ORIGINAL RESEARCH ARTICLE

Baseline Characteristics from UNITE: An Observational, International, Multicentre Registry to Evaluate Hidradenitis Suppurativa (Acne Inversa) in Clinical Practice

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Abstract

Background Hidradenitis suppurativa (HS), also known as acne inversa, is a recurring, painful, chronic, and sometimes disfiguring inflammatory skin disease.

Objectives Our objective was to report the baseline clinical characteristics, natural history, and associated outcomes of patients with HS from the ongoing, prospective, non-interventional UNITE registry that is collecting data regarding the natural history and associated outcomes of HS.

Methods Patients with inflammatory HS lesions were enrolled, including adolescents (aged 12 to < 18 years) and adults (aged ≥ 18 years). None had participated in previous or current originator-adalimumab studies/registries. Patients received treatment consistent with site-specific, routine clinical practice. HS disease status was assessed by HS lesions and disease flare; treatment and outcomes data were collected at enrolment and every 6 months for ≤ 4 years.

Results Enrolment ($N = 594$; 89.1% adults; 10.9% adolescents) occurred from 29 October 2013 to 29 December 2015 at 73 sites in 12 countries. At baseline, the majority were female (69.7%) and White (81.2%), had moderate-to-severe disease (Hurley stage II or III; 93.3%), and had undergone prior procedures/surgery for HS (68.7%). In total, 61.6% of adults and 49.2% of adolescents were obese; 40.2% of patients reported current tobacco use. Scarring due to lesions occurred in 91.2% of patients. The prevalence of comorbidities of interest was as follows: depression (13.3%), other psychiatric disorders (9.6%), inflammatory bowel disease (2.7%), diabetes (9.1%), and polycystic ovary syndrome (5.2%).

Conclusions In this population from the UNITE HS registry, obesity and smoking were common, and disease burden was high, manifesting as multiple lesions, scarring, surgical history, and considerable comorbidities.

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Key Points

This report of the baseline characteristics from UNITE, a non-interventional long-term hidradenitis suppurativa (HS) registry, provides the first geographically diverse, detailed clinical description of HS in an observed population across North America, Europe, and Australia.

Clinical aspects of the disease appeared similar between adults and adolescents, although adolescents were more likely to have been diagnosed earlier in the disease course.

Lesion count and scarring affected the groin/pelvic/pubic area most commonly and severely compared with the inframammary area, in contrast to previous reports.

1 Introduction

Hidradenitis suppurativa (HS; or acne inversa) is a chronic, inflammatory skin disease that manifests as inflammatory nodules, abscesses, draining fistulas, and—in some cases—severe scarring [1]. The disease affects mainly intertriginous areas (axillae, inguinal, genital, and inframammary regions), which are subject to friction [1, 2].

HS occurs about three times more frequently in women than in men [3–6]. The estimated prevalence is 0.1% based on US claims data and approximately 1–4% in Europe [7, 8]. Clinical experience suggests that HS is under-recognised, especially among the non-dermatology community [9], which frequently results in substantial delay in diagnosis (≥ 7 years average) [10, 11]. Onset is generally post-pubertal (20–30 years of age) [4] but can rarely occur in prepubescence [5]. The disease is diagnosed by the presence of characteristic lesions in typical body sites, but there is no confirmatory diagnostic test [12]. Adults and adolescents share the clinical features of HS.

Although not fully understood, the pathogenesis of HS is thought to be a combination of genetic, environmental, and physiological factors, including auto-inflammatory mechanisms and microbiome alterations [11], and may also be related to follicular occlusion, inflammation, and abnormal immune response in the skin [1, 13, 14].

HS greatly impacts quality of life [12, 15–18], and disease burden can be substantial, especially as severity increases. The malodorous discharge from draining lesions can cause embarrassment, psychological stress, and social stigma, which may lead to social isolation [9]. Pain from active lesions can substantially impair quality of life and lead to work disability [16]. Symptoms can also be caused by irreversible scarring, which can limit physical activity and cause psychological impairment [19]. Noncutaneous comorbidities can also be significantly burdensome [20] and include depression, arthritis (including spondyloarthropathies), metabolic syndrome, polycystic ovary syndrome (PCOS), obesity, skin cancer, and inflammatory bowel disease [7, 11, 12, 21, 22].

Treatment for HS is typically individualised based on clinical presentation and disease impact [23]. Evidence-based treatments include anti-inflammatory antibiotics (topical clindamycin, then oral doxycycline or minocycline) and adalimumab (the only approved pharmacological treatment for HS). Less well-researched treatments include zinc gluconate, topical resorcinol, intralesional and systemic corticosteroids, acitretin, and infliximab. Other agents with limited levels of supporting evidence include hormone therapy, cyclosporine, dapsone, and others [24, 25]. Classical surgery and/or laser techniques can be combined with medical therapy and may be appropriate for locally recurring lesions

and for severe disease [26]. Adjuvant measures include pain management, treatment of superinfections, weight loss, and tobacco abstinence [24].

Improved characterisation of the natural history, diagnostic patterns, and clinical characteristics of HS could inform the development of treatments and improve patient care. To that end, UNITE is the first geographically diverse, longitudinal, prospective, observational registry to collect long-term clinical and health-related quality-of-life data from patients with HS. The objective of this ongoing registry is to evaluate the natural history and risk of progression of HS, evolving clinical practice trends, and associated outcomes in patients with HS. We report UNITE's baseline demographic and clinical characteristics for adult and adolescent patients with HS. Baseline patient-reported outcomes from UNITE, including comprehensive quality-of-life outcomes, are published separately [27].

