Clinical Rheumatology (2022) 41:2597–2599
https://doi.org/10.1007/s10067-022-06203-1

LETTERS OF BIOMEDICAL AND CLINICAL RESEARCH

Modification of immunomodulatory medications by rheumatology patients during the peak of the COVID-19 pandemic in New York City

Medha Barbhaiya[1,2,3] · Marianna B. Frey[4] · Jonah Levine[4] · Gregory Vitone[4] · Lindsay Lally[1,2] · Michael D. Lockshin[1,2] · Vivian Bykerk[1,2] · Candace H. Feldman[5] · Lisa A. Mandl[1,2,3]

Received: 11 March 2022 / Revised: 27 April 2022 / Accepted: 5 May 2022 / Published online: 20 May 2022

Dear Editor,

Within the USA, from March through May 2020, New York City was an early coronavirus disease 2019 (COVID-19) "hot spot." Due to concerns about the increased risk of severe illness due to immune dysfunction and the use of immunomodulatory or immunosuppressive medications [1, 2], patients with systemic rheumatic diseases living in New York City may have modified their immunomodulatory and immunosuppressive medications to mitigate the risk of severe infection. Our study evaluates medication modification during the early stage of the pandemic in the USA by patients followed at a major rheumatology center in New York City.

We emailed a secure web-based survey to 26,045 patients ≥ 18 years evaluated at least once by a rheumatologist between April 1, 2018, and April 21, 2020, at our hospital in New York City. Patients completed the survey by email or phone between April 24, 2020, and May 26, 2020. We collected information on potential SARS-CoV-2 exposure, symptoms, and rheumatic disease history. Patients reported any immunomodulatory or immunosuppressive medication use in the previous 6 months and indicated whether they increased, decreased, or discontinued their medication after February 1, 2020 (i.e., during the COVID-19 pandemic), as well as reasons for medication changes. This study was approved by the Hospital for Special Surgery Institutional Review Board.

A total of 6357/26,045 respondents (24.4%) answered the medication questions. The mean age of respondents was 59.3 (standard deviation [SD] 15.9) years; 77.6% were female, 82.9% were White, 4.5% were Black, and 7.1% were Hispanic/Latinx. A total of 3111 respondents (48.9%) reported any use of at least one immunomodulatory or immunosuppressive medication in the previous 6 months: 1996 respondents used 1 immunosuppressive or immunomodulatory medication, 828 used 2 medications, and 287 used ≥ 2 medications.

Therefore, as some patients reported the use of more than one medication, among the 3111 patients, there were 4585 individual reports of any immunomodulatory/

✉ Medha Barbhaiya
BarbhaiyaM@hss.edu

Marianna B. Frey
Marianna_Frey@URMC.Rochester.edu

Jonah Levine
LevineJ@hss.edu

Gregory Vitone
gvitone31@gmail.com

Lindsay Lally
LallyL@hss.edu

Michael D. Lockshin
LockshinM@HSS.EDU

Vivian Bykerk
BykerkV@hss.edu

Candace H. Feldman
cfeldman@bwh.harvard.edu

Lisa A. Mandl
MandlL@hss.edu

1 Division of Rheumatology, Hospital for Special Surgery, New York, NY, USA

2 Department of Medicine, Weill Cornell Medicine, New York, NY, USA

3 Department of Population Health Sciences, Weill Cornell Medicine, New York, NY, USA

4 Hospital for Special Surgery, New York, NY, USA

5 Division of Rheumatology, Inflammation, and Immunity, Department of Medicine, Brigham and Women's Hospital, Boston, MA, USA

