Multiple Sclerosis and Related Disorders 64 (2022) 103969

Contents lists available at ScienceDirect

Multiple Sclerosis and Related Disorders

journal homepage: www.elsevier.com/locate/msard

Original Article

Long-term prognosis communication preferences in early-stage relapsing-remitting multiple sclerosis

Tamara Castillo-Triviño [a], Rocío Gómez-Ballesteros [b,*], Mónica Borges [c], Jesús Martín-Martínez [d], Javier Sotoca [e], Ana Alonso [f], Ana B. Caminero [g], Laura Borrega [h], José L. Sánchez-Menoyo [i], Francisco J. Barrero-Hernández [j], Carmen Calles [k], Luis Brieva [l], María R. Blasco-Quílez [m], Julio Dotor García-Soto [c], María del Campo-Amigo [n], Laura Navarro-Cantó [o], Eduardo Agüera [p], Moisés Garcés-Redondo [q], Olga Carmona [r], Laura Gabaldón-Torres [s], Lucía Forero [t], Mariona Hervás [u], Jorge Mauriño [b], Susana Sainz de la Maza [v]

[a] Department of Neurology, Hospital Universitario Donostia, San Sebastián, Spain
[b] Medical Department, Roche Farma, Madrid, Spain
[c] Department of Neurology, Hospital Universitario Virgen Macarena, Sevilla, Spain
[d] Department of Neurology, Hospital Universitario Miguel Servet, Zaragoza, Spain
[e] Department of Neurology, Hospital Universitari Mútua Terrassa, Terrassa, Spain
[f] Department of Neurology, Hospital Regional Universitario de Málaga, Málaga, Spain
[g] Department of Neurology, Complejo Asistencial de Ávila, Ávila, Spain
[h] Department of Neurology, Hospital Universitario Fundación Alcorcón, Alcorcón, Spain
[i] Department of Neurology, Hospital de Galdakao-Usansolo, Galdakao, Spain
[j] Department of Neurology, Hospital Universitario Clínico San Cecilio, Granada, Spain
[k] Department of Neurology, Hospital Universitari Son Espases, Palma de Mallorca, Spain
[l] Department of Neurology, Hospital Universitari Arnau de Vilanova, Lleida, Spain
[m] Department of Neurology, Hospital Universitario Puerta de Hierro, Madrid, Spain
[n] Department of Neurology, Complexo Hospitalario Universitario de Pontevedra, Pontevedra, Spain
[o] Department of Neurology, Hospital General Universitario de Elche, Elche, Spain
[p] Department of Neurology, Hospital Universitario Reina Sofía, Córdoba, Spain
[q] Department of Neurology, Hospital Clínico Universitario Lozano Blesa, Zaragoza, Spain
[r] Department of Neurology, Fundació Salut Empordà, Figueres, Spain
[s] Department of Neurology, Hospital Francesc de Borja, Gandía, Spain
[t] Department of Neurology, Hospital Universitario Puerta del Mar, Cádiz, Spain
[u] Department of Neurology, Consorci Corporació Sanitària Parc Taulí, Sabadell, Spain
[v] Department of Neurology, Hospital Universitario Ramón y Cajal, Madrid, Spain

ARTICLE INFO

Keywords:
Relapsing-remitting multiple sclerosis
Long-term prognosis communication
Early-stage
Patients' preferences
Shared decision-making

ABSTRACT

Background: Multiple sclerosis is one of the most common causes of neurological disability in young adults with major consequences for their future lives. Improving communication strategies on prognosis may help patients deal with the disease and adjust their long-term life goals. However, there is limited information on patients' preferences of long-term prognosis (LTP) communication and associated factors.
Objective: The aim of this study was to describe patients' preferences and assess the factors associated with LTP communication preferences in early-stage relapsing-remitting multiple sclerosis (RRMS) patients.
Methods: A multicenter, non-interventional study was conducted. Adult patients with a diagnosis of RRMS, a disease duration from first attack ≤ 3 years, and an Expanded Disability Status Scale (EDSS) score of 0-5.5 were included. The Prognosis in MS questionnaire was used to assess how much patients want to know about their LTP. Different patient-reported measures were administered to gather information on symptom severity, pain, fatigue, mood/anxiety, quality of life, stigma, illness perception, feeling of hopelessness, self-efficacy, information avoidance and coping strategies. Cognition was assessed using the Symbol Digit Modalities Test (SDMT). A

* Corresponding author at: Ribera del Loira, 50 (28042) Madrid, Spain.
E-mail address: rocio.gomez@roche.com (R. Gómez-Ballesteros).

https://doi.org/10.1016/j.msard.2022.103969
Received 24 February 2022; Received in revised form 23 May 2022; Accepted 13 June 2022
Available online 14 June 2022

multivariate logistic regression analysis was performed to assess the association between LTP information preference and demographic and clinical characteristics, as well as patients' perspectives.
Results: A total of 189 patients were included (mean age: 36.1 ± 9.4 years, 71.4% female, mean disease duration: 1.2 ± 0.8 years). Median EDSS score was 1.0 (IQR = 0.0-2.0). A proportion of 68.5% (n = 126) of patients had never discussed LTP with their neurologists, whereas 69.2% (n = 126) reported interest in knowing it (73.5% at diagnosis). Bivariate analyses suggested that patients were significantly more likely to have higher LTP information preferences if they were male and had a lower SDMT score. Male gender and a lower SDMT score were predictors of LTP information preferences.
Conclusions: Patients with early-stage RRMS want to discuss their LTP shortly after diagnosis. Understanding the factors involved may be useful to design individualized communication strategies.

