Table I. Comparison among Pfizer/BioNTech BNT162b2 messenger RNA COVID-19 vaccine, Moderna messenger RNA-1273 SARS-CoV-2 vaccine, hepatitis B virus vaccine, and seasonal influenza vaccine

Vaccines	P vaccine	M vaccine	HBV vaccine	Flu vaccine	Vaccine comparison				
	14,649	10,403	58,063	152,627					
Total number of patients reporting SE	Number of reported SE (%)	Number of reported SE (%)	Number of reported SE (%)	Number of reported SE (%)	P-M	P-HBV	P-Flu	M-HBV	M-Flu
Constitutional SE									
Headache	2932 (20.02)	2242 (21.55)	3641 (6.27)	11,594 (7.60)	**.003**	**<.001**	**<.001**	**<.001**	**<.001**
Fatigue	2188 (14.94)	1537 (14.77)	1124 (1.94)	6305 (4.13)	.736	**<.001**	**<.001**	**<.001**	**<.001**
Pyrexia	2003 (13.67)	1853 (17.81)	9473 (16.32)	19,880 (13.03)	**<.001**	**<.001**	**.027**	**<.001**	**<.001**
Chills	1985 (13.55)	1763 (16.95)	1291 (2.22)	9890 (6.48)	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**
Pain	1853 (12.65)	1622 (15.59)	3335 (5.74)	18,395 (12.05)	**<.001**	**<.001**	**.035**	**<.001**	**<.001**
Nausea	1794 (12.25)	1458 (14.02)	3602 (6.20)	9141 (5.99)	**<.001**	**<.001**	**<.001**	**<.001**	**<.001**
Myalgia	940 (6.42)	721 (6.93)	2669 (4.60)	7004 (4.59)	.113	**<.001**	**<.001**	**<.001**	**<.001**
Arthralgia	754 (5.15)	593 (5.70)	2363 (4.07)	4477 (2.93)	.059	**<.001**	**<.001**	**<.001**	**<.001**
Malaise	659 (4.50)	290 (2.79)	1683 (2.90)	5246 (3.44)	**<.001**	**<.001**	**<.001**	.554	**<.001**
Asthenia	621 (4.24)	433 (4.16)	2645 (4.56)	6407 (4.20)	.789	.103	.828	.079	.881
Dermatologic SE									
Pruritus	785 (5.36)	678 (6.52)	3651 (6.29)	9197 (6.03)	**<.001**	**<.001**	**.001**	.388	**.044**
Rash	779 (5.32)	528 (5.08)	4954 (8.53)	8305 (5.44)	.411	**<.001**	.540	**<.001**	.115
Urticaria	571 (3.90)	403 (3.87)	3715 (6.40)	8424 (5.52)	.949	**<.001**	**<.001**	**<.001**	**<.001**
Hyperhidrosis	474 (3.24)	314 (3.02)	1190 (2.05)	3225 (2.11)	.350	**<.001**	**<.001**	**<.001**	**<.001**
Erythema	416 (2.84)	498 (4.79)	1388 (2.39)	12,426 (8.14)	**<.001**	**.001**	**<.001**	**<.001**	**<.001**
Injection Site Pain	1192 (8.14)	1269 (12.20)	3102 (5.34)	18,140 (11.89)	**<.001**	**<.001**	**<.001**	**<.001**	.347
Injection site erythema	323 (2.20)	1104 (10.61)	2175 (3.75)	17,523 (11.48)	**<.001**	**<.001**	**<.001**	**<.001**	**.007**
Injection site swelling	291 (1.99)	839 (8.06)	1358 (2.34)	12,759 (8.36)	**<.001**	**.011**	**<.001**	**<.001**	.301
Injection site warmth	153 (1.04)	576 (5.54)	802 (1.38)	7831 (5.13)	**<.001**	**.001**	**<.001**	**<.001**	.073

Values in bold are values that are statistically significant (P value <.05). Cutoff value for statistical significance ≤.05.
Flu, Seasonal influenza vaccine; *HBV*, hepatitis B virus vaccine; *M*, Moderna messenger RNA-1273 SARS-CoV-2 vaccine; *P*, Pfizer/BioNTech BNT162b2 messenger RNA COVID-19 vaccine; *SE*, side effect.

