



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



## Correspondence

## COVID-19 in Argentine teriflunomide-treated multiple sclerosis patients: First national case series.



## ARTICLE INFO

**Keywords**  
 COVID-19  
 Teriflunomide  
 Multiple sclerosis  
 Argentina

## ABSTRACT

We report COVID-19 presentation, course and outcomes in teriflunomide-treated MS patients in Argentina. **Methods:** descriptive, retrospective, multicentre, study that included MS patients receiving teriflunomide who developed COVID-19, with clinical follow-up at reference MS centres, also listed in a nationwide registry. **Results:** Eighteen MS patients on teriflunomide treatment, from eight MS centres developed COVID-19. The mean age was 41.2 years and 72% of them were female; 94% had diagnosis of relapsing-remitting MS and 6% presented a radiologically isolated syndrome. Median EDSS was 2 (range 0-5.5). The average time on teriflunomide therapy was 3 years. COVID-19 diagnosis was confirmed with nasal swab in 61%. None required hospitalization and they completely recovered from the acute-phase within 7-14 days. All the patients continued their teriflunomide therapy during COVID-19 course. No MS relapses occurred during or after COVID-19 course. **Conclusion:** Our report adds to the evidence that COVID-19 is mild in patients receiving teriflunomide therapy and that continuing with teriflunomide therapy during Sars-CoV-2 infection is safe and advisable for MS patients.

## Introduction

The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) pandemic raised concerns among neurologists treating people with multiple sclerosis (MS) about the potential impact of COVID-19 on patients, particularly on those receiving disease modifying therapies (DMTs).

Initially, it was suggested to discontinue or postpone some immunosuppressive DMTs. Publications soon emerged, bringing about better understanding of the risks and benefits of DMTs use during the pandemic. However, the impact of the therapy on predisposition to more severe forms of COVID-19 is not clear enough yet. Therefore, it is important to generate evidence through case studies to inform clinical practice.

Most of the literature available to date has focused on second-generation therapies (as their immunosuppressive mechanism of action raised the greatest concerns) or consists of reviews with overall data analysis (Rostami Mansoor and Ghasemi-Kasman, 2021; Sormani et al., 2021; Sharifian-Dorche, 2021)

Detailed publications on clinical presentation and outcomes of COVID-19 in MS patients treated with first-line therapies are scarce. A few case reports of SARS-CoV-2 infection in patients receiving teriflunomide describe a self-limiting and mild course of the disease (Bollo et al., 2020; Capone et al., 2021; Ciardi et al., 2020; Maghzi et al., 2020; Mantero et al., 2020; Mohn et al., 2020; Yetkin et al., 2021).

To our knowledge, there are no publications assessing COVID-19 in Latin American MS patients under teriflunomide treatment. We report COVID-19 presentation, course and outcomes in the sub-group of teriflunomide-treated MS patients in Argentina.

## Study methodology

This was a descriptive observational, retrospective, multicentre,

<https://doi.org/10.1016/j.msard.2021.103049>

Received 28 March 2021; Received in revised form 8 May 2021; Accepted 22 May 2021

Available online 30 May 2021

2211-0348/© 2021 Elsevier B.V. All rights reserved.

open-label study.

We included all MS patients receiving teriflunomide (14 mg PO daily) with clinical follow-up at reference MS centres in Argentina, who were also included in a nationwide registry and developed COVID-19 from June 1<sup>st</sup> 2020 to January 31<sup>st</sup> 2021. (Alonso R et al., 2021)

Data were retrospectively obtained from medical records. Each treating neurologist completed a comprehensive form developed for the purposes of this study. The following variables were collected: gender; age; MS phenotype, years from MS diagnosis, Expanded Disability Status Scale (EDSS) score, years on teriflunomide treatment; comorbidities; COVID-19 symptoms, date of initiation and duration, diagnostic method, treatment, and hospitalization need; teriflunomide discontinuation during infection; oxygen requirement; outcomes; MS relapse during or after COVID-19; white blood cell count (WBC), absolute lymphocyte count (ALC); MRI scan during or after infection; post-COVID symptoms; anti-SARS-CoV-2 antibodies title, and vaccination against COVID-19.

