Published in final edited form as:
J Invest Dermatol. 2013 January ; 133(1): 97–103. doi:10.1038/jid.2012.255.

Incidence of Hidradenitis Suppurativa and Associated Factors: A Population-Based Study of Olmsted County, Minnesota

Benjamin G. Vazquez, MD[1,*], **Ali Alikhan, MD**[1,*], **Amy L. Weaver**[2], **David A. Wetter, MD**[1], and **Mark D. Davis, MD**[1]

[1]Department of Dermatology, Mayo Clinic, Rochester, Minnesota

[2]Division of Biomedical Statistics and Informatics, Mayo Clinic, Rochester, Minnesota

Abstract

There are no population-based incidence studies of hidradenitis suppurativa (HS). Using the medical records linkage system of the Rochester Epidemiology Project, we sought to determine incidence, as well as other associations and characteristics, for HS patients diagnosed in Olmsted County, Minnesota between 1968 and 2008. Incidence was estimated using the decennial census data for the county. Logistic regression models were fit to evaluate associations between patient characteristics and disease severity. A total of 268 incident cases were identified, with an overall annual age- and sex-adjusted incidence of 6.0 per 100,000. Age-adjusted incidence was significantly higher in women compared to men [8.2 (95% CI, 7.0–9.3) vs. 3.8 (95% CI, 3.0–4.7)]. The highest incidence was among young women aged 20–29 (18.4 per 100,000). The incidence has risen over the past four decades, particularly among women. Women were more likely to have axillary and upper anterior torso involvement, while men were more likely to have perineal or perianal disease. Additionally, 54.9% (140/255) patients were obese; 70.2% were current or former smokers; 42.9% carried a diagnosis of depression; 36.2% carried a diagnosis of acne; and 6% had pilonidal disease. Smoking and gender were significantly associated with more severe disease.

Keywords

hidradenitis suppurativa; acne inverse; follicular occlusion triad; follicular occlusion tetrad; obesity; smoking; tobacco; incidence; Rochester epidemiology project

Introduction

Hidradenitis suppurativa (HS) is a chronic, recurrent, inflammatory disorder of hair follicles in apocrine gland-bearing sites, resulting in abscesses and potentially fistula formation (Alikhan *et al.*, 2009). Associations with smoking, obesity, and inflammatory bowel disease have been described (Revuz *et al.*, 2008; Sartorius *et al.*, 2009; van der Zee *et al.*, 2010). HS can be debilitating and devastating, significantly compromising quality of life (Esmann and Jemec, 2011; Matusiak *et al.*, 2010a; Wolkenstein *et al.*, 2007). Furthermore, it represents a

Ali Alikhan, MD, Mayo Clinic, Department of Dermatology, 200 First Street SW, Rochester, MN 55905, Phone: 818 620-8488, Fax: 507 284-2072, alikhan.mirza@mayo.edu.

*Both authors contributed equally to the manuscript

Benjamin Vazquez, Ali Alikhan, David Wetter, and Mark Davis have no conflicts of interest to declare.

Conflict of Interest

The authors state no conflict of interest.

diagnostic and treatment challenge not only to dermatologists, but also to primary care physicians and surgeons (Alikhan *et al.*, 2009).

Despite the severity of the disorder, little epidemiologic data has been published (Alikhan *et al.*, 2009). Depending on the study, prevalence rates have ranged from 0.00033% to 4% (Fitzsimmons *et al.*, 1985; Jemec, 1988; Jemec *et al.*, 1996; Lookingbill, 1988; Revuz *et al.*, 2008). To our knowledge, there is no population-based data on incidence. The primary purpose of this study was to calculate the incidence of HS using population-based data from a single well-studied and well-characterized US county. Data relating to demographic variables, diagnostic criteria, treatment and outcomes, and associations with other medical disorders is also presented.

Results

Between 1968 and 2008, 1,263 patients who had received a diagnosis of HS were identified using the Rochester Epidemiology Project (REP) resources. Of these, 268 were confirmed to have a first-ever diagnosis of HS as a resident of Olmsted County using the criteria outlined below.