1. Introduction

Multiple sclerosis is one of the most common causes of neurological disability in young adults with major consequences for their future lives (Conway et al., 2010; Kaufmann et al., 2020). Most patients with relapsing-remitting multiple sclerosis (RRMS) are diagnosed between 20-40 years of age, when they are about to make long-term life decisions (George et al., 2016). Relapses, progression, and symptoms are unpredictable in the disease, which gives uncertainty to patients' lives and affects their adjustment and well-being (Dennison et al., 2009; Carey et al., 2021). However, even though prognostication remains a challenging task with variable outcomes in MS patients, there is increasing evidence that demographic and clinical factors such as age at disease onset, gender, topography and number of lesions, or presence/absence of oligoclonal bands may decrease some of the uncertainty and guide neurologists when establishing the patient's disease course and disability milestones (Tintore et al., 2015; Manouchehrinia et al., 2019; Rotstein et al., 2019; Tintore et al., 2020).

Patient-centered care addresses patients' needs and preferences, offering individually designed information that will enable patients to have an active role in decisions concerning their health (Truglio-Londrigan et al., 2012). Nevertheless, these needs and preferences are not always established or reviewed through the course of the disease, and may vary depending on the contextual, clinical, social and psychological circumstances (Eskyte et al., 2019). In fact, a high percentage of MS patients claim to have never discussed their long-term prognosis (LTP) with healthcare professionals or to lack clarity about it, showing willingness to learn more about this issue. Understanding LTP is considered to be useful by MS patients for decisions regarding treatment, financial planning or job matters, among others (Dennison et al., 2018; Carnero Contentti et al., 2020; Kosch et al., 2021).

Improving communication strategies on prognosis may help patients deal with their condition and adjust their long-term life, especially if achieved at the start of disease. Thus, the aim of this study was to describe patients' preferences and assess the factors associated with LTP communication in early-stage RRMS patients.

2. Methods

2.1. Study design

We conducted a multicenter, non-interventional, cross-sectional study (MS-ONSET study). Key eligibility criteria included age 18 years and older, a diagnosis of RRMS according to the 2017 revised McDonald criteria, a disease duration from first attack $\leq$3 years, and an Expanded Disability Status Scale (EDSS) score from 0 to 5.5 (Kurtzke, 1983; Thompson et al., 2018). Patients were consecutively recruited in the context of their follow-up visits at 21 hospital-based neuroimmunology clinics between November 2020 and March 2021. This study was conducted in accordance with the Good Clinical Practice Guidelines of the International Conference on Harmonisation and the ethical principles of the Declaration of Helsinki and was approved by the investigational review board of the Hospital Universitari Arnau de Vilanova (Lleida, Spain). All participants provided written informed consent.

2.2. Outcome measures

Patients' preferences, attitudes, and experiences towards LTP communication were assessed using a 7-item version of the Prognosis in MS questionnaire (Dennison et al., 2018). The 7 questions address how often patients discuss their LTP during neurology appointments, who proposes the topic, their clarity about it, their willingness to know, how often they think about it, whether they discuss their LTP with other people, and whether they consider knowing their LTP important for making family, job, relationship and financial planning decisions.

The SymptoMScreen (SyMS), Visual Analogue Scale (VAS), 5-item Modified Fatigue Impact Scale (MFIS-5), Hospital Anxiety and Depression Scale (HADS), Symbol Digit Modalities Test (SDMT), Multiple Sclerosis Impact Scale (MSIS-29), Stigma Scale for Chronic Illness 8-item version (SSCI-8), and Brief Illness Perception Questionnaire (B-IPQ) were used to gather information on symptom severity, pain, fatigue, mood/anxiety, cognition, quality of life, stigma, and illness perception, respectively. Aspects of patient's behavior and self-management such as self-efficacy, hopelessness, information avoidance and coping style were measured with General Self-Efficacy Scale (GSES), State-Trait Hopelessness Scale (STHS), Miller Behavioral Style Scale (MBSS), and Brief-COPE, respectively.

