

## Letter

# Association of alopecia areata with COVID-19 vaccination: A vaccine adverse events reporting system analysis

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## To the Editor

Alopecia areata (AA) is a non-scarring autoimmune hair loss disorder often characterized by significant impairment of quality of life and psychosocial well-being.<sup>1</sup> Some AA cases that developed following COVID-19 infection or vaccination are believed to be associated with molecular mimicry phenomena, defined as the immune system mistakenly attacking its own cells after being triggered by the virus or vaccine.<sup>2</sup> There is limited data on the prevalence of AA compared to other adverse events (AE) of COVID-19 vaccinations in the United States, particularly for individuals with preexisting autoimmune conditions. In this study, we performed a cross-sectional analysis of potential vaccine-related AA cases to investigate the risk of AA after vaccination and help identify potential at-risk populations.

The Vaccine Adverse Events Reporting System (VAERS) is a national AE spontaneous reporting system managed by the Food and Drug Administration and Centers for Disease Control and Prevention. VAERS was queried for unique cases of AA following COVID-19 vaccination from December 20, 2020, to February 28, 2025, using the keywords "alopecia areata," "alopecia totalis (AAT)," "alopecia universalis (AAU)," and "bald spots." Cases were excluded if descriptions did not specify the type of alopecia or had been classified as invalid. Pearson's  $\chi^2$  test and Welch's T test were conducted using R 4.1.12 to analyze differences between demographic and clinical characteristics when applicable. This study used secondary data from de-identified datasets available publicly, and thus was exempt from institutional review board approval in accordance with institutional and national guidelines.

A total of 206 AA cases met inclusion criteria, with 66% of subjects identifying as female and a mean age of 41.4 years (Table 1). Most cases occurred in early to mid-adulthood (aged 18–59 years). Females versus males were more often affected across most age groups ( $P < .001$ ). The 18–39 age group had the highest observed frequencies of AA within 1 month of exposure, while ages

50–64 were more often affected between 1 to 4 months after vaccination ( $P = .041$ ). Females more often had onset within 1 month compared to males ( $P = .0486$ ). AAU and AAT showed a stronger association with a past medical history of autoimmune disorders than patchy AA ( $P = .003$ ). History of AA, autoimmune disorders, or prior vaccination AE did not predispose to AA development, though autoimmune and prior vaccination AE history were more likely to occur together in patients who developed AA ( $P = .0166$ ). AA reports resulted from Pfizer (132/206, 64.1%), Moderna (65/206, 31.6%), Janssen (8/206, 3.9%), and Novavax (1/206, 0.5%) vaccines, with no difference in risk of AA between manufacturers ( $P = .761$ ). Most cases occurred after the first dose (90/206, 43.7%), with percentages decreasing with subsequent doses. The difference was not statistically significant between manufacturers ( $P = .83$ ).

The AA cohort subjects were younger (41.4 versus 50.44;  $P < .0001$ ) and had a similar sex distribution ( $P = .59$ ) compared to the cohort of subjects with all other COVID-vaccination AEs (1 043 696) (Table 2). Moderna vaccinations were associated with a higher proportion of other AEs compared to AA, while Pfizer vaccinations were associated with a higher proportion of AA AEs than other AEs ( $P < .0001$ ).

Our study demonstrates an association between AA and COVID-19 vaccination in the United States across all age groups, with women versus men experiencing AA particularly within the first month of vaccination. The difference in onset between younger and older age groups may be associated with varying immune responses associated with aging,<sup>3</sup> or related to other underlying chronic conditions or systemic causes leading to hair loss.<sup>4</sup> Females had a more immediate onset of alopecia compared to males, perhaps owing to more frequent autoimmune conditions,<sup>5</sup> or females reporting hair loss sooner as a result of being more conscious of changes in their hair.<sup>6</sup> A previous AA or autoimmune disorder history was not strongly associated with post-vaccination AA, suggesting that monitoring patients within the first few

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months of vaccination is important, regardless of history or vaccine manufacturer.

Results from prior studies differed from our findings. For example, a 2023 survey-based study of 152 online AA support group participants found that a greater proportion of patients developed AA after the second COVID-19 vaccination (25/47, 53.2%) than the first (12/47, 25.5%) or third (10/47, 21.3%) vaccinations (no *P* value reported).<sup>7</sup> In addition, a 2023 systematic review of 51 patients with COVID-vaccination-related AA reported that 24 (47.1%) patients had preexisting AA,<sup>8</sup> while only 28/206 (13.59%) from our VAERS cohort had a preexisting autoimmune disorder and 15/206 (7.28%) had a previous AA history. The same study also reported AA occurring most frequently within 1 month after the first dose, with incidence decreasing gradually with time,<sup>8</sup> while our study found age and sex differences within days of AA onset.