The characteristics of the 268 patients confirmed to have HS are summarized in Table I. The median age at the time of diagnosis was 30.6 years (range 9.9 years to 78.5 years). The median time between onset of symptoms and diagnosis was 3.3 years (range 0 to 30 years). The majority of patients were white (90.3%), reflecting the general demographics of Olmsted County. The median BMI was 31.1 kg/m^2, and 54.9% (140/255) had a BMI of 30 kg/m^2 or greater. At the time of their diagnosis, 57.7% of cases reported currently smoking and an additional 12.5% had smoked prior to their diagnosis.

Incidence data is summarized in Tables II and III. The overall annual age- and sex-adjusted incidence of HS in Olmsted County during 1968–2008 was 6.0 per 100,000 person-years (95% CI, 5.2–6.7). The incidence was significantly higher among women than men with 8.2 per 100,000 (95% CI, 7.0–9.3) and 3.8 per 100,000 (95% CI, 3.0–4.7), respectively ($p<0.001$). The highest incidence was among women aged 20–29 (18.4 per 100,000). This was also the age range with the highest incidence for men (7.4 per 100,000). There was a sharp decline in incidence among women after age 49. There was also a decline among men, but the rate of decline across the age groups after age 20 was significantly different between the sexes ($p=0.014$). Incidence of HS by calendar decade demonstrates a steady increase in incidence from 4.3 per 100,000 (95% CI, 2.8–5.8) during 1970 – 1979 to 9.6 per 100,000 (95% CI, 7.8–11.3) during 2000–2008. This increasing trend across the decades was more apparent in women ($p<0.001$) than men ($p=0.20$).

At the time of diagnosis, 160 (59.7%) patients had Hurley stage I disease, 102 (38.1%) had Hurley stage II disease, and 6 (2.2%) had Hurley stage III disease. Disease involvement by site and gender is summarized in Table IV. Axillary involvement was present in 165 (61.6%) patients, and significantly more common in women than men (67.7% vs 46.8%, $p = 0.001$), as were upper torso involvement (24.9% vs 2.5%, $p <0.001$) and groin or thigh involvement (73.0% vs 60.8, $p = 0.047$). Conversely, men were significantly more likely to have perianal or perineal disease (20.3% vs 5.8% $p <0.001$).

A diagnosis of depression was found in 115 (42.9%) patients. A history of acne was present in 97 (36.2%) of the patients. Based on clinical description, 28 (28.9%) had mild acne, 39 (40.2%) had moderate acne, and 24 (24.7%) had severe acne. Pilonidal disease was present in 16 (6%) patients, but none carried a diagnosis of acne conglobata or dissecting cellulitis of the scalp. Aside from acne and pilonidal disease, no other concurrent dermatological

disorder or malignancy occurred frequently enough to warrant analysis. The same is true of internal malignancies.

Patient characteristics were evaluated for an association with disease severity, defined as Hurley grade I vs. II or III (Table V). In univariate analysis, age, male sex, and any history of smoking demonstrated a statistically significant association with greater disease severity. However, after adjusting for age, only male sex remained significantly associated with disease severity ($p = 0.015$). There were no significant associations identified between disease severity and BMI, depression, acne, or pilonidal disease.

Discussion

Our population-based study of HS demonstrates an overall annual incidence of 6.0 per 100,000 person-years during 1968 – 2008. The highest incidence is among young women aged 20–29 (18.4 per 100,000). The incidence is significantly higher among women than men, and the incidence among women has trended upwards over the last four decades. The incidence is highest between the ages of 20–49 with a particularly steep decline, particularly among women, after age 49. Males and patients with a smoking history were more likely to have a higher disease severity. In terms of site involvement, women were more likely to have axillary and upper anterior torso involvement while men were more likely to have perineal or perianal disease. The majority of patients were overweight or obese, and many carried a diagnosis of depression.

