ORIGINAL RESEARCH

Cross-Sectional Analysis of Biologic Use in the Treatment of Veterans With Hidradenitis Suppurativa

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Background: Biologic medications, such as adalimumab, secukinumab, and bimekizumab, are currently the only medications approved by the US Food and Drug Administration for the treatment of hidradenitis suppurativa (HS). Low rates of biologic use in HS have been reported, with significant differences in prescription patterns by sex, race, and age. However, no studies have analyzed these metrics in the Veterans Health Administration (VHA). This study evaluated HS therapy in the VHA and potential disparities in biologic prescription patterns for patients.

Methods: This retrospective cross-sectional analysis used VHA data from January 1, 2011, to December 31, 2021. Biologic prescriptions, including adalimumab and infliximab, were analyzed across varying patient demographics and characteristics.

Results: In VHA, 29,483 individuals had ≥ 1 diagnosis of HS, of whom 5.2% were prescribed ≥ 1 biologic (adalimumab or infliximab). Most patients diagnosed with HS were White (60.6%), men (75.3%), and obese (59.3%) and had prior or current tobacco use (73.5%). An age-dependent reduction in the odds of being prescribed a biologic in patients with HS ($P < .001$) was observed. Obesity (body mass index ≥ 30) significantly increased the odds of biologic prescription ($P < .001$).

Conclusions: Biologic use in patients with HS was relatively low but higher or within the same range as previous studies. Understanding biologic prescription patterns offers potential to identify and improve access to underserved HS populations.

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Hidradenitis suppurativa (HS) is a chronic, inflammatory skin disorder characterized by painful nodules, abscesses, and tunnels predominantly affecting intertriginous areas of the body.[1,2] The condition poses significant challenges in terms of diagnosis, treatment, and quality of life for affected individuals. Various systemic therapies have been explored to manage this debilitating condition, with the emergence of biologic agents offering hope for improved outcomes. In 2015, adalimumab (ADA) was the first biologic approved by the US Food and Drug Administration (FDA) for the treatment of HS, followed by secukinumab in 2023 and bimekizumab in 2024. However, the off-label use of other biologics and/or tumor necrosis factor inhibitors such as infliximab (IFX) has become common practice.[3]

Although these therapies have demonstrated promising results in the treatment of HS, their widespread use may be hindered by accessibility and cost barriers. Orenstein et al analyzed data from the IBM Explorys platform from 2015 to 2020 and found that only 1.8% of patients diagnosed with HS had been prescribed ADA or IFX.[4] More recently, Garg et al examined IBM MarketScan and IBM US Medicaid data from 2015 to 2018 to evaluate trends in clinical care and treatment. The prevalence of ADA and IFX prescriptions among patients with HS ranged from 2.3% to 8.0% (ADA) and 0.7% to 0.9% (IFX) for patients with commercial insurance, and 1.4% to 4.8% (ADA) and 0.5% to 0.7% (IFX) for patients with Medicaid.[5] Biologics are often expensive, and the high cost associated with these therapies has been identified as a significant barrier to access for patients with HS, particularly those who lack adequate insurance coverage or face financial constraints.[6]

Furthermore, these barriers, particularly the financial barriers, are potentially compounded by the demographics of patients most notably affected by HS. In the US, a disproportionate incidence of HS has been noted in specific groups and age ranges, including women, individuals aged 18 to 29 years, and Black individuals.[4] Orenstein et al found a statistically significant difference in use of ADA and IFX biologics based on age, sex, and race.[4]

The aim of this study was to examine the use of 2 biologics (ADA and IFX) in the Veterans Health Administration (VHA), a unique population in which financial barriers are reduced due to the single-payer government health care system structure. This design allowed for improved isolation and evaluation of variation in ADA and/or IFX prescription rates by demographics and health-related factors among patients with HS. To our knowledge, no studies have analyzed these metrics within the VHA.

METHODS

This retrospective, cross-sectional analysis of VHA patients used data from the US

Department of Veterans Affairs (VA) Corporate Data Warehouse, a data repository that provides access to longitudinal national electronic health record data for all veterans receiving care through VHA facilities. This study received ethical approval from institutional review boards at the Minneapolis Veterans Affairs Health Care System and VA Salt Lake City Healthcare System. Patient information was deidentified, and patient consent was not required.