All patients signed a written informed consent. This study was based on anonymized and de-identified data. Researchers ensured data confidentiality and all personal information was protected according to the Personal Data Protection Act of Argentina (Act #25,326 and regulations in force).

## Case series

Eighteen MS patients under teriflunomide treatment from eight MS centres developed COVID-19 and were included in this case series (Table 1)

Patient's mean age was 41.2 ( $\pm$ 12.6) years and 72% of them were female; 94% (n=17) had diagnosis of relapsing-remitting MS and 6% (n=1) presented a radiologically isolated syndrome. The mean time since MS diagnosis was 6.17 ( $\pm$ 5,6) years and mean time on teriflunomide therapy was 3 ( $\pm$ 1,5) years. Patient's median EDSS score was

**Table 1**

Demographic and clinical characteristics of teriflunomide-treated Argentine MS patients with COVID-19.

Patient #	Gender	Age (years)	MS type	Years from MS diagnosis	EDSS (ongoing)	Comorbidities	Teriflunomide therapy (years)	COVID-19 symptoms initiation date (dd/mm/year)	COVID-19 symptoms	COVID-19 diagnosis	anti COVID-19 drugs / Hospitalization / Oxygen therapy	COVID-19 symptoms duration (days)	COVID-19 severity	Recovery	Post-COVID-19 symptoms	WBC and ALC	MS relapse (during or after COVID-19)	MRI (during or after COVID-19 start)	MRI report (new lesion / Gd enhancement)	anti SARS-CoV-2 antibodies
1	F	45	RR	3	3	No	3	12/12/2020	Fever, dry cough, sore throat	Nasal swab	No	4-7	Mild	Full	No	Normal	No	No		ND
2	M	37	RR	5	4	No	2	10/10/2020	Fever, fatigue	Nasal swab	No	1-3	Mild	Full	No	Normal	No	No		ND
3	F	53	RR	9	3	No	5	16/11/2020	Fever, fatigue, smell/taste loss	Nasal swab	No	1-3	Mild	Full	No	Normal	No	No		ND
4	F	50	RR	4	1.5	Diabetes Hypertension Hypothyroidism	0.6	06/09/2020	Dry cough, nasal congestion, smell/taste loss, fatigue	Clinical criteria	No	4-7	Mild	Full	No	Normal	No	Yes (17/12/2020)	No	ND
5	F	31	RR	1	1.5	No	0.6	07/09/2020	Nasal congestion, smell/taste loss, myalgia,	Nasal swab	No	4-7	Mild	Full	Headaches and fatigue	Normal	No	Yes (12/12/2020)	No	ND
6	M	52	RR	20	1.0	No	3	30/11/2020	Fever, dry cough, myalgia, fatigue	Nasal swab (PCR-Quick test)	No	4-7	Mild	Full	No	NA	No	No		ND
7	F	25	RR	5	2.0	No	3	09/01/2021	Fatigue, dry cough, smell/taste loss	Nasal swab	No	1-3	Mild	Full	No	Normal	No	No		ND
8	F	54	RR	3	2.0	No	3	21/10/2020	Diarrhea, nausea/vomiting, headache, fatigue, pruritus, sore throat	Clinical criteria	No	4-7	Mild	Full	No	Normal	No	Yes (19/12/2020)	No	Yes Positive
9	F	28	RR	3	1.0	No	3	06/01/2021	Nasal congestion, smell/taste loss, fatigue	Nasal swab	No	1-3	Mild	Full	No	Normal	No	Yes (04/02/2021)	No	ND
10	F	25	RR	1	1.0	No	1	18/12/2020	Fever, myalgia, diarrhea, headache	Clinical criteria	No	4-7	Mild	Full	No	Normal	No	No		ND
11	F	27	RR	5	0	No	4	31/08/2020	Dry cough, nasal congestion, myalgia, headache, fatigue	Clinical criteria	No	4-7	Mild	Full	Headaches and fatigue	Normal	No	Yes (10/12/2020)	No	ND
12	M	32	RR	3	1.0	Obesity Asthma Tobacco use	2	15/09/2020	Fever, headache, fatigue	Nasal swab (PCR-Quick test)	No	4-7	Mild	Full	No	NA	No	Yes (18/01/2021)	New lesions No Gd+	Yes Negative
13	F	40	RIS	3	1.0	No	2	12/08/2020	Fever, dry cough, nasal congestion, smell/taste loss, myalgia	Clinical criteria	No	4-7	Mild	Full	No	Normal	No	No		ND
14	F	69	RR	20	5.5	Hypothyroidism	4	03/06/2020	Fever, smell/taste loss	Clinical criteria	No	1-3	Mild	Full	No	Normal	No	No		ND
15	F	38	RR	7	3	No	4	10/11/2020	Fever, smell/taste loss	Nasal swab	No	1-3	Mild	Full	No	Normal	No	No		ND
16	M	29	RR	13	3	No	7	09/09/2020	Fever, dry cough, nasal congestion	Nasal swab	No	1-3	Mild	Full	No	Normal	No	No		ND
17	M	52	RR	4	3	Diabetes	3	10/02/2021	Fever, dry cough, smell/taste loss, myalgia, headache, fatigue	Nasal swab	No	14	Mild	Full	No	NA	No	No		ND
18	F	55	RR	2	3	No	1.5	29/08/2020	Fever, fatigue, smell/taste loss	Clinical criteria	No	14	Mild	Full	No	Normal	No	No		ND