2 Materials and Methods

2.1 Study Design

In this non-interventional registry, patient treatment is rendered per routine clinical practice at each site. The protocol does not mandate using specific medication(s) or treatment procedure(s). Data on HS treatment and associated clinical and patient-reported outcomes were collected at enrolment and approximately every 6 months thereafter for up to 4 years. As this registry is observational, no pre-defined hypotheses exist regarding the magnitude of any resulting differences.

2.2 Patients

Approximately 500–600 patients were to be enrolled from 75–100 sites across 12 countries. UNITE's sample size was based on the size needed for a reliable assessment of the descriptive statistics. Adolescents (aged 12–18 years) and adults (aged ≥ 18 years) with a confirmed diagnosis of HS, presence of HS inflammatory nodules and/or abscesses, and no previous or current participation in an adalimumab clinical study or registry were enrolled. To minimise potential bias in outcome measurement due to varying levels of disease severity, the registry attempted to enrol a balanced proportion of adults across Hurley stages I, II, and III (mild, moderate, and severe disease, respectively); given the lower numbers of adolescents enrolled, balance across stages was not attempted.

2.3 Baseline Characteristics

The last non-missing measurement collected at or before enrolment was used as the baseline for summary of demographics, disease characteristics, and disease activity. Adverse events were not prospectively collected since this is a non-drug, non-interventional disease registry. No routine laboratory results were collected.

The clinical course of HS was assessed by lesions located in the overall body areas and in the anatomic region within each body area, as defined in Online Resource 1. The following were assessed at enrolment: lesions and hypertrophic scarring, lesion type (abscess, inflammatory nodule, non-inflammatory nodule, draining fistula, and non-draining fistula), lesional drainage requiring use of pad(s), and frequency of HS flares. "Flare" was identified by the investigator and patient.

2.4 Statistical Analysis

All baseline characteristics were summarised by descriptive statistics. Means and standard deviations (SDs) were reported for continuous variables; count and proportion were reported for categorical variables. Analyses were conducted for all enrolled in the registry. When appropriate, results were also reported by age group (adolescents and adults) and/or by baseline Hurley stage. All statistical analyses were conducted in SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).

3 Results

Enrolment started on 29 October 2013 and completed on 29 December 2015. As of 24 September 2018, most patients had participated in the registry for ≥ 3.5 years. A total of 594 patients were enrolled from 73 sites in 12 countries: USA (323; with an additional 10 in Puerto Rico), Canada (76), Netherlands (36), Germany (35), Spain (32), Italy (30), Hungary (14), Greece (11), Switzerland (11), Australia (8), France (5), and Czech Republic (3).

3.1 Patient Characteristics at Baseline

The majority of patients were adults (89.1%, $N = 529$), of whom 97.7% were aged < 65 years and 10.9% ($N = 65$) were adolescents (Table 1). The mean age was 36.1 years. Most patients were female (69.7%) and White (81.2%). Current or previous tobacco use was reported by 64.1% of adults and 6.1% of adolescents. Current tobacco use was reported by 40.2% of all patients and increased with increasing disease severity (32.5%, 39.8%, and 43.1% at Hurley stages I, II, and III, respectively).

The majority (83.7% of adults and 75.4% of adolescents) were overweight to obese, defined as body mass index (BMI) ≥ 25 kg/m^2 for adults and ≥ 85th percentile for adolescents. Most adults (61.6%) and almost half of adolescents (49.2%) were obese (BMI ≥ 30 kg/m^2 for adults and BMI ≥ 95th percentile for adolescents) (Table 2).

3.2 Disease Characteristics at Baseline

The majority of patients had Hurley stage II disease (65.4% of adults and 73.8% of adolescents; Table 3). In addition, a higher proportion of adults (94.7%) than adolescents (81.5%) had Hurley stage II or III disease. The median/mean time between onset of HS symptoms and diagnosis was 4.1/8.3 years for adults and 1.3/2.5 years for adolescents (Table 3). Approximately one-third of patients reported a family history of HS (30.1% adults, 35.4% adolescents).

Patients had substantial disease burden based on mean $\pm$ SD lesion counts and number of flares (Table 3). Among lesions, nodules were most frequent overall (6.9 $\pm$ 10.7 inflammatory and 6.9 $\pm$ 18.4 non-inflammatory). Flares during the 6 months before baseline were 5.8 $\pm$ 9.5 for adults (approximately one flare/month) and 4.6 $\pm$ 5.6 for adolescents. More than one-third of patients (38.7%) used pads for lesional drainage.

Mean total lesion count was highest in the pelvic/pubic/genital region compared with other body areas (Fig. 1). Mean total lesion count was highest in each body area at Hurley stage III for adults (Fig. 1a) but Hurley stage II for adolescents (Fig. 1b). The pelvic/pubic/genital region had the highest total mean $\pm$ SD abscess and inflammatory nodule (AN) count (6.6 $\pm$ 11.7) and total fistula (draining and non-draining) count (5.9 $\pm$ 14.7) compared with other body areas (Fig. 1c). Patients at Hurley stage III had the highest AN and fistula counts (18.7 $\pm$ 24.9 and 19.6 $\pm$ 40.7, respectively; Fig. 1d).