Prevalence of HS has varied from as low as 1 in 3000 to as high as 4% (Jemec *et al.*, 1996; Lookingbill, 1988). Two fairly recent studies have estimated the prevalence to be about 1% (Jemec *et al.*, 1996; Revuz *et al.*, 2008), and as high as 4% among young adults at a Danish sexually transmitted disease clinic (Jemec *et al.*, 1996). Thus, it has been suggested that HS may be a common disease. However, these studies may have been influenced by referral bias and issues with patient self-reporting. In contrast, our data suggests that HS is a rare disease. Interestingly, the majority of cases we reviewed did not meet the diagnostic criteria proposed by Alikhan et al (Alikhan *et al.*, 2009).

Of note, the incidence of HS appears to be increasing steadily over the last four decades. This trend was noted particularly among women. While it is beyond the scope of this study to identify the underlying etiology for this trend, it is likely multifactorial. Obesity, smoking, and physicians' awareness and capacity to diagnose this disease may all play a role.

Peak incidence of HS occurred in the third decade, with sharp decline after the fifth decade. Revuz et al demonstrated a similar decrease of HS prevalence among people aged 55 years and older (Revuz *et al.*, 2008). This trend is likely due to the onset of menopause among women, where the sharpest decline was noted. The onset of HS among women after menopause has previously been reported as rare (Fitzsimmons *et al.*, 1985; Thornton and Abcarian, 1978), a claim supported by our data.

Our data demonstrates several important differences in disease characteristics between men and women. Axillary, upper anterior torso, and groin involvement were more common among women, while perianal and perineal involvement were more common among men. Similar patterns have been noted in previously studied HS patient populations (Anderson and Dockerty, 1958; Canoui-Poitrine *et al.*, 2009; Jemec, 1988; Jemec *et al.*, 1996). Additionally, men were more likely than women to have Hurley stage II or III disease. Increased disease severity among male HS patients has been demonstrated previously by Canoui-Poitrine et al using the Sartorius scoring system (Canoui-Poitrine *et al.*, 2009).

Nearly 70% of patients in our study were current or former smokers, which is similar to or lower than data published by Canoui-Poitrine et al, Konig et al, Revuz et al, and Sartorius et al (Canoui-Poitrine *et al.*, 2009; Konig *et al.*, 1999; Revuz *et al.*, 2008; Sartorius *et al.*, 2009). It is well accepted that smoking may be a triggering or exacerbating factor in HS. Additionally, we found smoking to be associated with worse disease (higher Hurley stage), which was also demonstrated by Sartorius et al (Sartorius *et al.*, 2009), but not Canoui-Poitrine et al (Canoui-Poitrine *et al.*, 2009). There is even some evidence that smoking cessation may improve HS (Simonart, 2010).

On average, patients in our study were obese (mean BMI = 32.6). This is consistent, though somewhat higher, than data reported by Sartorius et al (mean BMI = 28.3, overweight) and much higher than data reported by Canoui-Poitrine et al (mean BMI = 25.6, overweight) and Revuz et al (mean BMI = 25.6, overweight). We did not find a correlation between BMI and more severe disease, though this has been demonstrated previously by Canoui-Poitrine et al (Canoui-Poitrine *et al.*, 2009).

While HS is commonly grouped in a follicular occlusion tetrad with pilonidal disease, acne conglobata, and dissecting cellulitis, we only appreciated an association with pilonidal disease (6% of patients). This association is somewhat weaker than that demonstrated by Canoui-Poitrine et al, in which 90 of 302 (30.2%) HS patients had concomitant pilonidal disease. Nearly 40% of patients carried a current or prior diagnosis of acne vulgaris. It is difficult to comment on the accuracy of this data as oftentimes patients do not seek medical care for acne, and thus acne is not mentioned in notes or coded for billing purposes. In any case, we did not find a correlation between acne severity and HS severity, and a diagnosis of acne was seen in a similar percentage of male and female patients (35.9% and 36.7%, respectively).

Over 40% of HS patients in our study carried a diagnosis of depression, compared to a lifetime prevalence of mood disorders in the general population of 20.8% (Kessler *et al.*, 2005). This is not surprising as several studies have demonstrated a decreased quality of life in patients with HS (Matusiak *et al.*, 2010a, b; Wolkenstein *et al.*, 2007). In fact, patients with HS may have a lower quality of life than patients with neurofibromatosis 1, chronic urticaria, psoriasis, acne vulgaris, Darier disease, Hailey-Hailey disease, and atopic dermatitis (Matusiak *et al.*, 2010a; Wolkenstein *et al.*, 2007). Quality of life in HS has also been shown to correlate with disease severity, duration, pain, continuous evolution, particular locations (e.g. perianal), uncovered locations, and more involved locations (Matusiak *et al.*, 2010a, b; Wolkenstein *et al.*, 2007).