Patients with HS were identified using ≥ 1 *International Classification of Diseases* (*ICD*) diagnostic code: (*ICD-9* [705.83] or *ICD-10* [L73.2]) between January 1, 2011, and December 31, 2021. The study included patients aged ≥ 18 years as of January 1, 2011, with ≥ 2 patient encounters during the postdiagnosis follow-up period, and with ≥ 1 encounter 6 months postindex. Patients with a biologic prescription prior to HS diagnosis were excluded. For this study, the term biologics refers to ADA and/or IFX prescriptions, unless otherwise specified. Only ADA and IFX were included in this analysis because ADA, a tumor necrosis factor (TNF)-α inhibitor, was the only FDA-approved medication at the time of the search, and IFX is another common TNF-α inhibitor used for the treatment of HS.

Statistical Analysis

We calculated logistic regression using SAS 9.4 (SAS Institute, Cary, NC). For each variable, the univariate relationship with biologic prescriptions was examined first, followed by the multivariate relationship controlling for all other variables. The following variables were controlled for in the multivariate models and were chosen a priori: sex, age, race, ethnicity, US region, hospital setting, current or previous tobacco use, obesity (defined as body mass index [BMI] ≥ 30), and Charlson Comorbidity Index (CCI).[7]

RESULTS

Using *ICD* codes, we identified 29,483 individuals with ≥ 1 HS diagnosis (Figure 1). Of those identified, 1537 patients (5.21%) had been prescribed ≥ 1 biologic. The cohort was predominantly White (60.56%), male (75.27%), obese (59.34%), and had a history of current or previous tobacco use (73.47%) (Table 1). There were significant adjusted differences in prescription rates among veterans with HS based on age, race, and BMI. Notably, there was an age-dependent reduction in the odds of being prescribed a biologic in patients with HS. Compared with patients aged 18 to 44 years, patients aged

TABLE 1. Study Population Demographic and Characteristics of Patients With HS in VA Health Care System

Criteria	Total, No. (%)	No ADA/IFX, No. (%)	ADA/IFX, No. (%)	*P* value[a]
Overall	29,483	27,946 (94.79)	1537 (5.21)	
Sex				< .001
Female	7291 (24.73)	6829 (24.44)	462 (30.06)	
Male	22,192 (75.27)	21,117 (75.56)	1075 (69.94)	
Age, y				< .001
18–44	11,234 (38.10)	10,411 (37.25)	823 (53.55)	
45–64	13,073 (44.34)	12,469 (44.62)	604 (39.30)	
> 64	5167 (17.53)	5057 (18.10)	110 (7.16)	
Missing	9 (0.03)	9 (0.03)	0 (0.00)	
Race[b]				< .001
White	16,790 (56.95)	16,005 (57.27)	785 (51.07)	
Black	10,227 (34.69)	9621 (34.43)	606 (39.43)	
Asian	229 (0.78)	212 (0.76)	17 (1.11)	
AI/AN	237 (0.80)	220 (0.79)	17 (1.11)	
NH/PI	241 (0.82)	236 (0.84)	5 (0.33)	
Missing	1759 (5.97)	1652 (5.91)	107 (6.96)	
Ethnicity[b]				.07
Hispanic	2195 (7.44)	2065 (7.39)	130 (8.46)	
Non-Hispanic	26,332 (89.31)	25,008 (89.49)	1324 (86.14)	
Missing	956 (3.24)	873 (3.12)	83 (5.40)	
US region				< .001
East	3352 (11.37)	3210 (11.49)	142 (9.24)	
Midwest	6182 (20.97)	5874 (21.02)	308 (20.04)	
South	14,389 (48.80)	13,552 (48.49)	837 (54.46)	
West	5232 (17.75)	4990 (17.86)	242 (15.74)	
Missing	328 (1.11)	320 (1.15)	8 (0.52)	
Hospital setting				.04
Urban	21,643 (73.41)	20,479 (73.28)	1164 (75.73)	
Rural	7826 (26.54)	7453 (26.67)	373 (24.27)	
Missing	14 (0.05)	14 (0.05)	0 (0.00)	
Tobacco use[c]				.49
Yes	15,592 (52.88)	14,862 (53.18)	730 (47.50)	
No	5631 (19.10)	5380 (19.25)	251 (16.33)	
Missing	8260 (28.02)	7704 (27.57)	556 (36.17)	
Obesity[d]				< .001
Yes	17,114 (58.05)	16,119 (57.68)	995 (64.74)	
No	11,726 (39.77)	11,263 (40.30)	463 (30.12)	
Missing	643 (2.18)	564 (2.02)	79 (5.14)	
CCI				< .001
0	15,019 (50.94)	14,054 (50.29)	965 (62.78)	
1	6175 (20.94)	5880 (21.04)	295 (19.19)	
> 1	8289 (28.11)	8012 (28.67)	277 (18.02)	