The SyMS is a validated, self-report questionnaire assessing MS symptom severity across twelve neurologic domains (Green et al., 2017; Meca-Lallana et al., 2020). The total score ranges from 0 to 72, with higher scores indicating more severe symptom endorsement. The VAS is a tool used to measure pain. The patient rates the intensity of the pain experienced on a 100 mm scale, from no pain to pain as bad as it could be (Gurkan et al., 2018). The MFIS-5 is a brief self-assessment tool for measuring the impact of fatigue on cognitive, physical and psychosocial function (Meca-Lallana et al., 2019). The total score ranges from 0 to 20, with higher scores indicating more severe fatigue. The HADS is a fourteen-item, self-assessment scale to measure symptoms of anxiety and depression (Zigmond et al., 1983). A total subscale score of >10 points out of 21 indicates a probable case of anxiety or depression, respectively. The SDMT measures patient attention, concentration, and speed of information processing and is a sensitive screening tool to evaluate cognitive impairment in patients with MS (Sandry et al., 2021). A cut-off of $\leq$ 49 correct substitutions was used to identify participants with cognitive problems (Lopez-Gongora et al., 2015). The MSIS-29 is a condition-specific, self-reported questionnaire for measuring the impact of MS on people's lives (Hawton et al., 2012). It has two subscales: a 20-item physical impact scale and a 9-item psychological impact scale, where higher scores indicate a greater impact. The SSCI-8 (Molina et al., 2013; Ballesteros et al., 2019) is an eight-item scale developed to assess internalized and experienced stigma across neurological conditions. A cut-off score >8 indicates the presence of stigmatization (Perez-Miralles et al., 2019). The B-IPQ (Broadbent et al., 2006), consists of eight items graded on a linear 0–10 response scale, used to measure cognitive and emotional illness representation, and shown to be a valid and reliable measure in MS (Dennison et al., 2010). The GSES assesses optimistic self-beliefs to cope with a variety of difficult demands in life. Higher scores correspond to higher self-efficacy (Luszczynska et al., 2005). The STHS is a reliable and valid tool that helps to discriminate in which

patients hopelessness represents a state in response to a new event coming to their lives from those in which it reflects a patient's habitual trait (Dunn et al., 2014). A total score is achieved for each of the subscales (State and Trait) and higher scores indicate a higher hopelessness level. The MBSS is a measure of coping dispositions that consists of hypothetical stressful situations (i.e. threat of the dentist, the threat of being laid off work). Each situation is followed by eight potential responses, half of the statements are of an information-seeking variety, which is monitoring, whereas the remaining describe avoidance of information, or blunting. Patients are divided into information seekers (high monitors)/information avoiders (low monitors) and distractors (high blunters)/nondistractors (low blunters) on the basis of their scores (Miller, 1987). The Brief-COPE (Carver, 1997) is a 28 item self-reported questionnaire designed to measure effective and ineffective ways to cope with a stressful life event. This abbreviated inventory is comprised of items that assess how often a person uses different coping strategies (e.g., "I've been turning to work or other activities to take my mind off things", "I've been criticizing myself").

2.3. Methodological approach

Demographic and clinical characteristics were summarized using frequencies (percentages) and means (standard deviations). Current LTP information preference was dichotomized as having higher preferences (answers "want to know a lot" and "want to know a little" in the Prognosis in MS questionnaire) and having lower preferences ("unsure" or "don't want to know"). Bivariate analysis were performed using linear regression to determine if the independent sociodemographic, clinical, and patient-reported variables correlated with patients' preference in knowing long-term prognosis. Subsequently, a multivariate logistic regression was performed with those variables obtaining a p-value <0.1 in the bivariate analysis. To select the best model, we used the Akaike information criterion (AIC).

3. Results

A total of 191 consecutive patients were screened for the study, but two of them were excluded for being under the age of 18. Thus, a total of 189 patients were finally included. The mean age was 36.1 years and 71.4% were female. The mean disease duration was 1.2 years and median EDSS score was 1.0. A proportion of 69.8% of patients were receiving a disease modifying therapy (59.7% had just started their first treatment, whereas 10.1% had already received previous treatments). Symptom severity was low, and a considerable proportion of patients (43.1%) had information processing speed problems measured by SDMT. The prevalence of stigma was 56.6% and almost 25% of patients were categorized as probable cases of anxiety. Sociodemographic and clinical characteristics of the sample are shown in Table 1.

One hundred twenty-six patients (68.5%) had never discussed their LTP during neurology appointments with their healthcare professionals and 56.5% claimed to have "no idea" about it. Similar percentage of patients (69.2%) reported interest in knowing about it, whereas most of the respondents (73.5%) were interested in having known their LTP at the time of diagnosis. About half of the participants considered knowing the LTP could influence their decisions on treatment (54.8%), job matters (48.4%), family (45.7%) and financial planning (45.2%) (Table 2). It should be noted that although the percentage of patients who had never discussed LTP and the percentage of those with interest in knowing LTP were similar, these groups are distinct. Of the 126 patients who had never discussed long-term prognosis, 54 (42.9%) wanted to know a lot about it, 24 (19%) a little, 26 (20.6%) were not sure, and 17 (13.5%) did not want to know about it, while 5 (4%) patients did not answer this question.