Our data has several important limitations. The population studied was primarily Caucasian and limited to Southeast Minnesota. Thus, data collected in our study may not be representative of HS patients in other countries or even in different parts of the US. Furthermore, strict diagnostic criteria (described below) were employed which determined inclusion into our study – it is possible that true cases of HS were excluded. As one of the criteria was ‘symptomatology for at least 6 months,’ it is possible that early mild cases were missed. Nevertheless, the overwhelming majority of excluded cases were clearly not HS, but rather ruptured epidermoid cysts, furuncles, folliculitis, or contact or irritant dermatitis; we also noted that many cases were called HS simply because symptoms occurred in common anatomic locations for HS (e.g. axilla or groin). It is unlikely that many true cases of HS were missed due to our strict diagnostic criteria.

While our study has several limitations, it is, to our knowledge, the first population-based incidence study on HS. We have demonstrated that HS is a rare disease, though its incidence appears to be rising with time. It is associated with a current or previous smoking history,

obesity, and gender. Furthermore, there is an association between severity of HS and gender, as well as severity of HS and smoking. There are also important differences in sites of involvement between men and women. HS patients appear to have high rates of depression. Further studies should be prospectively performed to more accurately assess clinical outcomes and optimal treatments of patients with HS.

Materials and Methods

Study setting

We reviewed cases of HS within the population of Olmsted County, Minnesota. Olmsted County is located in the southeastern corner of Minnesota, roughly 90 miles southeast of Minneapolis and St. Paul. According to the 2010 US Census, Olmsted County had a population of 144,000 people with over 70% of the population residing within Rochester. The US Census data indicate that residents are largely white - not of Hispanic origin (83% in 2010), and the level of college graduates is relatively higher than the general population of Minnesota (39% report having a bachelors degree or higher in Olmsted county compared with 31% for the entire state). Despite these educational differences, prior comparisons have shown this population to be socioeconomically and demographically similar to the general US white population (Maradit Kremers *et al.*, 2004; Melton, 1996).

This study was approved by the Mayo Clinic and Olmsted Medical Center institutional review boards. Inpatient and outpatient medical records were obtained for review using the Rochester Epidemiology Project (REP). REP is a unique Olmsted County centralized, computerized medical records linkage system containing medical diagnoses and surgical procedures for nearly all patients in Olmsted County since the 1960s (Melton, 1996). This resource has been successful for various reasons, including: 1) the county is isolated from other urban centers with virtually all medical care in the county concentrated among a small number of providers (e.g. Mayo Clinic, Olmsted Medical Group, Olmsted Community Hospital, regional hospitals, private practitioners, and nursing homes); 2) the out-migration rates are low, and there has been a net in-migration to the county; 3) nearly all providers in the county employ a unit medical record system in which all medical information on each patient is accumulated within a single dossier; and 4) detailed indices that contain all clinical and pathologic diagnoses and surgical procedures that have been recorded since 1966 have been carefully organized for research purposes (Maradit Kremers *et al.*, 2004). The overall result is that all medical data (including death certificates) collected on an individual by health care providers at all levels of medical care is located in a single file (Maradit Kremers *et al.*, 2004).