Abbreviations: ADA, adalimumab; AI, American Indian; AN, Alaska Native; CCI, Charlson Comorbidity Index; HS, hidradenitis suppurativa; IFX, infliximab; NH, Native Hawaiian; PI, Pacific Islander; VA, US Department of Veterans Affairs.
[a]Pearson χ^2.
[b]Self-reported.
[c]Defined as either current or former use.
[d]Defined as body mass index ≥ 30.

TABLE 2. Analysis of Biologic Use in Patients With HS

Patients with HS[a]	ADA/IFX prevalence, % (No./total)	cOR (95% CI)	aOR (95% CI)	*P* value[b]
Overall	5.21 (1537/29,483)	Reference	Reference	Reference
Sex				
Female	6.34 (462/7291)	Reference	Reference	Reference
Male	4.84 (1075/22,192)	0.75 (0.67-0.84)	0.97 (0.83-1.12)	.68
Age, y				
18-44	7.33 (823/11,234)	Reference	Reference	Reference
45-64	4.62 (604/13,073)	0.61 (0.54-0.69)	0.63 (0.54-0.74)	< .001
> 64	2.13 (110/5167)	0.28 (0.22-0.33)	0.36 (0.27-0.48)	< .001
Race[c]				
White	4.68 (785/16,790)	Reference	Reference	Reference
AI/AN	7.17 (17/237)	1.58 (0.96-2.59)	1.38 (0.74-2.57)	.31
Asian	7.42 (17/229)	1.63 (0.99-2.69)	1.06 (0.52-2.19)	.87
Black	5.93 (606/10,227)	1.28 (1.15-1.43)	1.07 (0.92-1.25)	.38
NH/PI	2.07 (5/241)	0.43 (0.18-1.05)	0.23 (0.06-0.92)	.04
Ethnicity[c]				
Non-Hispanic	5.03 (1324/26,332)	Reference	Reference	Reference
Hispanic	5.92 (130/2195)	1.19 (0.98-1.43)	1.12 (0.86-1.47)	.40
US region				
Midwest	4.98 (308/6182)	Reference	Reference	Reference
East	4.24 (142/3352)	0.84 (0.69-1.03)	0.94 (0.73-1.21)	.62
South	5.82 (837/14,389)	1.18 (1.03-1.35)	1.10 (0.92-1.32)	.30
West	4.63 (242/5232)	0.92 (0.77-1.10)	0.93 (0.73-1.18)	.55
Hospital setting				
Urban	5.38 (1164/21,634)	Reference	Reference	Reference
Rural	4.77 (373/7826)	0.88 (0.78-0.99)	1.06 (0.90-1.24)	.47
Tobacco use[d]				
No	4.46 (251/5631)	Reference	Reference	Reference
Yes	4.68 (730/15,592)	1.05 (0.90-1.22)	1.14 (0.97-1.34)	.11
Obesity[e]				
No	3.95 (463/11,726)	Reference	Reference	Reference
Yes	5.81 (995/17,114)	1.50 (1.34-1.68)	1.47 (1.27-1.71)	< .001
CCI				
0	6.43 (965/15,019)	Reference	Reference	Reference
1	4.78 (295/6175)	0.73 (0.63-0.84)	0.97 (0.82-1.16)	.77
> 1	2.74 (227/8289)	0.50 (0.44-0.58)	0.89 (0.74-1.07)	.22