Having higher preferences for LTP communication was more frequent in men and in those with information processing speed impairment ($p < 0.001$ and $p = 0.029$, respectively, Table 3). No association was found with other patient characteristics.

Table 1
Sociodemographic and clinical characteristics.

Variables	N = 189
Age, years, mean (SD)	36.1 (9.4)
Gender (female), n (%)	135 (71.4)
Education, n (%)	
University	151 (79.9)
Living status, n (%)	
With a partner/family member	164 (86.8)
Time since diagnosis, years, mean (SD)	1.1 (0.8)
Time since first attack, years, mean (SD)	1.2 (0.8)
Number of relapses since first attack, mean (SD)	1.8 (8.4)
Number of relapses in the last year, mean (SD)	0.9 (1.0)
Number of patients on disease modifying therapy, n (%)	132 (69.8)
EDSS score, median (IQR)	1.0 (0-2.0)
SDMT score, mean (SD)	51.7 (14.7)
≤49 correct answers, n (%)	81 (43.1)
SyMS score, mean (SD)	12.0 (10.8)
MFIS-5 global score, mean (SD)	6.2 (5.1)
SSCI-8 global score, mean (SD)	10.4 (3.9)
Stigma prevalence (total score >8), n (%)	107 (56.6)
HADS	
Anxiety global score, mean (SD)	7.8 (4.3)
Depression global score, mean (SD)	4.1 (3.9)
Anxiety categorized (probable cases), n (%)	47 (24.9)
Depression categorized (probable cases), n (%)	13 (6.9)
MSIS-29	
Physical impact, mean (SD)	29.2 (11.3)
Psychological impact, mean (SD)	17.2 (6.6)
B-IPQ total score, mean (SD)	38.0 (11.8)
Brief-COPE 28	
Positive strategies, mean (SD)	6.1 (1.7)
Negative strategies, mean (SD)	3.1 (1.6)
STHS	
Total score on state, mean (SD)	19.8 (5.4)
Total score on trait, mean (SD)	25.6 (6.2)
MBSS	
Total monitoring, mean (SD)	2.6 (1.8)
Total blunting, mean (SD)	1.6 (1.4)
GSES total score, mean (SD)	3.0 (0.9)

B-IPQ, Brief Illness Perception Questionnaire; EDSS: Expanded Disability Status Scale; GSES, Generalized Self-Efficacy Scale; HADS: Hospital Anxiety and Depression Scale; IQR: Interquartile range; MBSS, Miller Behavioral Style Scale; MFIS-5: 5-item Modified Fatigue Scale; MSIS-29, Multiple Sclerosis Impact Scale; SD: Standard deviation; SDMT: Symbol Digit Modalities Scale; SSCI-8: Stigma Scale for Chronic Illness 8-item version; STHS, State-Trait Hopelessness Scale; SyMS: SymptoMScreen.

Bivariate analyses suggested that patients were significantly more likely to have higher LTP information preferences if they were male and had a lower SDMT score. Male gender and a score below 49 in the SDMT were predictors of LTP information preferences in the multivariate logistic regression (Table 4).

4. Discussion

Understanding patients' preferences and needs through the course of the disease is important for reaching a patient-centred approach in MS. Although there is increasing evidence about patients prognosis communication experiences in MS, studies are limited and there is still a need for further research (Dennison et al., 2016; Dennison et al., 2018; Carnero Contentti et al., 2020; Kosch et al., 2021). In this respect, this is the first study assessing early-stage RRMS patients' experiences in LTP communication, and their preferences and associated factors. Overall, we found that most patients had never discussed LTP with their clinicians and had a desire for doing so. Higher LTP preferences were observed in patients with male gender and information processing speed problems.

The period surrounding MS diagnosis has been reported as emotionally intense, with feelings of fear, anxiety, and hopelessness, but relieving as diagnosis is disclosed (Solari, 2014; Carey et al., 2021;

Table 2
Long-term prognosis communication experiences and preferences (n = 188).

Survey item	Answer options	N[a] (%)
Has your long-term prognosis ever been discussed during your neurology appointments?	Yes	58 (31.5)
	No	126 (68.5)
Who brought up the topic of long-term prognosis during your appointments?[b]	Patient	28 (48.3)
	Neurologist	38 (62.5)
	MS nurse	4 (6.9)
	Family member/ friend	7 (12.1)
	Do not know/cannot remember	2 (3.5)
How clear are you about your long-term prognosis?	No idea	96 (56.5)
	Very rough idea (20 years)	35 (20.6)
	Rough idea (10 years)	20 (11.8)
	Accurate idea (5 years)	10 (5.9)
	Very accurate idea (2 years)	9 (5.3)
Please indicate how much you want to know your long-term prognosis right now	Want to know a lot	82 (45.1)
	Want to know a little	44 (24.2)
	Not sure	36 (19.8)
	Do not want to know	20 (11.0)
Please indicate how much you would have wanted to know your long-term prognosis around the time you had your diagnosis	Wanted to know a lot	83 (45.9)
	Wanted to know a little	50 (27.6)
	Not sure	30 (16.6)
	Did not want to know	18 (9.9)
Roughly how often do you think about your long-term prognosis?	Daily	41 (22.2)
	Weekly	31 (16.8)
	Monthly	28 (15.1)
	Once a year	7 (3.8)
	Rarely	65 (35.1)
	Never	13 (7)
Do you think that knowing a reliable long-term prognosis will affect your current decisions about[b]	Treatment	103 (54.8)
	Relationships	66 (35.1)
	Family planning	86 (45.7)
	Job matters	91 (48.4)
	Financial planning	85 (45.2)