Conflicts of interest

Dr Rosmarin has received honoraria as a consultant for AbbVie, Celgene, Dermavant, Dermira, Janssen, Lilly, Novartis, Pfizer, and Regeneron Pharmaceuticals Inc; has received research support from AbbVie, Bristol Meyers Squibb, Celgene, Dermira, Incyte, Janssen, Lilly, Merck, Novartis, Pfizer, and Regeneron Pharmaceuticals Inc; and has served as a paid speaker for AbbVie, Celgene, Janssen, Lilly, Novartis, Pfizer, Regeneron Pharmaceuticals Inc, and Sanofi. Dr Cohen and Authors Gao and Kahn have no conflicts of interest to declare.

REFERENCES

1. Many remain doubtful about getting COVID-19 vaccine. AP-NORC Center for Public Affairs Research. Accessed March 15, 2021. https://apnorc.org/projects/many-remain-doubtful-about-getting-covid-19-vaccine/
2. Baden LR, El Sahly HM, Essink B, et al. Efficacy and safety of the mRNA-1273 SARS-CoV-2 vaccine. *N Engl J Med*. 2021;384(5):403-416.
3. Polack FP, Thomas SJ, Kitchin N, et al. Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine. *N Engl J Med*. 2020; 383(27):2603-2615.
4. VAERS Data. US Department of Health and Human Services. Accessed March 5, 2021. https://vaers.hhs.gov/data.html
5. Shimabukuro TT, Nguyen M, Martin D, DeStefano F. Safety monitoring in the Vaccine Adverse Event Reporting System (VAERS). *Vaccine*. 2015;33(36):4398-4405.

https://doi.org/10.1016/j.jaad.2021.09.044

Biologic therapy is not associated with increased COVID-19 severity in patients with hidradenitis suppurativa: Initial findings from the Global Hidradenitis Suppurativa COVID-19 Registry

To the Editor: Hidradenitis suppurativa (HS) patients may be at increased risk of severe COVID-19 and poor outcomes due to comorbidities and biologic treatment.[1] COVID-19 cases in HS patients were reported in the Global Hidradenitis Suppurativa COVID-19 Registry (https://hscovid.ucsf.edu/) from April 5, 2020, to February 2, 2021.[1] Eligible cases had confirmed diagnosis of HS by a health care provider (HCP) or screening questions and COVID-19 diagnosis by an HCP. Comparisons were performed using the Fisher's exact or Pearson χ^2 test. Multivariable logistic regression was used to predict outcomes based on biologic use, adjusting for demographic features and comorbidities.