Study criteria

Through the REP, all medical records for patients receiving a first-ever diagnosis of HS from January 1, 1968 – December 31, 2008 were identified and retrieved using various Hospital Adaptation of the International Classification of Diseases (HICDA) codes (‘hydradenitis, NOS,’ ‘hidradenitis, suppurative,’ ‘hydradenitis, suppurative,’ ‘hidradenitis, NOS, ‘hydradenitis, NOS,’ and ‘infection, sweat gland’), Berkson codes (‘hydrosadenitis,’ ‘inflammation, sweat gland,’ ‘hydradenitis, hydro-adenitis, hidrosadenitis,’ and ‘hidradenitis, hidro-adenitis, hidrosadenitis’), and ICD-9 code ‘hidradenitis.’ Patients who did not provide authorization for research purposes were excluded. Each chart was reviewed to confirm a diagnosis of HS. This was done using the criteria and algorithm outlined by Alikhan et al in 2009 (Alikhan *et al.*, 2009). Patients with multiple, recurrent, chronic, and bilateral lesions primarily along the milk line, but also in atypical locations (e.g. perineal and perianal region), were considered to have a clinical diagnosis of HS (Table VI). For our purposes, we considered chronic disease to be greater than six months duration (from the

onset of symptoms). The date of diagnosis used for our study was the date the patient received a first-ever diagnosis of HS by either a dermatologist or a non-dermatologist physician provided that they met the clinical criteria outlined above. Any chart in which the diagnosis was unclear was reviewed by both abstractors (B.G.V. and A.A) to determine whether the clinical findings and history met the outlined criteria. Patients not meeting these criteria, and those for whom a consensus could not be made were excluded. The study was limited to incident cases; therefore patients with a diagnosis of HS prior to residing in Olmsted County were also excluded.

Data collection

The medical records were reviewed by one of two abstractors and the following information was abstracted. Socio-demographic data include age at diagnosis, gender, race, and education level. In addition, smoking status and family history of HS were collected. Body mass index (BMI) was calculated using any weight recorded within six months of the diagnosis date; otherwise the description of body habitus by the physician was recorded if available. Comorbid diagnoses were recorded including depression, anxiety, history of internal malignancy, history of cutaneous malignancy, history of acne, and other concurrent dermatological disorders. These were recorded as ever having a diagnosis of these conditions. Patients with a history of acne were graded as mild, moderate or severe based on the clinical description at the time of diagnosis (CDER, 2005). Anatomic zones affected by HS were recorded, along with disease severity using the Hurley staging system (Table VI) (Alikhan *et al.*, 2009). The abstracted data was entered into a database created for this particular study using REDCap (Research Electronic Data Capture) tools hosted at the Mayo Clinic (Harris *et al.*, 2009). REDCap is a secure, web-based application designed to support data capture for research studies.

Statistical analyses

The data was analyzed using the SAS version 9.2 software package (SAS Institute, Inc.; Cary, NC). Age- and sex-specific incidence rates in Olmsted County during 1968–2008 were calculated overall and by calendar decade. The incidence rates were calculated with the assumption that the entire population of Olmsted County was at risk. The numerator was the number of persons with HS diagnosis within this period and the denominator was obtained from the decennial census data for 1968–2008, with linear interpolation between census years. Rates were age- and sex-adjusted to the total population structure of the U.S. in 2000. The 95% confidence intervals (CIs) for the rates were calculated assuming a Poisson error distribution.

The relation of incidence rates to sex, age, and time period of diagnosis (1970–1979–1980–1989,1990–1999–2000–2008) were assessed by fitting generalized linear models assuming a Poisson error structure using the SAS procedure GENMOD. The observations used for the regression analysis were the crude incidence counts for all combinations of sex, 10-year age groupings, and 10-year time periods, which were offset by the natural logarithm of the number of persons. In the modeling, we first fit sex and age group, testing for an interaction between them, and then the interaction between sex and time period. The significance of linear trends across age groupings and time periods were each assessed with likelihood ratio statistics with 1 degree of freedom. Over-dispersion was accounted for by estimating a dispersion parameter (i.e. deviance divided by its degrees of freedom), which was then used to adjust the variance of the parameter estimates (McCullagh and Nelder, 1983).

The chi-square test was used to compare the involvement at various locations between males and females. Logistic regression models were fit to evaluate the association between patient characteristics and disease severity, defined as Hurley grade I vs. II or III. Associations were

summarized using the estimated odds ratio (OR) and corresponding 95% confidence interval (CI). Each characteristic was evaluated in a model with and without adjusting for age at HS diagnosis. All calculated p-values were two-sided and p-values less than 0.05 were considered statistically significant.