[a] Number of responders is different for each question due to missing data. % is calculated as % of respondents who provided data for the specific item. [b]Multiple response option.

Nissen et al., 2021). The latest diagnostic criteria have reduced this time period (Thompson et al., 2018; Tintore et al., 2021), which in our cohort was only 0.1 years, making patients face new challenges and decisions rapidly after first symptom presentation. This together with the unpredictability and uncertain prognosis of RRMS can be critical for emotional wellbeing and adjustment to the disease. Thus, communication at this point may be an important matter for patients when establishing a trusting long-term relationship with clinicians and interventions have been shown to significantly increase informed choice and risk knowledge decisions (Edwards et al., 2008; Dennison et al.,

Table 3
Relationships between sociodemographic, clinical and patient-reported outcomes and long-term communication preferences.

Variables	Current long-term prognosis information preference (dichotomized: higher/lower)		
	Higher (n = 126)	Lower (n = 56)	*P*-value
Age[a]	36.4 ± 9.60	35.9 ± 8.70	0.89
Gender[b]			<0.001
Female	80 (63.5)	50 (89.3)	
Male	46 (36.5)	6 (10.7)	
Educational level[b]			0.372
University	67 (53.2)	23 (41.1)	
Higher than secondary/professional training	36 (28.6)	19 (33.9)	
Secondary	14 (11.1)	11 (19.6)	
Primary	7 (5.6)	3 (5.4)	
Lower than primary education	2 (1.6)	0	
Living status[b]			0.45
Lives alone	13 (10.4)	8 (14.8)	
Lives with partner/family	112 (89.6)	46 (85.2)	
Employment status[b]			0.124
Active	87 (69.0)	36 (64.3)	
Unemployed	12 (9.5)	12 (21.4)	
Retired	1 (0.8)	0	
Other	26 (20.6)	8 (14.3)	
Disease duration[a]	1.27 ± 0.83	1.19 ± 0.75	0.57
EDSS at diagnosis[a]	1.43 ± 0.97	1.41 ± 1.20	0.713
EDSS at inclusion[a]	1.31 ± 1.00	1.21 ± 1.19	0.326
Relapses in the previous year[a]	0.92 ± 0.88	0.86 ± 1.15	0.315
Total relapses[a]	1.13 ± 0.99	3.29 ± 15.26	0.881
9-HPT[a]	22.5 ± 10.68	21.4 ± 5.78	0.526
T25-FW[a]	6.11 ± 4.09	5.29 ± 2.26	0.109
Pain[a]	6.84 ± 17.6	6.62 ± 15.1	0.285
Gd-enhancing lesions at diagnosis[a]	1.95 ± 3.65	1.10 ± 1.55	0.282
Gd-enhancing lesions at inclusion[a]	1.14 ± 3.45	0.64 ± 1.56	0.451
T2 lesions at diagnosis[b]			0.296
0	2 (1.6)	1 (1.9)	
1-5	17 (13.7)	10 (18.5)	
6-10	20 (16.1)	12 (22.2)	
11-15	15 (12.1)	9 (16.7)	
>15	68 (54.8)	20 (37.0)	
Other	2 (1.6)	2 (3.7)	
New T2 lesions at inclusion[a]	2.88 ± 7.78	4.61 ± 11.27	0.264
Previous DMT[b]			0.602
Yes	12 (9.5)	7 (12.5)	
No	114 (90.5)	49 (87.5)	
Current treatment for MS symptoms[b]			0.691
Yes	27 (21.8)	10 (17.9)	
No	97 (78.2)	46 (82.1)	
Success on SDMT[b]			0.029
>49	66 (52.4)	40 (71.4)	
≤49	59 (46.8)	16 (28.6)	
NA	1 (0.8)	0	
Total score on SymptoMScreen[a]	12.2 ± 10.6	11.1 ± 10.1	0.482
Total score on MFIS-5[a]	6.2 ± 4.8	5.9 ± 5.4	0.791
MSIS-29 physical impact[a]	15.3 ± 18.8	14.2 ± 17.3	0.744
MSIS-29 psychological impact[a]	30.7 ± 24.0	28.8 ± 24.5	0.63
Anxiety (HADS)[b]			0.382
No cases	92 (73.0)	45 (80.4)	
Probable cases	34 (27.0)	11 (19.6)	
Depression (HADS)[b]			0.507
No cases	117 (92.9)	54 (96.4)	
Probable cases	9 (7.1)	2 (3.6)	
Total score on B-IPQ[a]	38.1 ± 11.6	36.6 ± 11.0	0.393
SSCI-8 score[b]			1
= 8	54 (42.9)	24 (42.9)	
> 8	72 (57.1)	32 (57.1)	
Total score on GSES[a]	32.2 ± 5.40	31.6 ± 5.47	0.485
Total score on State (STHS)[a]	2.0 ± 0.5	1.9 ± 0.5	0.208