Table I. Patient characteristics

Characteristics	Patient/Caregiver-reported cases			Health care provider-reported cases		
	Biologic	No biologic	All	Biologic	No biologic	All
Number	25	110	135	22	22	44
Age, y (median, IQR)	34 (32-46)	31 (26-39)	33 (26-41)	34 (27-42)	33 (28-39)	33.5 (27.5-41)
Female sex	22 (88.0%)	100 (90.9%)	122 (90.4%)	13 (59.1%)	15 (71.4%)	28 (65.1%)
Race/ethnicity						
White	16 (64.0%)	79 (71.8%)	95 (70.4%)	11 (50.0%)	7 (31.8%)	18 (40.9%)
Black African	2 (8.0%)	2 (1.8%)	4 (3.0%)	0 (0%)	4 (18.2%)	4 (9.1%)
Black African American	2 (8.0%)	3 (2.8%)	5 (3.7%)	4 (18.2%)	1 (4.6%)	5 (11.4%)
Asian	0 (0%)	1 (0.9%)	1 (0.7%)	1 (4.6%)	1 (4.6%)	2 (4.5%)
Hispanic	3 (12.0%)	13 (11.8%)	16 (11.8%)	3 (13.6%)	1 (4.6%)	4 (9.1%)
Mixed race	2 (8.0%)	8 (7.3%)	10 (7.4%)	0 (0%)	2 (9.1%)	2 (4.6%)
Other	0 (0%)	4 (3.7%)	4 (3.0%)	2 (9.1%)	3 (13.6%)	5 (11.4%)
Country						
United States	22 (88.0%)	56 (50.9%)	78 (57.8%)	8 (36.4%)	5 (22.7%)	13 (29.6%)
United Kingdom	1 (4.0%)	14 (12.7%)	15 (11.1%)	5 (22.7%)	3 (13.6%)	8 (18.2%)
Brazil	0 (0%)	15 (13.6%)	15 (11.1%)	1 (4.6%)	0 (0%)	1 (2.3%)
Sweden	0 (0%)	13 (11.8%)	13 (9.6%)	–	–	–
France	–	–	–	1 (4.6%)	10 (45.5%)	11 (25.0%)
Italy	–	–	–	4 (18.2%)	1 (4.6%)	5 (11.4%)
Other	11 (10.1%)	2 (8.0%)	13 (9.7%)*	3 (13.7%)	3 (13.7%)	6 (13.7%)†
Comorbidities						
Obesity	17 (68.0%)	72 (65.5%)	89 (65.9%)	7 (31.8%)	6 (27.3%)	13 (29.6%)
Diabetes	1 (4.0%)	4 (3.6%)	5 (3.7%)	4 (18.2%)	2 (9.1%)	6 (13.7%)
Pulmonary disease	10 (40.0%)	22 (20.0%)	32 (23.7%)	2 (9.1%)	2 (9.1%)	4 (9.1%)
Tobacco smoking	4 (16.0%)	19 (17.3%)	23 (17.0%)	–	–	–
CV disease	1 (4.0%)	3 (2.7%)	4 (3.0%)	2 (9.1%)	0 (0%)	2 (4.6%)
Hurley stage						
Hurley 1	3 (12.0%)	26 (23.6%)	29 (21.5%)	2 (9.1%)	5 (22.7%)	7 (15.9%)
Hurley 2	11 (44.0%)	49 (45.5%)	60 (45.2%)	7 (31.8%)	10 (45.6%)	17 (38.6%)
Hurley 3	9 (36.0%)	21 (19.1%)	30 (22.2%)	13 (59.1%)	7 (31.8%)	20 (45.5%)
Unknown	2 (8.0%)	13 (11.8%)	15 (11.1%)	–	–	–

CV, Cardiovascular; *IQR*, interquartile range.

*Other category includes 1-3 cases each from Argentina, Austria, Canada, Denmark, Ireland, Peru, Saudi Arabia, and Spain.

†Other category includes 1-2 cases each from Argentina, Canada, Czech Republic, Israel, and Saudi Arabia.

One hundred ninety-two and 44 cases were entered in the patient and HCP registries, respectively. Forty self-reported cases were incomplete. The descriptive characteristics of 135 eligible self-reported and 44 eligible HCP-reported cases are presented in Table I. Tumor necrosis factor inhibitors were the most commonly used biologic (self-reported: 22/25, 88.0%; and HCP: 19/22, 86.3%). No myocardial infarctions, strokes, or deaths were reported.

Among the self-reported cases, the odds of hospitalization (biologic: 3/25 [12%]; nonbiologic: 19/110 [17.4%], odds ratio 0.34, $P = .16$) or oxygen requirement (biologic: 5/25 (20%); nonbiologic: 28/110 (25.5%), odds ratio 0.6, $P = .37$) were not greater with biologics. No complications occurred in 49.3% of the patients, and 64.9% required no COVID-19 treatment. Patients on biologic therapy reported dyspnea less frequently (biologic 1/25, 4.0%; nonbiologic 23/110, 20.9%, $P = .04$) but showed a trend toward increased HS flares (biologic 12/25, 48.0%; nonbiologic 32/110, 29.4%, $P = .07$) and longer time to COVID-19 resolution (biologic: median (interquartile range) 21 (14-31) days; nonbiologic: 14 (9-25) days, $P = .07$). Two cases of pneumonias, 1 of sepsis, and 1 of pulmonary embolism were reported, all in patients on nonbiologic therapy. There were no differences in treatment location ($P = .6$) or complications ($P > .1$ for all) between those who continued biologics and those who discontinued biologics.