Scarring due to HS was reported by 91.2% of patients overall and was more common in adults than in adolescents (92.8% and 78.5%, respectively). Scarring increased with Hurley stage (4.7%, 97.2%, and 100% for Hurley stage I, II, and III, respectively; Table 4). The most common areas affected by scarring were pelvic/pubic/genital, followed by axilla (69.4% and 60.8% of patients, respectively).

3.3 Comorbidities at Baseline

The most common comorbidities were hypertension (14.3% of all patients), depression (13.3%), and other cognitive/psychiatric disorders, including anxiety (9.6%) (Table 5). Notable skin manifestations included pilonidal cyst (7.1% of patients), contracture, or strictures due to HS scarring (4.5%), severe acne (4.2%), and acne conglobata (2.7%). Metabolic conditions included diabetes mellitus (9.1%) and hyperlipidaemia (5.9%). Inflammatory bowel disease was reported in 2.7% of all patients, and 5.2% had PCOS.

Table 1 Baseline demographics

Characteristics	Adults N = 529	Adolescents N = 65	All patients N = 594	All patients, by Hurley stage		
				I (N = 40)	II (N = 394)	III (N = 160)
Sex						
Male	166 (31.4)	14 (21.5)	180 (30.3)	11 (27.5)	105 (26.6)	64 (40.0)
Female	363 (68.6)	51 (78.5)	414 (69.7)	29 (72.5)	289 (73.4)	96 (60.0)
Race[a]						
White	425 (80.3)	53 (88.3)	478 (81.2)	31 (81.6)	330 (84.4)	117 (73.1)
Black	88 (16.6)	7 (11.7)	95 (16.1)	7 (18.4)	52 (13.3)	36 (22.5)
Asian	11 (2.1)	0	11 (1.9)	0	7 (1.8)	4 (2.5)
Native Hawaiian or Pacific Islander	2 (0.4)	0	2 (0.3)	0	1 (0.3)	1 (0.6)
American Indian or Alaskan Native	2 (0.4)	0	2 (0.3)	0	1 (0.3)	1 (0.6)
Multi-race	1 (0.2)	0	1 (0.2)	0	0	1 (0.6)
Ethnicity						
Hispanic or Latino	65 (12.3)	6 (9.2)	71 (12.0)	8 (20.0)	46 (11.7)	17 (10.6)
Age, years	38.6 ± 12.57	15.6 ± 1.38	36.1 ± 13.88	NC	NC	NC
Age categories, years						
12 to ≤ 17	0	65 (100)	65 (10.9)	12 (30.0)	48 (12.2)	5 (3.1)
18 to < 40	296 (56.0)	0	296 (49.8)	14 (35.0)	203 (51.5)	79 (49.4)
40 to ≤ 64	221 (41.8)	0	221 (37.2)	13 (32.5)	134 (34.0)	74 (46.3)
≥ 65	12 (2.3)	0	12 (2.0)	1 (2.5)	9 (2.3)	2 (1.3)
Tobacco use[b]						
User	235 (44.6)	3 (4.6)	238 (40.2)	13 (32.5)	156 (39.8)	69 (43.1)
Former user	103 (19.5)	1 (1.5)	104 (17.6)	7 (17.5)	70 (17.9)	27 (16.9)
Non-user	189 (35.9)	61 (93.8)	250 (42.2)	20 (50.0)	166 (42.3)	64 (40.0)
Alcohol[c]						
User	279 (54.1)	3 (4.7)	282 (48.6)	15 (40.5)	193 (50.0)	74 (47.1)
Former user	63 (12.2)	0	63 (10.9)	2 (5.4)	37 (9.6)	24 (15.3)
Non-user	174 (33.7)	61 (95.3)	235 (40.5)	20 (54.1)	156 (40.4)	59 (37.6)

Data are presented as mean ± standard deviation or N (%) unless otherwise indicated

NC data not collected

[a]Missing data (two and three adolescents at Hurley stage I and II, respectively)

[b]Tobacco use unknown (two adults at Hurley stage II)

[c]Alcohol use unknown (13 adults: two, eight, and three at Hurley stage I, II, and III, respectively; one adolescent at Hurley stage I)

3.4 Treatment Before Enrolment

The proportion of adults reporting a prior procedure/surgery for HS (72.4%) was higher than the proportion of adolescents (38.5%; Table 6). Similar proportions of adults and adolescents had used prior medication for HS (73.9% and 67.7%, respectively; Table 7). Overall, a majority (68.7%) had one or more prior procedure/surgery for HS; the most common was incision and drainage by a physician (33.8%). The proportion of patients reporting any prior HS procedure/surgery was higher at Hurley stage II or III (70.0%) than at Hurley stage I (50.0%; Table 6).

The majority of patients (73.2%) had received prior medication for HS (Table 7). The most common medication category was antibiotics (68.4% overall; 69.0% adults, 63.1% adolescents), with retinoids (17.7%; topical vs. oral was not specified), corticosteroids (8.8%), hormonal therapies (4.4%), and immunosuppressants (1.3%) also reported. Only 5.5% of adults, and no adolescents, had been prescribed a biologic. Opioid use was reported by 1.3% of all patients. The main reason for discontinuation of prior medication for HS was inadequate response (55.5% overall; 56.9% adults, 42.6% adolescents).