This study is subject to several limitations. Only 5 cases were confirmed by biopsy, and the reliance on reporting by patients, healthcare professionals, and vaccine manufacturers may have led to incomplete or inconsistent patient histories. Additionally, there is a potential for misdiagnosis and misclassification, as some individuals may have had mixed types of hair loss.

Our findings highlight an association between AA development and COVID-19 vaccination. Further research is needed to corroborate these findings, better understand the underlying mechanisms of this association, and inform evidence-based management strategies, including early intervention and tailored treatments. Following vaccination, physicians can advise patients to monitor for hair loss and confirm with physical examination, trichoscopy, and biopsy.

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### Potential conflicts of interest

Shari R. Lipner, MD, PhD, has served as a consultant for Moberg Pharmaceuticals and BelleTorus Corporation.

**Table 1.** Demographics and History of Autoimmune Alopecia Cases Following COVID-19 Vaccinations by Vaccine Manufacturer.

Variable	Janssen	Moderna	Novavax	Pfizer-BioNTech	Total	P Value
Alopecia type						.7605
AA	8	54	1	114	177	
AT	0	6	0	4	10	
AU	0	5	0	13	18	
AB	0	0	0	1	1	
Age, y						.3089
3–5	0	0	0	2	2	
6–17	0	0	0	21	21	
18–29	2	8	0	16	26	
30–39	2	11	0	25	38	
40–49	1	15	1	18	35	
50–59	0	15	0	21	36	
60–64	1	5	0	8	14	
65–79	1	8	0	7	16	
80+	0	0	0	2	2	
Unknown	1	3	0	12	16	
Sex						.0754
Female	2	39	1	94	136	
Male	5	25	0	33	63	
Unknown	1	1	0	5	7	
History of autoimmune disorders						.805
Yes	1	11	0	16	28	
No	7	54	1	116	178	
History of AA						.561
Yes	0	7	0	8	15	
No	8	59	1	123	191	
Prior vaccination AE						.9498
Yes	0	2	0	3	5	
No	8	63	1	129	201	
Onset, days						.8328
0	0	1	0	8	9	
1	0	1	0	3	4	
2	0	2	0	1	3	
3	0	4	0	3	7	
4	0	1	0	0	1	
5	0	1	0	1	2	
6	0	0	0	4	4	
7	1	2	0	6	9	
8	1	1	0	3	5	
9	0	3	0	2	5	
10–14	0	9	0	9	18	
15–30	1	11	1	22	35	
31–60	1	6	0	25	32	
61–120	1	9	0	10	20	
121+	2	8	0	11	21	
Unknown	1	6	0	24	31	
Vaccination dose						.1108
Dose 1	6	32	1	51	90	
Dose 2	0	17	0	48	65	
Dose 3	0	10	0	8	18	
Dose 4	0	0	0	5	5	
Unknown	2	6	0	20	28	

Abbreviations: AA, alopecia areata; AB, alopecia barbae; AE, adverse event; AT, alopecia totalis; AU, alopecia universalis.

**Table 2.** Alopecia Areata Versus All Other AEs Related to COVID-19 Vaccination in the VAERS.

Variable	Alopecia (n = 206)	All Other AEs (n = 1 043 696)	P Value
Mean age, y (range)	41.39362 (5-83)	50.44053 (0.08-119)	< .0001
Sex, n (%)			.588
Female	136 (66.02)	663 402 (63.60)	
Male	63 (30.60)	337 590 (32.30)	
Unknown	7 (3.40)	42 433 (4.06)	
Hospitalizations, n (%)	0 (0)	163 717 (15.70)	
Deaths, n (%)	0 (0)	22 704 (2.18)	
Vaccination dose, n (%)			.7041
1	90 (43.70)	447 624 (42.90)	
2	65 (31.60)	284 381 (27.20)	
3	18 (8.73)	101 834 (9.80)	
4	5 (2.43)	30 037 (2.90)	
5	0 (0)	6806 (0.65)	
6	0 (0)	1536 (0.15)	
7	0 (0)	967 (0.09)	
Unknown/other	28 (13.6)	170 258 (16.30)	
Manufacturer, n (%)			
Janssen	8 (3.90)	73 655 (7.00)	.100504
Moderna	65 (31.60)	474 384 (45.50)	< .0001
Novavax	1 (0.49)	715 (0.07)	.3397243
Pfizer-BioNTech	132 (64.10)	487 168 (46.70)	< .0001

Abbreviations: AE, adverse event; VAERS, Vaccine Adverse Events Reporting System.

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