immunosuppressive medication use: 1170 (25.5%) antimalarials, 1008 (22.0%) biologics, 1216 (26.5%) conventional disease-modifying antirheumatic drugs (DMARDs), 986 (21.5%) corticosteroids, 148 (3.2%) small molecules, and 57 (1.2%) other DMARDs (Table 1). One-fourth of medications (1157/4585) were modified; of these, 152 were increased (13.1%), 469 were decreased (40.5%), and 536 were discontinued (46.3%) (Table 1). For each respondent, we collected only one modification per medication. Among dose reductions, 33.5% were for corticosteroids, 31.6% for biologics, 18.6% for conventional DMARDs, 13.9% for antimalarials, and 2.1% for small molecules. Medication discontinuation was highest for corticosteroids (50.7%), followed by conventional DMARDs (20.0%), biologics (15.9%), antimalarials (9.5%), and small molecules (2.8%). Tumor necrosis factor inhibitors (TNF inhibitors) accounted for most biologic dose reductions (64.2%) and discontinuations (50.6%). Methotrexate accounted for the majority of conventional DMARD dose reductions (67.8%), but less than half (47.7%) of total discontinuations. 42.8% increases in medication doses were for corticosteroids and 24.3% for conventional DMARDs. Medication reductions were advised > 50% of the time by a physician across medication categories, often but not always by a rheumatologist (Supplement). Up to 41% of discontinuations in any medication category were patient-directed (Supplement).

During the initial peak of the COVID-19 pandemic in New York City, patients at our large, specialty center modified one-fourth of immunomodulatory/immunosuppressive medications. Across medication categories, over half of medication reductions/discontinuations were recommended by a physician, while up to 41% of discontinuations were patient-directed. This is a description of patient behaviors; we did not perform statistical analyses to avoid biases due to our large numbers and multiple comparisons. Our response rate is acceptable for large surveys [3].

Our findings provide insight into the real-world behavior related to medication use by patients with rheumatic disease, before the first American College of Rheumatology COVID-19 task force guidelines were widely disseminated

Table 1 Immunomodulatory medication dosage modification among rheumatology patients who reported use in the last 6 months during the April to May 2020 COVID-19 pandemic "surge" in New York City

Immunomodulatory medication history	Overall use	Increased dosage	Decreased dosage	Medication discontinued*	No change
Medication usage (*N* reports)	4585	152	469	536	3428
Antimalarials	1170 (25.5)	30 (19.7)	65 (13.9)	51 (9.5)	1024 (29.9)
Biologics	1008 (22)	17 (11.2)	148 (31.6)	85 (15.9)	758 (22.1)
Abatacept	61 (6.1)	0 (0)	6 (4.1)	9 (10.6)	46 (6.1)
Belimumab	47 (4.7)	1 (5.9)	7 (4.7)	2 (2.4)	37 (4.9)
TNF inhibitors	596 (59.1)	9 (52.9)	95 (64.2)	43 (50.6)	449 (59.2)
IL-6 inhibitors	77 (7.6)	2 (11.8)	8 (5.4)	10 (11.8)	57 (7.5)
IL-1 inhibitors	10 (1)	0 (0)	2 (1.4)	2 (2.4)	6 (0.8)
IL-12/23 inhibitors	17 (1.7)	0 (0)	1 (0.7)	2 (2.4)	14 (1.8)
IL-17 inhibitors	92 (9.1)	3 (17.6)	14 (9.5)	9 (10.6)	66 (8.7)
Cyclophosphamide	6 (0.6)	0 (0)	0 (0)	3 (3.5)	3 (0.4)
Rituximab	102 (10.1)	2 (11.8)	15 (10.1)	5 (5.9)	80 (10.6)
Conventional DMARDs	1216 (26.5)	37 (24.3)	87 (18.6)	107 (20)	985 (28.7)
Leflunomide	102 (8.4)	3 (8.1)	3 (3.4)	9 (8.4)	87 (8.8)
Methotrexate	696 (57.2)	25 (67.6)	59 (67.8)	51 (47.7)	561 (57)
Mycophenolate	182 (15)	3 (8.1)	12 (13.8)	29 (27.1)	138 (14)
Azathioprine	73 (6)	2 (5.4)	5 (5.7)	5 (4.7)	61 (6.2)
Sulfasalazine	163 (13.4)	4 (10.8)	8 (9.2)	13 (12.1)	138 (14)
Corticosteroids (methylprednisolone, prednisone)	986 (21.5)	65 (42.8)	157 (33.5)	272 (50.7)	492 (14.4)
Small molecules	148 (3.2)	1 (0.7)	10 (2.1)	15 (2.8)	122 (3.6)
JAK inhibitors	99 (66.9)	0 (0)	10 (100)	11 (73.3)	78 (63.9)
Apremilast	49 (33.1)	1 (100)	0 (0)	4 (26.7)	44 (36.1)
Other DMARDs	57 (1.2)	2 (1.3)	2 (0.4)	6 (1.1)	47 (1.4)
Cyclosporine	9 (15.8)	1 (50)	1 (50)	0 (0)	7 (14.9)
Tacrolimus	48 (84.2)	1 (50)	1 (50)	6 (100)	40 (85.1)