Abbreviations: ADA, adalimumab; AI/AN, American Indian or Alaska Native; aOR, adjusted odds ratio; CCI, Charlson Comorbidity Index; cOR, crude odds ratio; HS, hidradenitis suppurativa; *ICD-9* or *ICD-10*, *International Classification of Diseases*, *Ninth* or *Tenth Revision*; IFX, infliximab; NH/PI, Native Hawaiian or Pacific Islander.
[a]Patients identified using ≥ 1 validated *ICD-9* (705.83) or *ICD-10* (L73.2) diagnosis code.
[b]Reported *P* value corresponds to group-specific aOR adjusted for age, sex, race, ethnicity, census region, urban/rural, tobacco use, obesity, and CCI.
[c]Self-reported.
[d]Defined as either current or former use.
[e]Defined as body mass index ≥ 30.

45 to 64 years (adjusted odds ratio [aOR], 0.63; 95% CI, 0.54–0.74; *P* < .001) and patients aged ≥ 65 years (aOR, 0.36; 95% CI, 0.27–0.48; *P* < .001) had significantly lower odds of receiving a biologic prescription (Table 2). Compared with White patients with HS, Native Hawaiian (NH) or Pacific Islander (PI) patients were less likely to be prescribed a biologic (aOR, 0.23; 95% CI, 0.06–0.92; *P* = .04). Patients with obesity had significantly higher odds of receiving a biologic prescription compared with patients without obesity (aOR, 1.47; 95% CI, 1.27–1.71; *P* < .001).

After adjusting for the variables listed in Table 1, there were no significant differences in biologic prescription rates for men compared with women (aOR, 0.97; 95% CI, 0.83-1.12; *P* = .68). We observed slight variations in biologic prescriptions between US regions (Midwest 5.0%, East 4.2%, South 5.8%, West 4.6%), none of which

were significantly different in the fully adjusted model. No statistically significant differences were found in biologic prescriptions between urban and rural VA settings (5.4% vs 4.8%; aOR, 1.06; 95% CI, 0.90–1.24; *P* = .47). Tobacco use was not associated with the rate of biologic prescription receipt (aOR, 1.14; 95% CI, 0.97–1.34; *P* = .11). After adjusting for other variables (as outlined in Table 2), no significant differences were found between CCI of 0 and 1 (aOR, 0.97; 95% CI, 0.82–1.16; *P* = .77) or between CCI of 0 and 2 (aOR, 0.89; 95% CI, 0.74–1.07; *P* = .22).[7]

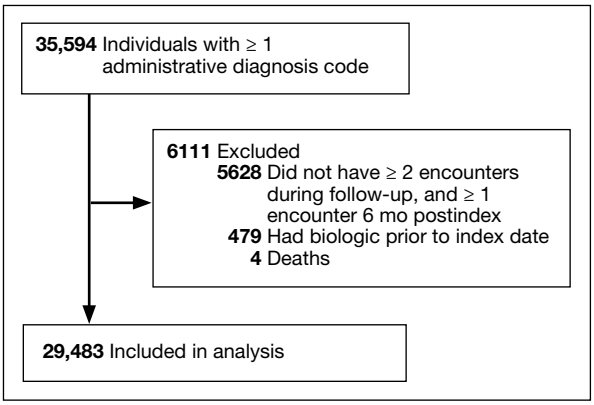

FIGURE. STROBE Flowchart of Cohort Included in Analysis.

DISCUSSION

The aim of the study was to ascertain potential discrepancies in biologic prescription patterns among patients with HS in the VHA by demographic and lifestyle behavior modifiers. Veteran cohorts are unique in composition, consisting predominantly of older White men within a single-payer health care system. The prevalence of biologic prescriptions in this population was low (5.2%), consistent with prior studies (1.8%–8.9%).[4,5]

We found a significant difference in ADA/IFX prescription patterns between White patients and NH/PI patients (aOR, 0.23; 95% CI, 0.06-0.92; *P* = .04). Further replication of this result is needed due to the small number of NH/PI patients included in the study (n = 241). Notably, we did not find a significant difference in the odds of Black patients being prescribed a biologic compared with White patients (aOR, 1.07; 95% CI, 0.92–1.25; *P* = .38), consistent with prior studies.[4]