ALC: absolute lymphocyte count; EDSS: Expanded Disability Status Scale; Gd: gadolinium; Gd+: gadolinium-enhancing lesions; MS: multiple sclerosis; NA: not available; ND: not determined; RIS: radiologically isolated syndrome; RR: relapsing-remitting; WBC: white blood cell count. Table format based on Capone *et al.*, 2021, Mantero *et al.*, 2020 and Maghzi *et al.*, 2020.

ALC: absolute lymphocyte count; EDSS: Expanded Disability Status Scale; Gd: gadolinium; Gd+: gadolinium-enhancing lesions; MS: multiple sclerosis; NA: not available; ND: not determined; RIS: radiologically isolated syndrome; RR: relapsing-remitting; WBC: white blood cell count. Table format based on Capone *et al.*, 2021, Mantero *et al.*, 2020 and Maghzi *et al.*, 2020.

2 (range 0-5.5). Four patients (22%) had comorbidities, which were well-controlled.

Regarding COVID-19, diagnosis was made with nasal swab in 11 patients (61%) and was based on clinical criteria in 7 patients (39%). The most frequent symptoms were: fever 67% (n=12) and fatigue 61% (n=11), followed by loss of smell/taste in 56% of the patients (n=10).

Upper airways symptoms like dry cough and nasal congestion were present in 44% and 33% of patients respectively; myalgia was reported by 33% and headache by 28% of the cases. Gastrointestinal symptoms (diarrhoea, nausea/vomiting) and sore throat were less frequent (17% and 11%, respectively). Only one patient reported pruritus (6%) (Fig. 1).

All patients were managed in the outpatient setting. Only symptomatic treatment with ibuprofen or acetaminophen was used and none of the patients required anti SARS-CoV-2-specific drugs. The clinical course was mild in all the patients, who fully recovered from the acute-phase with symptom resolution within 7-14 days. Furthermore, 39% of the patients showed a very mild infection course and recovered within 1-3 days. Data on WBC and ALC were available for 15/18 patients and were within normal limits.

None of the patients discontinued their teriflunomide scheduled therapy during COVID-19 course. No MS relapses occurred during or after COVID-19 course.

Only two patients developed prolonged fatigue after acute infection, both of whom recovered within 3 months.

MRI was performed in 6 patients between 1 and 6 months after COVID-19. None of them showed contrast-enhancing lesions. Only one patient (#12) showed non-enhancing new lesions (it was not possible to determine if these new lesions were related to SARS-CoV-2 infection or were pre-existing because the previous MRI that was used for comparison had been performed one year before).

Antibodies against SARS-CoV-2 were only determined in 2 patients more than a month post-infection; titres were positive in one of them. None of the patients in this series has been immunized until this manuscript submission date.