3.5 Quality of Life

Patient quality of life was captured for 529 adults using the Dermatology Life Quality Index (DLQI) (mean score ± SD 12.6 ± 8.0) and for 65 adolescents using the Children's

Table 2 Baseline body weight and body mass index

Characteristics		Adults N=529	Adolescents N=65	All patients N=594
Body weight, kg				
Male		(N=166) 100.7 ± 26.00	(N=14) 87.9 ± 21.45	(N=180) 99.7 ± 25.86
Female		(N=361) 93.7 ± 23.96	(N=51) 75.9 ± 20.68	(N=412) 91.5 ± 24.28
BMI, kg/m²		(N=526) 33.2 ± 8.10	(N=64) 28.1 ± 6.43	(N=590) 32.6 ± 8.08
BMI kg/m² categories		Adults (N=526)		
< 25	Normal weight	86 (16.3)		
25 to < 30	Overweight	116 (22.1)		
30 to < 40	Obese	219 (41.6)		
≥ 40	Morbidly obese	105 (20.0)		
BMI percentile categories			Adolescents (N=61)	
< 5th	Underweight		0	
5th to < 85th	Normal weight		15 (24.6)	
85th to < 95th	Overweight		16 (26.2)	
≥ 95th	Obese		30 (49.2)	

Data are presented as mean ± standard deviation or N (%) unless otherwise indicated

BMI body mass index

DLQI (CDLQI) (mean score ± SD 6.9 ± 6.2). In adults, the mean ± SD DLQI score by Hurley stages I, II, and III was 8.8 ± 7.3 (N=28), 11.6 ± 7.5 (N=346), and 15.7 ± 8.2 (N=155), respectively. In adolescents, the mean ± SD CDLQI score by Hurley stages I, II, and III was 5.5 ± 6.2 (N=12), 6.6 ± 6.0 (N=48), and 12.8 ± 6.2 (N=5), respectively. A thorough description of additional quality-of-life and other patient-reported outcomes from UNITE are published separately [27].

4 Discussion

The ongoing UNITE registry is the first global, longitudinal, prospective, observational registry collecting long-term clinical and quality-of-life data for patients with HS. Baseline data confirm that the burden of HS is substantial, especially with more severe disease. Patients had multiple comorbidities and generally received multiple treatments before enrolment. The majority were female and White, and the mean age was 36.1 years, which is similar to that in other reports of HS populations [7, 22, 28, 29].

Results suggest that patients may have been at a more advanced disease stage by the time they saw a dermatologist; 93.3% were at Hurley stage II or III and—consistent with other reports [10, 11, 28, 29]—the average time from symptom start to disease diagnosis was 7.7 years overall (adults 8.4 years; adolescents 2.5 years). The shorter time for adolescents suggests a greater likelihood of timely diagnosis despite having, on average, less severe disease. The mean age at start of symptoms was fairly young (23.2 years overall; adults 24.5, adolescents 12.1).

A strong heritable component was observed for HS in UNITE; 30.6% reported a family history of HS (adolescents 35.4% vs. adults 30.1%), similar to other reported findings [28, 30]

The burden of disease at baseline in UNITE was evaluated by examining lesions, scarring, comorbidities, prior medical treatments, and quality of life. Although the axilla is reportedly the area most commonly affected with HS lesions [28, 29, 31], the highest mean number of lesions overall in UNITE was observed in the pelvic/pubic/genital region, followed by axillary and mammary regions. Scarring was also most common in the pelvic/pubic/genital region (69.4% of patients); 60.8% had axillary scarring. Over 90% of patients had some degree of scarring at baseline. Nearly 5% of those classified as having Hurley stage I disease had scarring at baseline; by Hurley stage definition, these patients were under-classified, suggesting that severity can be overlooked in HS. Scarring is one of the major components of disease burden. In a qualitative study, 80.9% of patients reported psychological symptoms and 38.1% reported physical symptoms or limitations due to scarring [19]. Thus, it is critical to manage HS aggressively across Hurley stages to minimise the potential for irreversible damage.

Smoking and obesity have been identified as major risk factors associated with HS and as factors that are likely to increase disease severity [7, 32]. Patients with HS are