In line with prior studies, age was associated with the likelihood of receiving a biologic prescription.[4] Using the multivariate model adjusting for variables listed in Table 1, including CCI, patients aged 45 to 64 years and > 64 years were less likely to be prescribed a biologic than patients aged 18 to 44 years. HS disease activity could be a potential confounding variable, as HS severity may subside in some people with increasing age or menopause.[8]

Because different regions in the US have different sociopolitical ideologies and governing legislation, we hypothesized that there may be dissimilarities in the prevalence rates of biologic prescribing across various US regions. However, no significant differences were found in prescription patterns among US regions or between rural and urban settings. Previous research has demonstrated discernible disparities in both dermatologic care and clinical outcomes based on hospital setting (ie, urban vs rural).[9-11]

Tobacco use has been demonstrated to be associated with the development of HS.[12] In a large retrospective analysis, Garg et al reported increased odds of receiving a new HS diagnosis in known tobacco users (aOR, 1.9; 95% CI, 1.8–2.0).[13] The extent to which tobacco use affects HS severity is less understood. While some studies have found an association between smoking and HS severity, other analyses have failed to find this association.[14,15] The effects of smoking cessation on the disease course of HS are unknown.[16] This analysis, found no significant difference in prescriptions for biologics among patients with HS comparing current or previous tobacco users with nonusers.

There is a known positive correlation between increasing BMI and HS prevalence and severity that may be explained by the downstream effects of adipose tissue secretion of proinflammatory mediators and insulin resistance in the setting of chronic inflammation.[12] This analysis found that patients with HS and obesity were 1.47 times more likely to be prescribed a biologic than patients with HS without obesity, which may be confounded by increased HS severity among patients with obesity. The initial concern when analyzing tobacco use and obesity was that clinician bias may result in

a decrease in the prevalence of biologic use in these demographics, which was not supported in this study.

Although we identified few disparities, the results demonstrated a substantial underutilization of biologic therapies (5.2%), similar to the other US civilian studies (1.8-8.9%).[4,5] While there is no current universal, standardized severity scoring system to evaluate HS (it is difficult to objectively define moderate to severe HS), estimates have shown that 40.3% to 65.8% of patients with HS have Hurley stage II or III.[17-19] Therefore, only a small percentage of patients with moderate to severe disease were prescribed the only FDA-approved medication during this time period. The persistence of this underutilization within a medical system that reduces financial barriers suggests that nonfinancial barriers have a notable role in the underutilization of biologics.

For instance, risk of adverse events, particularly lymphoma and infection, has been cited by patients as a reason to avoid biologics. Additionally, treatment fatigue reduced some patients' willingness to try new treatments, as did lack of knowledge about treatment options.[6,20] Other reported barriers included the frequency of injections and fear of needles.[6] Additionally, within the VA, ADA may require prior authorization at the local facility level.[21] An established relationship with a dermatologist has been shown to significantly increase the odds of being prescribed a biologic medication in the face of these barriers.[4] Future system-wide quality improvement initiatives could be implemented to identify patients with HS not followed by dermatology, with the goal of establishing care with a dermatologist.

Limitations

Limitations to this study include an inability to categorize HS disease severity and assess the degree to which disease severity confounded study findings, particularly in relation to tobacco use and obesity. The generalizability of this study is also limited because of the demographic characteristics of the veteran patient population, which is predominantly older, White, and male, whereas HS disproportionately affects younger, Black, and female individuals in the US.[22] Despite these limitations, this study contributes valuable insights into the use of biologic therapies for veteran populations with HS using a national dataset.

CONCLUSIONS

This study was performed within a single-payer government medical system, likely reducing or removing the financial barriers that some patient populations may face when pursuing biologics for HS treatment. However, the prevalence of biologic use in this population was low overall (5.2%), suggesting that other factors play a role in the underutilization of biologics in HS. Consistent with previous studies, younger individuals were more likely to be prescribed a biologic, and no difference in prescription rates between Black and White patients was observed. Unlike previous studies, no significant difference in prescription rates between men and women was observed.

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Ethics and consent

Institutional review boards at the Minneapolis Veterans Affairs Health Care System and Veterans Affairs Salt Lake City Healthcare System reviewed and approved this study (IRBNet ID #1698678-5). Patient information was deidentified, and patient consent was not required. Patient data will not be shared with third parties.

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