### Final comments

A number of reviews (Rostami Mansoor et al., 2021; Sormani et al., 2021; Sharifian-Dorche et al., 2021) and seven original reports (Bollo

et al., 2020; Ciardi et al., 2020; Maghzi et al., 2020; Mantero et al., 2020; Mohn et al., 2020; Capone et al., 2021; Yetkin et al., 2021) describing in detail 16 MS patients who developed Sars-Cov-2 infection while on teriflunomide therapy, have been published since the pandemic began. Most of these publications were from Europe, where COVID-19 peak preceded in months the Latin American dissemination.

Our patients were younger compared to other case series (41.2 years vs. 50.5 years), but had similar median EDSS scores (2 vs. 2.25) and average time on teriflunomide treatment (3 vs. 3.7 years) (Capone et al., 2021). Symptom resolution took less time (within 7 days) for most patients in our series than in other reports (Bollo et al., 2020; Ciardi et al., 2020; Maghzi et al., 2020; Mantero et al., 2020; Mohn et al., 2020; Capone et al., 2021). In our series, the most frequent symptoms were fever and fatigue, while loss of smell/taste occupied the third place; as previously described, this last symptom was associated with mild-course COVID-19 (Lechien et al., 2021). None of the patients in our series required anti SARS-CoV-2-specific drugs, hospitalization nor oxygen therapy. The outcomes were favourable for 100% of our patients, only two of whom developed mild post-COVID symptoms that resolved within 3 months.

Louapre et al. (2020) have pointed out that older age, cardiovascular disease, obesity and neurological disability are the main risk factors for severe COVID-19 in MS patients, irrespective of the DMT administered. Sormani et al. (2021) found no association between DMT therapy and COVID-19 severity, except for B-cell depletors and methylprednisolone pulse within the previous month of severe infection. In a recent review on DMTs used during pandemic, first line drugs like glatiramer acetate, teriflunomide and dimethyl fumarate may be considered safe and  $\beta$ -interferons could be protective in early stages of the Covid-19 disease but may become detrimental in the hyper inflammation stage (Alborghetti et al., 2021).

The data published so far, either as detailed case reports or reviews, support the continuity of teriflunomide therapy, which has shown to be safe during COVID-19 course.

To our knowledge, this is the first Argentine and Latin American case series about COVID-19 in teriflunomide-treated MS patients.

In conclusion our observations suggest that teriflunomide therapy in MS patients might be safe during the course of Covid-19 and should not be discontinued during the infection. Our report also adds to the

## Symptoms of Covid-19 in MS patients treated with Teriflunomide

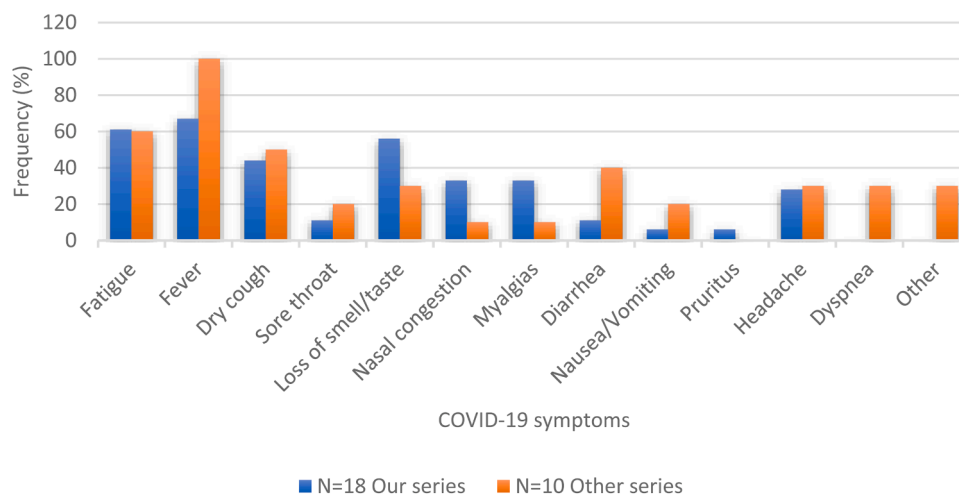


Fig. 1. Symptoms of COVID-19 in Argentine MS patients compared to other case series in the literature.

evidence that COVID-19 is mild in patients receiving teriflunomide therapy.