Table 3 Baseline characteristics associated with hidradenitis suppurativa

Characteristics	Adults N = 529	Adolescents N = 65	All patients N = 594
Hurley stage[a]			
I	28 (5.3)	12 (18.5)	40 (6.7)
II	346 (65.4)	48 (73.8)	394 (66.3)
III	155 (29.3)	5 (7.7)	160 (26.9)
ISH4 severity score[b] [43]			
≤ 3 (mild)	121 (22.9)	22 (34.4)	143 (24.1)
4–10 (moderate)	147 (27.8)	20 (31.3)	167 (28.1)
≥ 11 (severe)	261 (49.3)	22 (34.4)	283 (47.6)
Age at start of HS symptoms, years	(N = 528) 24.5 ± 12.3	(N = 65) 12.1 ± 3.4	(N = 593) 23.2 ± 12.3
Years from HS symptom onset to diagnosis	(N = 527)	(N = 65)	(N = 592)
Mean ± SD	8.3 ± 10.5	2.5 ± 3.3	7.7 ± 1.2
Median (1st, 3rd quartiles)	4.1 (0.6, 12.2)	1.3 (0.3, 3.0)	3.7 (0.5, 10.8)
Family history of HS	159 (30.1)	23 (35.4)	182 (30.6)
HS lesion count	(N = 529)	(N = 64)	(N = 593)
Abscesses	3.7 ± 8.8	2.6 ± 7.7	3.6 ± 8.8
Draining fistulas	2.6 ± 6.1	0.9 ± 2.0	2.4 ± 5.8
Non-draining fistulas	6.7 ± 22.6	1.2 ± 2.6	6.1 ± 21.5
Inflammatory nodules	7.1 ± 11.0	5.4 ± 7.4	6.9 ± 10.7
Non-inflammatory nodules	6.9 ± 17.5	6.4 ± 24.9	6.9 ± 18.4
Used pads for lesion drainage[c]	–	–	230 (38.7)
Mammary	–	–	34 (14.8)
Pelvic[d]	–	–	87 (37.8)
Axilla	–	–	97 (42.2)
Buttock	–	–	32 (13.9)
Number of HS flares[e] per patient during previous 6 months	(N = 529) 5.8 ± 9.5	(N = 64) 4.6 ± 5.6	(N = 593) 5.7 ± 9.1

Data are presented as mean ± standard deviation or N (%) unless otherwise indicated

HS hidradenitis suppurativa, *ISH4* International Hidradenitis Suppurativa Severity Score System, *SD* standard deviation

[a]Worst Hurley stage of all regions. Hurley stage I: Localised formation of single or multiple abscesses without sinus tracts and scarring. Hurley stage II: Recurrent abscesses with sinus tract formation and scarring; single or multiple lesions. Hurley stage III: Diffuse involvement with interconnected tracts and abscesses

[b]Data missing for one adolescent

[c]Patients could have reported using pads in multiple areas. Data were not analysed for adults versus adolescents because the number of adolescent patients was too small to provide meaningful information

[d]Includes groin

[e]"Flare" was as reported by patient or investigator and was not pre-defined in the protocol

13-fold more likely to be smokers and 4.4-fold more likely to be obese than are matched controls [7]. In UNITE, a substantial number of patients were current tobacco users at baseline, as also reported in other HS populations [7, 22, 28, 29]. Overall, the reported use at baseline increased as disease severity increased (measured by Hurley stage), a relationship also observed in another study [33]. Most UNITE patients were above normal weight, and the majority of those were obese, similar to baseline characteristics from a US-specific report of patients with HS [29]. However, two studies in France reported that just under half were overweight or obese, suggesting a potential geographical difference in obesity among patients with HS [7, 28]. In UNITE, a complete analysis of body weight or BMI by country of study site was not possible, as the majority of patients were enrolled in North America (USA and Canada).

The most common medical condition in UNITE was hypertension (14.3%); diabetes mellitus was reported by 9.1% of patients and hyperlipidaemia by 5.9%. These rates are lower than expected based on other reports [22, 34]. Approximately 2.7% of UNITE patients had a medical

Fig. 1 Hidradenitive lesion count by body area and Hurley stage. Mean total lesion count, by body area and Hurley stage: **a** adults and **b** adolescents. Mean abscess and inflammatory nodule and fistula counts, **c** overall and by body area and **d** by Hurley stage. [a]The "other" category includes abdomen, back, chest excluding infra- and intermammary areas, face including ears and behind ears, genitals, left and right upper and lower extremities, neck, pubic region, scalp; [b]$N = 187$ for fistulas in the mammary area. Lesions include **a**, **b** abscess, inflammatory and non-inflammatory nodules, draining and non-draining fistulas, hypertrophic scar caused by HS. **c**, **d** "Fistulas" includes fistulas and non-draining fistulas; "*N*" represents the number of patients in each Hurley stage who had any lesion present in the corresponding body area; used as denominator when calculating mean lesion count. SD is indicated under each data label appearing above each bar of the graphs. *AN* abscesses and inflammatory nodule, *HS* hidradenitis suppurativa, *SD* standard deviation
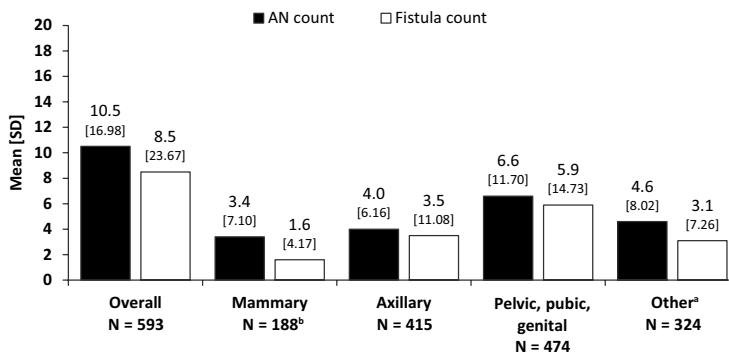