Acknowledgments

This work was supported by the Center for Translational Science Activities grant UL1 RR024150 and by the Rochester Epidemiology Project grant R01 AG034676 from the National Institute on Aging.

References

Alikhan A, Lynch PJ, Eisen DB. Hidradenitis suppurativa: a comprehensive review. J Am Acad Dermatol. 2009; 60:539–61. quiz 62–3. [PubMed: 19293006]

Anderson MJ Jr, Dockerty MB. Perianal hidradenitis suppurativa; a clinical and pathologic study. Dis Colon Rectum. 1958; 1:23–31. [PubMed: 13512158]

Canoui-Poitrine F, Revuz JE, Wolkenstein P, Viallette C, Gabison G, Pouget F, et al. Clinical characteristics of a series of 302 French patients with hidradenitis suppurativa, with an analysis of factors associated with disease severity. J Am Acad Dermatol. 2009; 61:51–7. [PubMed: 19406505]

CDER. FDA. Guidance for Industry - Acne Vulgaris: Developing Drugs for Treatment. U.S. Department of Health and Human Services; Rockville, MD: 2005. p. 1-17.

Esmann S, Jemec GB. Psychosocial impact of hidradenitis suppurativa: a qualitative study. Acta dermato-venereologica. 2011; 91:328–32. [PubMed: 21394419]

Fitzsimmons JS, Guilbert PR, Fitzsimmons EM. Evidence of genetic factors in hidradenitis suppurativa. Br J Dermatol. 1985; 113:1–8. [PubMed: 4015966]

Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. Journal of biomedical informatics. 2009; 42:377–81. [PubMed: 18929686]

Jemec GB. The symptomatology of hidradenitis suppurativa in women. Br J Dermatol. 1988; 119:345–50. [PubMed: 3179207]

Jemec GB, Heidenheim M, Nielsen NH. The prevalence of hidradenitis suppurativa and its potential precursor lesions. J Am Acad Dermatol. 1996; 35:191–4. [PubMed: 8708018]

Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005; 62:593–602. [PubMed: 15939837]

Konig A, Lehmann C, Rompel R, Happle R. Cigarette smoking as a triggering factor of hidradenitis suppurativa. Dermatology. 1999; 198:261–4. [PubMed: 10393449]

Lookingbill DP. Yield from a complete skin examination. Findings in 1157 new dermatology patients. J Am Acad Dermatol. 1988; 18:31–7. [PubMed: 3346406]

Maradit Kremers H, Crowson CS, Gabriel SE. Rochester Epidemiology Project: a unique resource for research in the rheumatic diseases. Rheumatic diseases clinics of North America. 2004; 30:819–34. vii. [PubMed: 15488695]

Matusiak L, Bieniek A, Szepietowski JC. Hidradenitis suppurativa markedly decreases quality of life and professional activity. J Am Acad Dermatol. 2010a; 62:706–8. 8, e1. [PubMed: 20227585]

Matusiak L, Bieniek A, Szepietowski JC. Psychophysical aspects of hidradenitis suppurativa. Acta Derm Venereol. 2010b; 90:264–8. [PubMed: 20526543]

McCullagh, P.; Nelder, JA. Generalized linear models. Chapman and Hall; London; New York: 1983. p. xiiip. 261

Melton LJ 3rd . History of the Rochester Epidemiology Project. Mayo Clinic proceedings Mayo Clinic. 1996; 71:266–74. [PubMed: 8594285]

Revuz JE, Canoui-Poitrine F, Wolkenstein P, Viallette C, Gabison G, Pouget F, et al. Prevalence and factors associated with hidradenitis suppurativa: results from two case-control studies. Journal of the American Academy of Dermatology. 2008; 59:596–601. [PubMed: 18674845]

Sartorius K, Emtestam L, Jemec GB, Lapins J. Objective scoring of hidradenitis suppurativa reflecting the role of tobacco smoking and obesity. Br J Dermatol. 2009; 161:831–9. [PubMed: 19438453]

Simonart T. Hidradenitis suppurativa and smoking. J Am Acad Dermatol. 2010; 62:149–50. [PubMed: 20082894]