(*continued on next page*)

Table 3 (*continued*)

Variables	Current long-term prognosis information preference (dichotomized: higher/lower)		
	Higher (n = 126)	Lower (n = 56)	*P*-value
Total score on Trait (STHS)[a]	1.97 ± 0.44	1.93 ± 0.52	0.628
Score on Active coping (Brief-COPE)[a]	6.17 ± 1.64	6.16 ± 1.55	0.981
Score on Planning (Brief-COPE)[a]	5.42 ± 1.83	5.29 ± 1.71	0.632
Score on Emotional support (Brief-COPE)[a]	5.68 ± 1.93	5.75 ± 2.08	0.837
Score on Social support (Brief-COPE)[a]	4.92 ± 1.81	4.80 ± 1.71	0.677
Score on Religion (Brief-COPE)[a]	3.21 ± 1.84	3.04 ± 1.63	0.513
Score on Positive reframing (Brief-COPE)[a]	5.95 ± 1.88	5.82 ± 1.82	0.658
Score on Acceptance (Brief-COPE)[a]	6.75 ± 1.46	6.64 ± 1.49	0.642
Score on Denial (Brief-COPE)[a]	3.14 ± 1.62	2.96 ± 1.48	0.467
Score on Humor (Brief-COPE)[a]	4.63 ± 2.15	4.34 ± 2.07	0.395
Score on Self-distraction (Brief-COPE)[a]	5.66 ± 1.83	5.55 ± 1.78	0.716
Score on Self-blame (Brief-COPE)[b]	3.24 ± 1.49	3.55 ± 1.73	0.239
Score on Disengagement (Brief-COPE)[a]	3.05 ± 1.53	2.75 ± 1.12	0.143
Score on Venting (Brief-COPE)[a]	4.26 ± 1.76	4.57 ± 1.44	0.214
Score on Substance abuse (Brief-COPE)[a]	2.22 ± 0.74	2.23 ± 0.713	0.932
Score on Monitoring coping style (MBSS)[a]	2.67 ± 1.79	2.45 ± 1.77	0.431
Score on Blunting coping style (MBSS)[a]	1.66 ± 1.34	1.55 ± 1.43	0.65

Data are presented as mean ± standard deviation or n (%). [a]Mann-Whitney U test. [b]Fisher's exact test. 9 HPT, 9-Hole Peg Test; B-IPQ, Brief Illness Perception Questionnaire; DMT, disease modifying therapy; EDSS, Expanded Disability Status Scale; Gd, gadolinium; HADS, Hospital Anxiety and Depression Scale; GSES, Generalized Self-Efficacy Scale; MBSS, Miller Behavioral Style Scale; MFIS-5, Modified Fatigue Impact Scale; MSIS-29, Multiple Sclerosis Impact Scale; MSWS-12, Multiple Sclerosis Walking Scale; SDMT, Symbol Digit Modality Test; STHS, State-Trait Hopelessness Scale; T25-FW, timed 25-Foot Walk.

Table 4
Correlation between demographics, clinical and patient measures with long-term information preferences.

	Estimate	Std. error	CI 95% low	CI 95% high	P-value
Gender (male vs female)	0.264	0.481	0.094	0.64	0.006
SDMT score (>49 vs ≤49)	2.059	0.367	1.016	4.32	0.049
Pain	0.988	0.007	0.974	1.00	0.111