(a) Mean Total Lesion Count, Adults, by Body Area and Hurley Stage
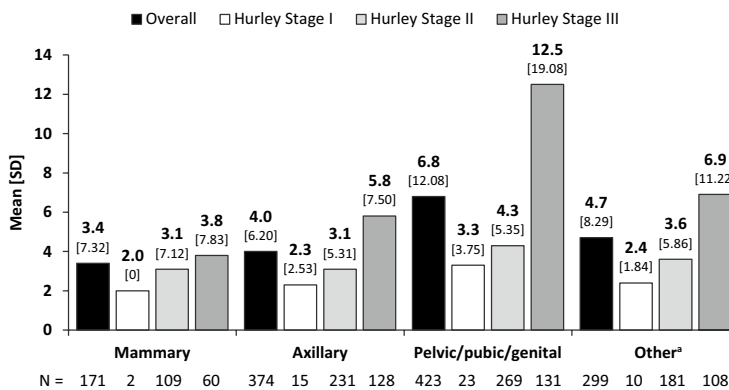
(b) Mean Total Lesion Count, Adolescents, by Body Area and Hurley Stage
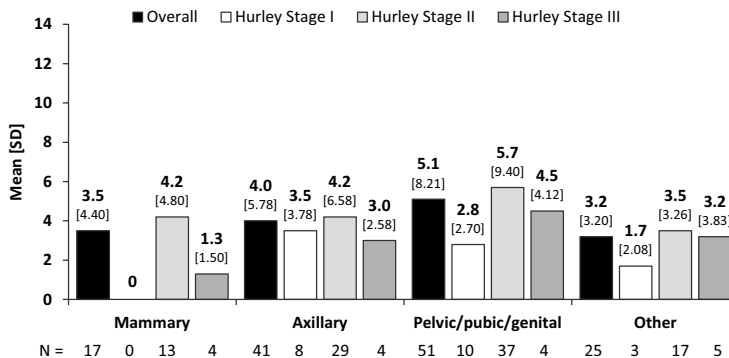
(c) Mean Abscess and Inflammatory Nodule (AN) and Fistula Counts, Overall and by Body Area

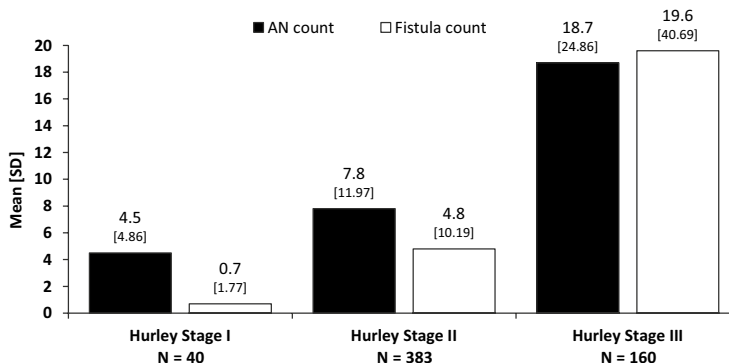(d) Mean Abscess and Inflammatory Nodule (AN) and Fistula Counts by Hurley Stage

Table 4 Patients with scarring due to hidradenitis suppurativa for enrolled patients (N = 594)

Scarring area	Any scarring	By Hurley stage		
		I (N = 43)	II (N = 392)	III (N = 159)
Entire body				
Overall, N = 594	542 (91.2)	2 (4.7)	381 (97.2)	159 (100.0)
Adults, N = 529	491 (92.8)	–	–	–
Adolescents, N = 65	51 (78.5)	–	–	–
Body area	Any scarring	Body area with scarring			
		1–25%	26–50%	51–75%	76–100%
Mammary[a]	152 (25.6)	106 (69.7)	29 (19.1)	11 (7.2)	6 (3.9)
Pelvic/pubic/genital[b]	412 (69.4)	220 (53.4)	106 (25.7)	46 (11.2)	40 (9.7)
Axilla[c]	361 (60.8)	195 (54.0)	86 (23.8)	37 (10.2)	43 (11.9)
Other body area[d]					
Abdomen	81 (13.6)	60 (74.1)	16 (19.8)	4 (4.9)	1 (1.2)
Back	36 (6.1)	27 (75.0)	4 (11.1)	3 (8.3)	2 (5.6)
Chest[e]	14 (2.4)	9 (64.3)	3 (21.4)	2 (14.3)	0
Face[f]	31 (5.2)	21 (67.7)	6 (19.4)	2 (6.5)	2 (6.5)
Upper extremity, right	20 (3.4)	16 (80.0)	3 (15.0)	1 (5.0)	0
Upper extremity, left	17 (2.9)	15 (88.2)	1 (5.9)	1 (5.9)	0
Lower extremity, right	36 (6.1)	29 (80.0)	4 (11.1)	2 (5.6)	1 (2.8)
Lower extremity, left	37 (6.2)	30 (81.1)	2 (5.4)	3 (8.1)	2 (5.4)
Neck	36 (6.1)	24 (66.7)	9 (25.0)	2 (5.6)	1 (2.8)
Scalp	12 (2.0)	7 (58.3)	5 (41.7)	0	0

Data are presented as N (%) unless otherwise indicated

[a]Includes intermammary and left and right inframammary areas

[b]Includes buttocks, inguinal fold, perianal, perineal, pubic, genital areas

[c]Includes left and right axilla areas

[d]Lists anatomic regions that are included in the body area labelled "Other"

[e]Excluding mammary, infra- and intermammary areas

[f]Including ears and behind ears

history of inflammatory bowel disease (Crohn's disease or ulcerative colitis), similar to other published rates [35–37].