Thornton JP, Abcarian H. Surgical treatment of perianal and perineal hidradenitis suppurativa. Dis Colon Rectum. 1978; 21:573–7. [PubMed: 738172]

van der Zee HH, van der Woude CJ, Florencia EF, Prens EP. Hidradenitis suppurativa and inflammatory bowel disease: are they associated? Results of a pilot study. The British journal of dermatology. 2010; 162:195–7. [PubMed: 19681876]

Wolkenstein P, Loundou A, Barrau K, Auquier P, Revuz J. Quality of life impairment in hidradenitis suppurativa: a study of 61 cases. J Am Acad Dermatol. 2007; 56:621–3. [PubMed: 17097366]

Table I

Demographical and Diagnostic Characteristics of HS Patients

Characteristic	Total (N = 268)
Gender	
Female	189 (70.5%)
Male	79 (29.5%)
Age at diagnosis (years)	
Mean (SD)	32.9 (12.6)
Median	30.6
Range	(9.9–78.5)
Race	
White	241 (90.3%)
Non-white	26 (9.7%)
Unknown	1
Education level (years)	
>12	139 (57.9%)
12	57 (23.8%)
<12	44 (18.3%)
Unknown	28
BMI (kg/m^2)	
N	249
Mean (SD)	32.6 (8.7)
Median	31.1
Range	(18.3–66.7)
BMI breakdown	
Underweight or normal (<25)	49 (19.2%)
Overweight (25.0 – 29.9)	66 (25.9%)
WHO class I obesity (30.0–34.9)	49 (19.2%)
WHO class II obesity (35.0 – 39.9)	49 (19.2%)
WHO class III obesity (40.0 – 49.9)	33 (12.9%)
Super obese (50+)	9 (3.5%)
Unknown †	13
Smoking status	
Never	79 (29.8%)
Current	153 (57.7%)
Former	33 (12.5%)
Unknown	3
1st or 2nd degree family members affected?	
Yes	22 (8.2%)
No	117 (43.7%)
Unknown	129 (48.1%)
Time between symptom onset and diagnosis (years)	

Characteristic	Total (N = 268)
N	156
Mean (SD)	5.1 (5.8)
Median	3.3
Range	(0.0–30.0)
Diagnosis of HS rendered by:	
Dermatologist	171 (63.8%)
Non-dermatologist but meets 4 criteria listed	97 (36.2%)

WHO = World Health Organization; SD = standard deviation.

[†]Of the 19 patients missing BMI, 6 patients had a description of body habitus by the physician that was recorded and abstracted.

Table II

Incidence of Hidradenitis Suppurativa per 100,000 Persons by Age and Gender in Olmsted County, Minnesota, 1968–2008

	Women		Men		Both sexes	
Age group, years	**No. of cases**	**Rate per 100,000**	**No. of cases**	**Rate per 100,000**	**No. of cases**	**Rate per 100,000**
0–19	30	4.4	7	1.0	37	2.7
20–29	66	18.4	23	7.4	89	13.3
30–39	50	14.2	23	6.7	73	10.5
40–49	36	12.3	14	5.0	50	8.7
50–59	3	1.5	5	2.6	8	2.0
60+	4	1.2	7	2.9	11	1.9
Total (95% CI)		8.2[†] (7.0–9.3)		3.8[†] (3.0–4.7)		6.0[‡] (5.2–6.7)

CI = confidence interval.

[†]Incidence per 100,000 person-years is directly age-adjusted to the population structure of the U.S. total population in 2000.

[‡]Incidence per 100,000 person-years is directly age-and sex-adjusted to the population structure of the U.S. total population in 2000.

Table III

Incidence of Hidradenitis Suppurativa per 100,000 Persons by 10-Year Intervals in Olmsted County, Minnesota, 1970–2008.