Among the HCP-reported cases, 78.1% (32/44) had mild COVID-19, and no differences in severity were seen between those on biologics and those on nonbiologics ($P = .2$) and between those who continued biologics versus those who discontinued biologics ($P = .9$). No complications were experienced by 86.4% (38/44) of the patients, and 84.1% (37/44) required no COVID-19 treatment. Dyspnea was experienced by 11.4% (5/44), but there was no difference in complications ($P = .3$) or COVID-19

treatment ($P = .5$) between patients on biologic therapy and those on nonbiologic therapy. We were insufficiently powered to assess differences in COVID-19 severity across age or comorbidities in either the self- or HCP-reported cases.

Our initial findings extend previous limited reports. One Italian survey did not detect COVID-19 among 96 HS patients, 59.4% of whom were on biologics,[2] whereas another confirmed 3 COVID-19 cases among 311 HS patients taking adalimumab.[3] None were hospitalized, and all fully recovered. A Spanish study found that 2 of 8 HS patients with COVID-19 symptoms were on adalimumab, and neither developed pneumonia or required hospitalization.[4] A US study reported 39 HS patients with confirmed COVID-19.[5] Eight (20.5%) were hospitalized, and one 60-year-old patient not on systemic treatments for HS died. Male sex, antibiotic treatment, diabetes, and increased mean age were associated with hospitalization. One patient on infliximab had a mild COVID-19 course and did not require hospitalization.

Despite sample size limitations, possible missed cases, and potential recall bias, this is the largest report of COVID-19 outcomes in an international HS population. These data provide valuable information to guide patient care during and after the pandemic.

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Conflicts of interest

Dr Naik has received grant support from AbbVie, consulting fees from 23andme, advisory board fees from Invitrogen Biovitrum; has served as an investigator for Pfizer; and is a board member of the US Hidradenitis Suppurativa Foundation. Dr Alhusayen has received fees for participating in advisory boards for AbbVie and Janssen, has received consulting fees from Eli Lilly and Hidramed solutions, and is the President of the Canadian Hidradenitis Suppurativa Foundation. Author Ingram has received fees for participating in advisory boards for Viela Bio and Kymera Therapeutics; consulting fees from UCB Pharma, Novartis, ChemoCentryx, and Boehringer Ingelheim; editorial honorarium as BJD Editor-in-Chief; royalties as chapter author for UpToDate; and co-copyright holder for the HiSQOL, HS Patient Global Assessment, HS Investigator Global Assessment. He received travel expenses and a speaker's honorarium from UCB Pharma. Dr Lowes has received fees for participating in advisory boards for AbbVie, Janssen, Viela Bio and consulting fees from Incyte, BSN, XBiotech, Kymera, and Almirall and is the Vice President of the US Hidradenitis Suppurativa Foundation. Author Guilbault has received compensation for patient advisory board from Boehringer Ingelheim and is a board member of the US HS Foundation and Hope for HS. Author Vilumsen has received compensation for patient advisory board from Boehringer Ingelheim and consulting fee for UCB and is the President of Patientforeningen HS Danmark. Drs Frew and Marzano and Authors Paul and Yannuzzi have no conflicts of interest to declare.

REFERENCES

1. Naik HB, Alhusayen R, Frew J, et al. Global Hidradenitis Suppurativa COVID-19 Registry: a registry to inform data-driven management practices. *Br J Dermatol*. 2020; 183(4):780-781.
2. Rozzo G, Ramondetta A, Fierro MT, Dapavo P, Ribero S. Moderate-to-severe hidradenitis suppurativa under systemic

therapy during the COVID-19 outbreak. *Dermatol Ther*. 2020;33(4):e13680.
3. Marzano AV, Moltrasio C, Genovese G, et al. Hidradenitis suppurativa and adalimumab in the COVID-19 era. *Eur J Dermatol*. 2020;30(6):748-749.
4. Galan JL, Silvente C, Gonzalez M, et al. Experience in patients with hidradenitis suppurativa and COVID-19 symptoms. *J Am Acad Dermatol*. 2020;83(4):e309-e311.
5. Lima XT, Cueva MA, Alora MB. COVID-19 in patients with hidradenitis suppurativa. *Br J Dermatol*. 2021;184(1):182-184.