Given the variety of contributors to the disease burden in HS, as seen in this analysis and previous reports, a multidisciplinary and multimodal approach to treatment is necessary. Under-treatment of HS is a global problem, which is confirmed by this analysis. At baseline, aside from antibiotics, systemic treatments such as oral retinoids and immunosuppressants had been prescribed in a minority of patients (17.7% and 1.3%, respectively). During the majority of the study enrolment period (December 2013 to December 2015), no biologic treatment was approved for HS. As such, reports at baseline of any biologic use for HS was low (5.5% of adults and no adolescents) and may not approximate biologic use post-approval of adalimumab; this is a potential limitation of this study. Procedural and surgical treatment of lesions is an important part of the HS treatment paradigm, especially as disease

severity increases [12, 26, 38], as was observed in UNITE; 50.0%, 67.8%, and 75.6% of patients with Hurley stages I, II, and III, respectively, reported prior procedures/surgeries. However, the high percentage of patients reporting a history of incision and drainage procedures, especially for patients with Hurley stage II or III disease (47.9% and 45.6%, respectively), suggests that disease in these patients is not adequately controlled; more aggressive surgical procedures such as de-roofing and en bloc excision were performed in far fewer of these patients (23.6% and 32.5% of patients with Hurley stage II and III disease, respectively).

Depression and anxiety are strongly associated with HS and are significant factors affecting quality of life for these patients [17, 18, 39, 40]. A retrospective case–control study reported that 58% of patients with HS had a psychiatric disorder [22]. Psychiatric comorbidities reported in UNITE at baseline included 13.3% with depression and

Table 5 Medical history of interest

Body system	Condition/diagnosis	All patients N = 594
Cardiovascular	Hypertension	85 (14.3)
	Anaemia	19 (3.2)
	Peripheral vascular disease	11 (1.9)
Gastrointestinal	Gastroesophageal reflux disease	31 (5.2)
	Inflammatory bowel disease[a]	16 (2.7)
Integument	Pilonidal cyst	42 (7.1)
	Contracture/strictures due to HS scarring	27 (4.5)
	Psoriasis	25 (4.2)
	Severe acne	25 (4.2)
	Acne conglobata	16 (2.7)
	Pyoderma gangrenosum	6 (1.0)
	Dissecting folliculitis	4 (0.7)
Metabolic	Diabetes mellitus	54 (9.1)
	Hyperlipidaemia[b]	35 (5.9)
	Irregular menstrual cycles	32 (5.4)
	Polycystic ovary syndrome	31 (5.2)
Neurologic and psychiatric	Depression	79 (13.3)
	Other cognitive or psychiatric disorder[c]	57 (9.6)
Pulmonary	Asthma	37 (6.2)

Data are presented as N (%)

HS hidradenitis suppurativa

[a]Including Crohn's disease and ulcerative colitis

[b]Also referred to as dyslipidaemia or hypercholesterolemia

[c]Excludes depression; includes anxiety. Some patients reported more than one "other cognitive psychiatric disorder"; those who experienced multiple disorders were counted only once. This could result in under-representation of incident disorders as the reported number only reflects the proportion of patients experiencing any cognitive/psychiatric disorder(s) other than depression

Table 6 Prior procedure and surgery for hidradenitis suppurativa

	Adults N = 529	Adolescents N = 65	All patients N = 594	All patients by Hurley stage		
				I, N = 40	II, N = 394	III, N = 160
Any procedure	383 (72.4)	25 (38.5)	408 (68.7)	20 (50.0)	267 (67.8)	121 (75.6)
De-roofing	40 (7.6)	0	40 (6.7)	0	23 (5.8)	17 (10.6)
En bloc excision	105 (19.8)	2 (3.1)	107 (18.0)	2 (5.0)	70 (17.8)	35 (21.9)
Incision and drainage by patient	71 (13.4)	1 (1.5)	72 (12.1)	2 (5.0)	58 (14.7)	12 (7.5)
Incision and drainage by physician	187 (35.3)	14 (21.5)	201 (33.8)	9 (22.5)	131 (33.2)	61 (38.1)
Intralesional steroid injections	91 (17.2)	5 (7.7)	96 (16.2)	5 (12.5)	61 (15.5)	30 (18.8)
Laser treatment, CO_2	9 (1.7)	1 (1.5)	10 (1.7)	0	6 (1.5)	4 (2.5)
Laser treatment, ND-YAG	5 (0.9)	0	5 (0.8)	0	3 (0.8)	2 (1.3)
Photodynamic therapy	5 (0.9)	0	5 (0.8)	0	2 (0.5)	3 (1.9)
External-beam radiation therapy	1 (0.2)	0	1 (0.2)	0	0	1 (0.6)
Other surgery or procedures	54 (10.2)	2 (3.1)	56 (9.4)	4 (10.0)	29 (7.4)	23 (14.4)

Data are presented as N (%)