### Declaration of Competing Interest

GL has received honoraria for advisory boards from Merck Serono Argentina and Schering Bayer Argentina; Travel grants for meetings and Congresses from Tuteur, Synthon Bagó, Merck Argentina; clinical trials from Novartis, Biogen, Teva, Schering, Merck; Speaker's fees from Biogen, Genzyme and Merck Serono.

JIR has received honoraria from Novartis as a scientific advisor. He has received travel grants and attended courses and conferences on behalf of Merck-Serono Argentina and Novartis Argentina

RA has received personal compensation for consulting, serving on a scientific advisory board, speaking or other activities from Biogen, Merck Serono, Novartis, Sanofi -Genzyme and Roche.

ECC has received reimbursement for developing educational presentations, educational and research grants, consultation fees, and/or travel stipends from Biogen Argentina, Genzyme Argentina, Merck Argentina and LATAM, Roche Argentina and LATAM, Raffo, and Novartis Argentina.

ND has received honoraria for advisory boards from: Bayer Argentina, Latin-america and Global; Merck Serono Argentina and Global; Genzyme Argentina; Latin-america and Global and Sanofi Global; travel grants for congresses from: Schering; Bayer; Serono; Merck Serono; Novartis; Biogen Idec; Teva-Tuteur; Teva; Roche; clinical trials from Bayer Argentina; Biogen Idec Argentina; Genzyme Argentina; Novartis Argentina; Roche Argentina; Teva Argentina; Sanofi Argentina and teaching courses fees from Bayer Argentina; Merck Serono Argentina and Genzyme Argentina.

The rest of the authors declares no conflict of interest.

### Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

### References

- Alborghetti, M., Bellucci, G., Gentile, A., Calderoni, C., Nicoletti, F., Capra, R., Salvetti, M., Centonze, D., 2021. Drugs used in the treatment of multiple sclerosis during COVID-19 pandemic: a critical viewpoint. *Curr. Neuropharmacol.* <https://doi.org/10.2174/1570159X19666210330094017>, 2021 Mar 29.
- Alonso, R., Silva, B., Garcea, O., Diaz, PEC, Dos Passos, GR, Navarro, DAR, Valle, LAG, Salinas, LCR, Negrotto, L, Luetic, G, Tkachuk, VA, Míguez, J, de Bedoya, FHD, Goiry, LG, Sánchez, NER, Burgos, M, Steinberg, J, Balbuena, ME, Alvarez, PM, López, PA, Ysraelit, MC, León, RA, Cohen, AB, Gracia, F, Molina, O, Casas, M, Deri, NH, Pappolla, A, Patrucco, L, Cristiano, E, Tavolini, D, Nadur, D, Granda, AMT, Weiser, R, Cassará, FP, Sinay, V, Rodríguez, CC, Lazaro, LG, Menichini, ML, Piedrabuena, R, Escobar, GO, Carrá, A, Chertcoff, A, Pujols, BS, Vrech, C, Tarulla, A, Carvajal, R, Mainella, C, Becker, J, Peeters, LM, Walton, C, Serena, MA, Nuñez, S, Rojas, JI, 2021. COVID-19 in multiple sclerosis and neuromyelitis optica spectrum disorder patients in Latin America: COVID-19 in MS and NMOSD patients in LATAM. *Mult. Scler. Relat. Disord.* 51, 102886 <https://doi.org/10.1016/j.msard.2021.102886>, 2021.
- Bollo, L., Guerra, T., Bavaro, D.F., Monno, L., Saracino, A., Angarano, G., Paolicelli, D., Trojano, M., Iaffaldano, P., 2020. Seroconversion and indolent course of COVID-19 in patients with multiple sclerosis treated with fingolimod and teriflunomide. *J. Neurol. Sci.* 416, 117011 <https://doi.org/10.1016/j.jns.2020.117011>.
- Ciardi, M.R., Zingaropoli, M.A., Pasculli, P., Perri, V., Tartaglia, M., Valeri, S., Russo, G., Conte, A., Mastroianni, C.M., 2020. The peripheral blood immune cell profile in a teriflunomide-treated multiple sclerosis patient with COVID-19 pneumonia. *J. Neuroimmunol.* 346, 577323 <https://doi.org/10.1016/j.jneuroim.2020.577323>.
- Capone, F., Motolese, F., Luce, T., Rossi, M., Magliozzi, A., Di Lazzaro, V., 2021. COVID-19 in teriflunomide-treated patients with multiple sclerosis: a case report and literature review. *Mult. Scler. Relat. Disord.* 48, 102734 <https://doi.org/10.1016/j.msard.2020.102734>.
- Lechien, JR, Chiesa-Estomba, CM, Beckers, E, Mustin, V, Ducarme, M, Journe, F, Marchant, A, Joffe, L, Barillari, MR, Cammaroto, G, Circiu, MP, Hans, S, Saussez, S, 2021. (COVID-19 Task Force of the Young-Otolaryngologists of the International Federations of Oto-rhino-laryngological Societies (YO-IFOS), Marseille, France;