Period *	Women		Men		Both Sexes	
	No. of cases	Incidence rate per 100,000† (95% CI)	No. of cases	Incidence rate per 100,000† (95% CI)	No. of cases	Incidence rate per 100,000‡ (95% CI)
1970–1979	22	5.4 (3.0–7.7)	13	3.2 (1.4–5.0)	35	4.3 (2.8–5.8)
1980–1989	28	5.3 (3.3–7.4)	18	4.0 (2.1–5.8)	46	4.6 (3.2–6.0)
1990–1999	52	8.7 (6.3–11.0)	16	2.8 (1.4–4.2)	68	5.7 (4.4–7.1)
2000–2008	85	14.1 (11.1–17.1)	30	5.2 (3.3–7.1)	115	9.6 (7.8–11.3)

*4 cases (2 women and 2 men) were omitted from 1968–1969

CI, confidence interval.

†Incidence per 100,000 person-years is directly age-adjusted to the population structure of the U.S. total population in 2000.

‡Incidence per 100,000 person-years is directly age-and sex-adjusted to the population structure of the U.S. total population in 2000.

Table IV

Site of Disease by Gender

Location	Female (N=189)	Male (N=79)	p-value †
Abdomen	5 (2.7%)	5 (6.3%)	0.15
Chest, breast, or inframammary	47 (24.9%)	2 (2.5%)	<0.001
Axilla	128 (67.7%)	37 (46.8%)	0.001
Perineal or perianal	11 (5.8%)	16 (20.3%)	<0.001
Scrotum	NA	5 (6.3%)	NA
Groin or thigh	138 (73.0%)	48 (60.8%)	0.047
Buttock or gluteal cleft	27 (14.3%)	10 (12.7%)	0.72
Neck or ear	3 (1.6%)	3 (3.8%)	0.27

† two-sided chi-square test; NA = not applicable.

Table V

Univariate and Multivariate Analysis of Gender, Smoking, BMI, Acne, and Depression as it Relates to HS severity

Characteristic	Hurley Grade II or III No. (%)	OR (95% CI)	P-values from univariate logistic regression analyses
Age at diagnosis (years)†			0.021
<= 23.4 (N=67)	20 (29.9%)	Referent	
23-5 – 30.6 (N=68)	34 (50.0%)	2.4 (1.2 – 4.8)	
30.7 – 40.3 (N=66)	21 (31.8%)	1.1 (0.5 – 2.3)	
>=40.5 (N=67)	33 (49.3%)	2.3 (1.1 – 4.6)	
Gender			0.006
Male (N=79)	42 (53.2%)	2.1 (1.2 – 3.6)	
Female (N=189)	66 (34.9%)	Referent	
Smoking history			0.016
Past/Current (N=186)	84 (45.2%)	2.0 (1.1 – 3.5)	
Never (N=79)	23 (29.1%)	Referent	
Unknown (N=3)			
BMI			0.63
>=30 kg/m^2 (N=140)	59 (42.1%)	1.1 (0.7 – 1.9)	
<30 kg/m^2 (N=115)	453 (39.1%)	Referent	
Unknown (N=13)			
Acne diagnosis ever			0.35
Yes (N=97)	43 (44.3%)	1.3 (0.8 – 2.1)	
No (N=169)	65 (38.5%)	Referent	
Unknown (N=2)			
Depression diagnosis ever			0.74
Yes (N=115)	45 (39.1%)	0.9 (0.6 – 1.5)	
No (N=153)	63 (41.2%)	Referent	
Pilonidal disease			0.77
Yes (N=16)	7 (43.8%)	1.2 (0.4 – 3.2)	
No (N=252)	101 (40.1%)	Referent	

OR, odds ratio

†Age was categorized based on the quartiles of the age distribution.

Table VI

Diagnostic Criteria for Hidradenitis Suppurativa and Hurley Staging System

Hidradenitis Suppurativa Diagnostic Criteria *
1. Is there more than a single inflamed lesion?
2. Is the course chronic with new and recurrent lesions?
3. Are the lesions bilateral?
4. Are the lesions located primarily in the milk line?
Hurley Staging
I. Abscess formation (single or multiple) without sinus tracts and cicatrization
II. One or more widely separated recurrent abscesses with tract formation and scars
III. Multiple interconnected tracts and abscesses throughout an entire area

* Patients had to meet all 4 criteria for study inclusion, except in cases of atypical locations (e.g. perianal or perineal, buttock or gluteal cleft, neck or ear, scrotum) in which lesions are not primarily located in the milk line.