ND-YAG neodymium-doped yttrium aluminum garnet

Table 7 Prior medication for hidradenitis suppurativa

Prior medication	Adults N = 529	Adolescents N = 65	All patients N = 594
Any category of prior medication	391 (73.9)	44 (67.7)	435 (73.2)
Retinoids	98 (18.5)	7 (10.8)	105 (17.7)
Antibiotics	365 (69.0)	41 (63.1)	406 (68.4)
Corticosteroids	47 (8.9)	5 (7.7)	52 (8.8)
Opioids	7 (1.3)	1 (1.5)	8 (1.3)
Biologics	29 (5.5)	0	29 (4.9)
Hormonal therapies	25 (4.7)	1 (1.5)	26 (4.4)
Immunosuppressants	6 (1.1)	2 (3.1)	8 (1.3)
Reasons for discontinuing prior HS medication[b]	N = 411	N = 47	N = 458
Treatment failure or inadequate response	234 (56.9)	20 (42.6)	254 (55.5)
Treatment not tolerated	64 (15.6)	8 (17.0)	72 (15.7)
Satisfactory remission	66 (16.1)	16 (34.0)	82 (17.9)
Complete remission	13 (3.2)	3 (6.4)	16 (3.5)
Other[a]	34 (8.3)	0	34 (7.4)

Data are presented as N (%)

HS hidradenitis suppurativa

[a]"Other" mainly includes patients who were prescribed a short course of therapy

[b]For patients with any previous treatment for hidradenitis suppurativa

9.6% with other cognitive/psychiatric disorders, including anxiety. However, the patient-reported Hospital Anxiety and Depression Scale outcome from UNITE showed that 58% of patients reported anxiety and 30% reported depression at baseline. This suggests that psychological disorders may be under-diagnosed and/or under-reported in this population and confirms the need for adequate multidisciplinary care and screening for these comorbidities.

Quality of life at baseline in UNITE was significantly impaired in adults, and scores worsened markedly as disease severity increased. Additional quality-of-life patient-reported outcomes from UNITE are addressed in a separate publication [27].

Limitations of this analysis include the bias that can be present in observational studies, including methods of patient selection, selective recall, inconsistent reporting, measurement errors, and under-reporting, especially of information not apparent to the data collector, such as comorbidities and prior treatment [41]. Another potential limitation is the method of describing disease severity and the potential influence of disease severity on enrolment. Per the protocol, the original Hurley staging criteria [24] were used as the method for defining severity, which is not necessarily correlated to disease activity at any given time. A newer method of Hurley staging has since been published [42], in which Hurley IC and IIC are classified as "severe", but this staging was not available at the time of data collection. In addition, while balancing of patients across Hurley stages was attempted, the vast majority enrolled had Hurley stage II and III disease; thus, their results may not

be generalisable to the entire HS population. Although the majority of UNITE patients were enrolled in North American (68.9%) sites, these data contribute to the global characterisation of HS in patients in real-world clinical settings.

5 Conclusions

The UNITE baseline data confirm that overweight, obesity, and smoking are common risk factors in patients with HS. The disease burden is high, reflected by the extent of scarring, frequency of disease flares (once monthly on average) despite treatment, and the significant comorbidity burden. Our results also confirm that patients can have HS for years before receiving an accurate diagnosis (8 years average overall) and that those with more severe disease often resort to surgery. The impact on quality of life and the challenging therapeutic management of HS often necessitate a multidisciplinary approach to care.

submission. This includes requests for clinical trial data for unlicensed products and indications. These clinical trial data can be requested by any qualified researchers who engage in rigorous, independent scientific research, and will be provided following review and approval of a research proposal and statistical analysis plan and execution of a data sharing agreement. Data requests can be submitted at any time, and the data will be accessible for 12 months, with possible extensions considered. For more information on the process, or to submit a request, visit the following link: http://www.abbvie.com/data-and-information-sharing.

Compliance with Ethical Standards

Conflict of interest EP Prens has received honoraria from AbbVie, Amgen, Celgene, Janssen, Galderma, Novartis, and Pfizer for participation as a speaker and on advisory boards and received investigator-initiated grants (paid to the Erasmus MC) from AbbVie, AstraZeneca, Janssen, and Pfizer. AM Lugo-Somolinos has received honoraria from AbbVie, Castle Creek, Celgene, Centocor, Janssen, Eli Lilly, Novartis, Pfizer, Regeneron, Scioderm, and Stiefel for participation as an investigator. AS Paller has received grants (to Northwestern University) from AbbVie, Anaptysbio, Eli Lilly, Galderma, Incyte, Leo, Janssen, Novartis, and Regeneron for investigator services, and honoraria from AbbVie, Amgen, Asana, Dermavant, Dermira, Eli Lilly, Forte, Galderma, Leo, Matrisys, Menlo, Mophosys/Galapagos, Novartis, Pfizer, Regeneron, Sanofi-Genzyme, and UCB for consulting services. F Kerdel has received honoraria from AbbVie, Amgen, Celgene, Eli Lilly, Janssen, Leo, Novartis, Ortho Dermatologics, Pfizer, Regeneron, Sanofi, and Stiefel for participation as a speaker and grants from AbbVie, Amgen, AstraZeneca, Celgene, Dr. Reddy's, Eli Lilly, Janssen, Novartis, Ortho Dermatologics, Pfizer, Regeneron, UCB, X-Biotech, and XOMA, for participation as an investigator. Y Duan, HD Teixeira, and M Longcore have received a salary as AbbVie employees and may have also received stocks and/or stock options. AB Kimball has received honoraria as a consultant and grants as an investigator from Janssen, AbbVie, Lilly, Novartis, Pfizer, and UCB and fellowship funding from Janssen and AbbVie.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the ethics committee, institutional review board, and/or other local approval processes in the specific country or region of the study site and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Patients and/or their legal guardians voluntarily signed an informed consent, approved by an institutional review board or ethics committee as applicable, according to local law.

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