University of Mons (UMons), Mons, Belgium; Université Versailles Saint-Quentin-en-Yvelines (Paris Saclay University), Paris, France; Université Libre de Bruxelles, Brussels, Belgium; Hospital Universitario Donostia, San Sebastian, Spain; Clinique de l'Europe, Brussels, Belgium; EpicURA Hospital, Hornu; Université libre de Bruxelles, Brussels, Belgium; Bayesia, Changé, France; University of Naples SUN, Naples; and Forli Hospital, Forli, Italy), 2021. Prevalence and 6-month recovery of olfactory dysfunction: a multicentre study of 1363 COVID-19 patients (Brief Report). *J. Intern. Med.* <https://doi.org/10.1111/joim.13209>.

- Louapre, C, Collongues, N, Stankoff, B, Giannesini, C, Papeix, C, Bensa, C, Deschamps, R, Créange, A, Wahab, A, Pelletier, J, Heinzlef, O, Labauge, P, Guilloton, L, Ahle, G, Goudot, M, Bigaut, K, Laplaud, DA, Vukusic, S, Lubetzki, C, De Sèze, J, investigators, Covisep, Derouiche, F, Tourbah, A, Mathey, G, Théaudin, M, Sellal, F, Dugay, MH, Zéphir, H, Vermersch, P, Durand-Dubief, F, Françoise, R, Andriodias-Condemin, G, Pique, J, Codjia, P, Tilikete, C, Marcaud, V, Lebrun-Frenay, C, Cohen, M, Ungureanu, A, Maillart, E, Beigneux, Y, Roux, T, Corvol, JC, Bordet, A, Mathieu, Y, Le Breton, F, Boulos, DD, Gout, O, Guéguen, A, Moulignier, A, Boudot, M, Chardain, A, Coulette, S, Manchon, E, Ayache, SS, Moreau, T, Garcia, PY, Kumaran, D, Castelnovo, G, Thouvenot, E, Taithe, F, Poupart, J, Kwiatkowski, A, Defeur, G, Derache, N, Branger, P, Biotti, D, Ciron, J, Clerc, C, Vaillant, M, Magy, L, Montcuquet, A, Kerschen, P, Coustans, M, Guennoc, AM, Brochet, B, Ouallet, JC, Ruet, A, Dulau, C, Wiertlewski, S, Berger, E, Buch, D, Bourre, B, Pallix-Guiot, M, Maurousset, A, Audoin, B, Rico, A, Maarouf, A, Edan, G, Papassin, J, Videt, D., 2020. Clinical characteristics and outcomes in patients with coronavirus disease 2019 and multiple sclerosis. *JAMA Neurol.* 77 (9), 1079–1088. <https://doi.org/10.1001/jamaneurol.2020.2581>, 2020 Sep 1.
- Maghzi, A.H., Houtchens, M.K., Preziosa, P., Ionete, C., Beretich, B.D., Stankiewicz, J.M., Tauhid, S., Cabot, A., Berriosmorales, I., Schwartz, T.H.W., Sloane, J.A., Freedman, M.S., Filippi, M., Weiner, H.L., Bakshi, R., 2020. COVID-19 in teriflunomide-treated patients with multiple sclerosis. *J. Neurol.* 267, 2790–2796. <https://doi.org/10.1007/s00415-020-09944-8>.
- Mantero, V., Baroncini, D., Balgera, R., Guaschino, C., Basilico, P., Annovazzi, P., Zaffaroni, M., Salmaggi, A., Cordanò, C., 2020. Mild COVID-19 infection in a group of teriflunomide-treated patients with multiple sclerosis. *J. Neurol.* 1–2. <https://doi.org/10.1007/s00415-020-10196-9>.