2009; Buecken et al., 2012; Kopke et al., 2014). Although prognostic estimates are still challenging and it might be difficult to have this conversation with patients, there is increasing evidence on demographic and clinical factors that could help neurologist to gain confidence when disclosing a prognosis, such as age at disease onset, gender, body mass index, topography and number of lesions, presence/absence of oligoclonal bands, or neurofilaments and cerebrospinal fluid chitinase 3-like-2, new biomarkers predictive of long-term disability progression (Comabella et al., 2021; Comabella et al., 2022; Manuel Escobar et al., 2022). However, our study in early-stage RRMS patients showed that this is commonly not achieved, as more than half of respondents reported never having discussed LTP during neurology appointments and claimed interest in knowing about it, this result being in line with previous reports (Dennison et al., 2018; Carnero Contentti et al., 2020; Kosch et al., 2021). Using the Prognosis in MS questionnaire, Dennison et al. found that 53.1% of UK patients had never discussed their LTP during neurology appointments, and Contentti et al. found the same in 21.5% of Argentinian patients (Dennison et al., 2018; Carnero Contentti et al., 2020). Although percentages vary, these results show an apparent unmet need of prognostic counselling among MS patients not only in a more advanced stage of the disease as those in UK and Argentinian populations (disease duration mean = 17.3 and 7.8, respectively), but also in those recently diagnosed (1.1 years) with low physical disability (median EDSS score = 1.0). As described for UK and Argentinian cohorts, 56.5% of patients lacked clarity about LTP, and more than half of patients thought about it at least once a month, considering this information especially important in decisions about treatment. These data are noteworthy, since almost 70% of patients in our cohort started their treatments without having discussed their LTP. As stated in our results, the only factors associated with higher preferences for LTP communication were male gender and cognitive impairment measured by SDMT. One possible explanation could be that male patients may have heard of a worse prognosis in men, causing higher disability than in woman regardless of disease phenotype and are therefore more interested in knowing about it (Kister et al., 2021). Men in the general population are also known for pursuing a more aggressive treatment, so that they could be more eager to look for answers and information (Bove et al., 2016). Furthermore, they might be concerned about the perception of those cognitive problems and want to know more about the progression of the disease (Parker et al., 2021). This should not be overlooked, as a high percentage (43.1%) of early-stage RRMS patients in our cohort had information processing speed problems. Interestingly, the previously described psychological factors in UK and Argentinian cohorts such as coping strategies, monitoring, fatigue severity or anxiety (Dennison et al., 2018; Carnero Contentti et al., 2020) were not found to be correlating factors in our study. Differences could be due to including patients with longer disease duration, higher disability, and various types of MS in previous cohorts, as coping strategies may vary with increasing MS duration and disability level (Lorefice et al., 2018; Kotas et al., 2021). The post-diagnostic period could thus be key for making early interventions in patients' adjustment to MS, influencing disease knowledge, uncertainty, risk and control perceptions, psychology factors and health behaviors.

Patients often search for other alternatives such as Internet and MS patient organizations to gain disease knowledge, but disclaimed it was difficult to find reliable and personalized information (Colombo et al., 2014; Synnot et al., 2016; Lavorgna et al., 2017; Higueras et al., 2022). Using online analytical processing tools or evidence-based educational programs might help in providing individualized prognostic information. Online analytical processing tools use large longitudinal patient cohort data to predict individual short- and long-term disease trajectories based on the patient characteristics. The Evidence-Based Decision Support Tool in MS (EBDiMS) uses data from one of the best-described patient cohorts, the London/Ontario cohort, gathered from 1972 to 2000. This tool generates an individualized prognosis estimate of the time to reach important disability milestones as well as a plot showing the average disease trajectory of the subjects chosen by the algorithm over a course of 30 years (Kosch et al., 2021). Previous studies have demonstrated high interest among patients in using these approaches, considering them understandable, interesting, and relevant for coping and treatment decisions without negative side effects (Kopke et al., 2014; Dennison et al., 2018; Carnero Contentti et al., 2020; Heesen et al., 2020; Kosch et al., 2021). However, clinicians' assistance and the support of friends or family members was highly required. This reinforces the need for clinicians to check patients' preference of LTP communication over time and psychological readiness to receive this information, as a small percentage in our study showed refusal or indifference, offering assistance in discussing these topics at office visits with those who have interest. Patients appreciate comprehensive information, and they have reported to be tolerant in understanding that prognosis is uncertain and may vary over time (Dennison et al., 2016; Eskyte et al., 2019). Thus, training programs for patients and neurologists in self-effective communication involving all relevant stakeholders are needed in terms of improving this issue, and ultimately patients' quality of life.

Several limitations should be noted regarding our study. First, the cross-sectional design did not allow us to assess changes or causal relationships in patients' LTP communication preferences over time as the

study consisted of a single visit. Second, there could be a potential selection bias in including people with higher interest in collaborating or with a better relationship with their physicians. Third, the recruitment period should be highlighted, as the coronavirus pandemic situation could have reduced the time spent at office visits and we did not collect the average duration of these visits. To our knowledge, this is the first study to assess communication experiences and preferences of LTP in patients with short disease duration (<3 years) and low physical disability compared to previous studies in more advanced disease populations. Contrary to the previous studies, we did not found correlations with psychological factors or symptoms, as these may vary with the progression of the disease, highlighting the importance of the post-diagnostic period for making early interventions in patients' adjustment to MS.

5. Conclusions

There is a clear need in RRMS patients for improving their prognostic information knowledge shortly after diagnosis. In early-stage RRMS patients, no clinical or behavioural factors were associated with higher LTP preferences, but assessing cognitive deficits at this time may be useful to design individualized communication strategies in order to achieve disease adjustment. Future studies should investigate LTP preferences longitudinally and consider developing specific training programs to improve communication at neurology appointments.