Column percentages are shown for all numbers

[4]. Understanding patient and physician behavior during this public health crisis will help guide planning for any COVID-19 surges due to new variants or future pandemics. This work also lays the foundation for longitudinal studies that evaluate the impact of unanticipated medication changes on rheumatic disease flares and outcomes.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10067-022-06203-1.

Acknowledgements Thanks to Deanna Jannat-Khah, DrPH, for her help in assembling the cohort for analysis.

Author contributions Conceptualization: MB, LAM, VB, MDL, LL, and CHF.
Methodology: MB, LAM, VB, and CHF
Formal analysis and investigation: MB, LAM, GV, MBF, and JML
Writing—original draft preparation: MB and LAM
Writing—review and editing: MB, MBF, JL, GV, LL, MDL, VB, CHF, and LAM
Supervision: MB, LL, MDL, VB, CHF, and LAM

Funding Dr. Barbhaiya is currently supported by the Rheumatology Research Foundation Investigator Award. Dr. Mandl receives grant support from Regeneron Pharmaceuticals and Pfizer Inc. for work unrelated to the content of this article and is an associate editor at *Annals of Internal Medicine*. This study received support from the Barbara Volcker Center for Women and Rheumatic Diseases at Hospital for Special Surgery. Dr. Feldman serves on the Medical and Scientific Advisory Board of the Lupus Foundation of America and was a member of the American College of Rheumatology Board of Directors (both unpaid positions). She receives research funding from Brigham and Women's Hospital, the NIH, Pfizer Pharmaceuticals, and Bristol Myers Squibb Foundation for work unrelated to the content of this article. She serves as a research consultant on grants to the American College of Rheumatology, the Lupus Foundation of America, and the University of Alabama and also for work unrelated to the content of this article. The funders had no role in the study design, data collection, analysis, decision to publish, or preparation of the manuscript.

Declarations

Disclosures None.

References

1. Blumentals WA, Arreglado A, Napalkov P, Toovey S (2012) Rheumatoid arthritis and the incidence of influenza and influenza-related complications: a retrospective cohort study. BMC Musculoskelet Disord 13:158. https://doi.org/10.1186/1471-2474-13-158
2. Furer V, Rondaan C, Heijstek M, van Assen S, Bijl M, Agmon-Levin N et al (2019) Incidence and prevalence of vaccine preventable infections in adult patients with autoimmune inflammatory rheumatic diseases (AIIRD): a systemic literature review informing the 2019 update of the EULAR recommendations for vaccination in adult patients with AIIRD. RMD Open 5(2):e001041. https://doi.org/10.1136/rmdopen-2019-001041
3. Morton SM, Bandara DK, Robinson EM, Carr PE (2012) In the 21st century, what is an acceptable response rate? Aust N Z J Public Health 36(2):106–108. https://doi.org/10.1111/j.1753-6405.2012.00854.x
4. Mikuls TR, Johnson SR, Fraenkel L, Arasaratnam RJ, Baden LR, Bermas BL et al (2020) American College of Rheumatology Guidance for the Management of Rheumatic Disease in Adult Patients During the COVID-19 Pandemic: version 1. Arthritis Rheumatol 72(8):1241–1251. https://doi.org/10.1002/art.41301