- Mohn, N., Saker, F., Bonda, V., Respondek, G., Bachmann, M., Stoll, M., Wattjes, M.P., Stangel, M., Skripuletz, T., 2020. Mild COVID-19 symptoms despite treatment with teriflunomide and high-dose methylprednisolone due to multiple sclerosis relapse. *J. Neurol.* 267, 2803–2805. <https://doi.org/10.1007/s00415-020-09921-1>.
- Rostami Mansoor, S., Ghasemi-Kasman, M., 2021. Impact of disease-modifying drugs on the severity of COVID-19 infection in multiple sclerosis patients. *J. Med. Virol.* 93 (3), 1314–1319. <https://doi.org/10.1002/jmv.26593>.
- Sharifian-Dorche, M., Sahraian MA, Fadda G, Osherov M, Sharifian-Dorche A, Karaminia M, Saveriano AW, La Piana R, Antel JP, Giacomini PS., 2021. COVID-19 and disease-modifying therapies in patients with demyelinating diseases of the central nervous system: A systematic review. *Mult Scler Relat Disord* 50, 102800. <https://doi.org/10.1016/j.msard.2021.102800>.
- Sormani, M.P., De Rossi, N., Schiavetti, I., Carmisciano, L., Cordioli, C., Muiola, L., Radaelli, M., Immovilli, P., Capobianco, M., Trojano, M., Zaratin, P., Tedeschi, G., Comi, G., Battaglia, M.A., Patti, F., Salvetti, M., Musc-19 Study Group, 2021. Disease-Modifying Therapies and Coronavirus Disease 2019 Severity in Multiple Sclerosis. *Ann. Neurol.* 89, 780–789. <https://doi.org/10.1002/ana.26028>.
- Yetkin, MF, Yetkin, NA, Akcakoyunlu, M, Mirza, M., 2021. Transient monocular visual impairment as an initial symptom of COVID-19 infection in an individual with multiple sclerosis receiving teriflunomide. *Neurol. Sci.* 1–4. <https://doi.org/10.1007/s10072-021-05097-2>, 2021 Feb 3.

Geraldine Luetic<sup>a,\*</sup>, María L. Menichini<sup>a,b</sup>, Marcos Burgos<sup>c</sup>, Ricardo Alonso<sup>d</sup>, Edgar Carnero Contentte<sup>e</sup>, Adriana Carrá<sup>f</sup>, Norma Deri<sup>g</sup>, Judith Steinberg<sup>f</sup>, Juan I. Rojas<sup>h,i</sup>, on behalf RelacoEM

Study group

<sup>a</sup> Instituto de Neurociencias de Rosario, Rosario; Argentina

<sup>b</sup> Sanatorio Británico Rosario. Argentina

<sup>c</sup> Hospital San Bernardo, Salta. Argentina

<sup>d</sup> Centro Universitario de Esclerosis Múltiple, Hospital Ramos Mejía, Buenos Aires. Argentina

<sup>e</sup> Unidad de Neuroinmunología, Departamento de Neurociencias, Hospital Alemán, CABA, Argentina

<sup>f</sup> Sección de enfermedades desmielinizantes. Hospital Británico; CABA. Argentina

<sup>g</sup> Centro de Investigaciones Diabaid, CABA; Argentina

<sup>h</sup> Centro de Esclerosis Múltiple de Buenos Aires, CABA; Argentina

<sup>i</sup> Servicio de Neurología, Hospital Universitario CEMIC, Buenos Aires, Argentina

\* Corresponding author.

E-mail address: [gluetic@hotmail.com](mailto:gluetic@hotmail.com) (G. Luetic).