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Immunosuppressive biologics did not increase the risk of COVID-19 or subsequent mortality: A retrospective matched cohort study from Massachusetts

To the Editor: The COVID-19 pandemic raised concerns about the management of patients with immune-mediated inflammatory diseases treated with immunosuppressive biologics. A third of patients with psoriasis who discontinued their medications had disease progression.[1] As population-level analyses of this patient group remain limited, we compared the incidence of COVID-19 and subsequent mortality in a large cohort of patients prescribed biologics and matched controls.

We identified all patients aged 18 years and older with at least 1 prescription for a biologic from July 1, 2019 to February 29, 2020 in the Massachusetts General Brigham Enterprise Data Warehouse. The primary and secondary outcomes for this study were risk of COVID-19 and subsequent mortality, respectively. A multivariable logistic regression was used on matched data to calculate the odds ratio (OR) for COVID-19 diagnosis between the 2 groups, adjusting for age, sex, race, Charlson Comorbidity Index severity grade, median income, and local infection rates. A multivariable Poisson regression was used to compare all-cause mortality among patients diagnosed with COVID-19, adjusting for age, sex, Charlson Comorbidity Index severity grade, median income, and local infection rates. Detailed methods and sensitivity analyses are included in the Supplemental Materials (available via Mendeley at https://data.mendeley.com/datasets/w4478kftkk/1).

We identified 7361 patients who received biologics and 74,910 matched controls. Patient baseline characteristics are presented in Table I. Tumor necrosis factor inhibitors (adalimumab [28.4%], infliximab [15.6%], and etanercept [11.9%]), CD20-directed antibody (rituximab [15.6%]), and interleukin-4A inhibitor (dupilumab [8.6%]) were the most frequently prescribed biologics. Rheumatoid arthritis (27.5%), psoriasis (27.3%), psoriatic arthritis (16.2%), Crohn's disease (24.9%), and ulcerative colitis (18.9%) were the most common indications for biologics in our study.

Overall, biologics were not associated with COVID-19 (OR, 0.88; 95% confidence interval [CI], 0.71-1.09; $P = .25$), adjusting for demographics, comorbidity burden, and local infection rates (Table II). Patients treated with tumor necrosis factor inhibitors were less likely to be diagnosed with SARS-CoV-2 infection compared to matched controls (OR, 0.69; 95% CI, 0.48-0.98; $P = .04$). Similarly, those treated with dupilumab had lower odds of diagnosis (OR, 0.38; 95% CI, 0.12-1.18), although this difference was not statistically significant ($P = .10$). Mortality rates were also similar between the 2 groups after adjusting for demographics, comorbidity burden, and local infection rates (OR, 1.13; 95% CI, 0.57-2.76; $P = .57$).

Despite the ongoing vaccination efforts, COVID-19 remains a top health concern. The major finding of our study is that biologics did not increase the risk of a positive COVID-19 diagnosis, which is consistent with published literature.[2-4] Additionally, distinct biologics classes are known to cause varying susceptibilities to other viral infections. In our study, tumor necrosis factor inhibitors were associated with lower odds of COVID-19 diagnosis, consistent with reports of this class of biologics being associated with less-severe disease among large cohorts of patients.[2,4] Furthermore, we did not identify an association between biologics and mortality.

Our results must be considered in light of the real-world data it is based upon, because these patients may have altered their behavior to decrease their risk of infection, as has been reported in surveys of patients with inflammatory bowel disease and rheumatic diseases.[5] Dermatologists and patients should prioritize the well-established risk factors for COVID-19 when making decisions to continue therapy.

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