an important source of support for the caregiver, inasmuch as it can enhance caregivers' well-being and diminish their burden. Second, the use of formal support services is low compared with other countries,³² indicating that formal care is still poorly established in Spain.

We acknowledge several limitations of this study. First, we recruited a group of persons with MS (i.e. patients seen in several outpatient clinics) and, as a consequence, our results may not be generalized to population-dwelling caregivers of persons with MS. Therefore, we acknowledge the need to replicate these findings in a population-based survey of unselected patients and caregivers. Second, we collected data at one point in time. Thus, we do not know whether the factors explaining the variance would be maintained in a longitudinal study. Longitudinal studies of caregiver burden in MS are needed to characterize the stability and evolution of this problem within the natural history of the disease process. Furthermore, this study did not take into consideration the personal attributes of caregivers, such as their skill, or aspects of HRQoL of persons with MS, which have been shown to be closely linked to caregiver's well-being.^{12,20} On the other hand, this study had considerable strengths. The study design also allowed us to assess caregiver burden and HRQoL in parallel in several Spanish communities. Very few studies evaluated the impact of MS on HRQoL of persons with MS caregivers, and none except the present study focused specifically on both perceived burden and HRQoL. Finally, we were able to consider a variety of confounding comorbidities and adjust for these in our analyses in order to distinguish the impact of MS from that of other medical conditions.

In conclusion, MS caregivers should be better prepared to care and participate in educational programs. In addition, access to supportive management structures should be facilitated. It would be desirable for all MS outpatient clinics to have a social worker actively providing counseling and support to persons with MS and their caregivers. Emotional and vitality

aspects of caregivers as well as disability of persons with MS are important predictors of burden. Rehabilitation for disability among the persons with MS and psychological and social support among the caregivers should therefore be considered to reduce caregiver burden.

Acknowledgements

The study was supported by an educational grant from Bayern. The authors gratefully acknowledge the vital help of the other members of the CAREQOL-MS Study Group: Virginia de las Heras ('San Carlos' Clinic Hospital, Madrid), José Balseiro (Getafe University Hospital, Getafe, Madrid), Elena Rodríguez García (Hospital 'Severo Ochoa', Leganés, Madrid), Ángel Luis Guerrero (Hospital 'Río Carrión', Palencia), Ambrosio Miralles (University Hospital 'La Paz', Madrid), Marisa Martínez Ginés (University Hospital 'Gregorio Marañón', Madrid), Lucía Ayuso (University Hospital 'Príncipe de Asturias', Alcalá de Henares, Madrid), Monserrat Gómez Gutiérrez (Hospital 'San Pedro de Alcántara', Cáceres), Carmen Durán Herrera (University Hospital 'Infanta Cristina', Badajoz), M^a Rosa García Montero (Hospital 'Virgen de la Salud', Toledo), Ignacio López-Zuaco Aroca (Hospital 'Mancha-Centro', Alcázar de San Juan, Ciudad Real), Amelia Mendoza (Segovia General Hospital, Segovia), and José Hernández Ramos (Don Benito Hospital, Don Benito, Badajoz). We also wish to express our sincere thanks to all of the individuals with MS and their caregivers. We also thank Eileen Ríos, BS, who critiqued late stage drafts of the paper. Finally, we also acknowledge the contribution provided by Dr Pablo Martínez for his advice. The authors report no conflicts of interest.

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