Financial support and sponsorship

The study was funded by Roche Medical Department, Spain (ML2064). The funding source had no role in the design of this study, data analysis and interpretation, review and approval of the manuscript or the decision to submit for publication.

CRediT authorship contribution statement

Tamara Castillo-Triviño: Conceptualization, Data curation, Writing – original draft, Writing – review & editing. **Rocío Gómez-Ballesteros:** Conceptualization, Writing – original draft, Writing – review & editing. **Mónica Borges:** Conceptualization, Data curation, Writing – original draft, Writing – review & editing. **Jesús Martín-Martínez:** Data curation, Writing – review & editing. **Javier Sotoca:** Data curation, Writing – review & editing. **Ana Alonso:** Data curation, Writing – review & editing. **Ana B. Caminero:** Data curation, Writing – review & editing. **Laura Borrega:** Data curation, Writing – review & editing. **José L. Sánchez-Menoyo:** Data curation, Writing – review & editing. **Francisco J. Barrero-Hernández:** Data curation, Writing – review & editing. **Carmen Calles:** Data curation, Writing – review & editing. **Luis Brieva:** Data curation, Writing – review & editing. **María R. Blasco-Quílez:** Data curation, Writing – review & editing. **Julio Dotor García-Soto:** Data curation, Writing – review & editing. **María del Campo-Amigo:** Data curation, Writing – review & editing. **Laura Navarro-Cantó:** Data curation, Writing – review & editing. **Eduardo Agüera:** Data curation, Writing – review & editing. **Moisés Garcés-Redondo:** Data curation, Writing – review & editing. **Olga Carmona:** Data curation, Writing – review & editing. **Laura Gabaldón-Torres:** Data curation, Writing – review & editing. **Lucía Forero:** Data curation, Writing – review & editing. **Mariona Hervás:** Data curation, Writing – review & editing. **Jorge Mauriño:** Conceptualization, Writing – original draft, Writing – review & editing. **Susana Sainz de la Maza:** Conceptualization, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

JM and RGB are employees of Roche Pharma Spain. JMM has served on scientific advisory boards and/or has received speaking honoraria, research funding and support to attend scientific meetings from Biogen, Merck, Novartis, Roche and Teva. JS has received speaking honoraria, compensation for consulting services and support to attend scientific meetings from Almirall, Bayer, Biogen, Merck, Novartis, Sanofi, Roche and Teva. AA has received compensation for consulting services from Biogen, BMS, Sanofi, Roche, Janssen and Novartis; and speaking honoraria from Biogen, BMS, Sanofi, Roche, Janssen, Merck, Almirall and Novartis. ABC has received courses and honoraria for her participation as speaker/meeting moderator/symposia organizer from Alter, Almirall, Bayer, Bial, Biogen, Bristol-Myers-Squibb, Lilly, Merck-Serono, Mylan, Novartis, Roche, Sanofi-Genzyme, Teva and UCB; and support to attend scientific meetings from Biogen, Bial, Merck-Serono, Novartis, Roche, Sanofi-Genzyme and Teva. JLSM has received support to attend scientific meetings from Novartis, Merck, and Biogen; speaking honoraria from Biogen, Novartis, Sanofi, Merck, Almirall, Bayer and Teva; and has participated in clinical trials from Biogen, Merck and Roche. FJBH has received compensation for consulting services and speaking honoraria from Almirall, Biogen, Genzyme, Merck-Serono, Novartis, Roche, Sanofi and Teva. CC has received compensation for consulting services, speaking honoraria and support to attend scientific meetings and courses from Merck, Teva, Sanofi-Genzyme, Novartis, Biogen, Roche, and Bristol-Myers-Squibb. LB has received compensation for consulting services, speaking honoraria and support to attend scientific meetings from Bayer, Celgene, Biogen, Genzyme, Merck, Novartis, Roche, Almirall and Teva. JDGS has received compensation for consulting services and speaking honoraria from Biogen, Novartis, Merck, UCB, Sanofi-Genzyme, Roche, Almirall and Teva. MCA has received compensation for consulting services from Genzyme, Roche, Novartis, Sanofi and Biogen. LNC has received compensations from Sanofi-Genzyme, Merk, Biogen and Roche. EA has received speaking honoraria from Roche, Novartis, Merck, Sanofi and Biogen. MGR has received speaking honoraria from Biogen, Sanofi, Almirall and Novartis. LGT has received speaking honoraria from Biogen, Novartis, Merck, Bayer, Sanofi-Genzyme, Almirall, Roche and Teva. MH has participated in observational studies and has received compensation for consulting services and speaking honoraria from Roche, Merck, Sanofi, Biogen, Novartis and Bayer. SSM received payment for lecturing or travel expenses from Merck-Serono, Biogen, Sanofi-Genzyme, Roche, and Novartis. The rest of the authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Acknowledgements

Authors are most grateful to all patients, neurologists and nurses participating in the study.

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