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Clinical Epidemiology and Phenotypic Characteristics of Hidradenitis Suppurativa Disease in the Central Region of Saudi Arabia: Findings from a Cross-Sectional

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Background: Hidradenitis suppurativa (HS) is a complex condition that is often misdiagnosed, and regional data on its clinical features and risk factors are limited. This study aimed to explore the clinical epidemiology and phenotypic characteristics of HS in the central region of Saudi Arabia.

Materials and Methods: A cross-sectional study was conducted on HS patients at King Khalid University Hospital (KKUH) in Riyadh from December 2020 to December 2021. Clinical, epidemiological, and comorbidity data were collected, and the severity of HS was categorized with the Hurley staging system. Statistical analysis was performed with SPSS, with the significance level set to $p < 0.05$.

Results: Of the patients, 54.8% were aged 15–30 years, 57.04% were female, and 95.56% were Saudi. Obesity was present in 48.89% of the patients, and 34.07% were smokers. The comorbid conditions included acne (10.37%), asthma (8.15%), mental disorders (2.22%), and endocrine or noncommunicable diseases (18.52%). Most patients (80.74%) had multiple affected sites. No significant associations were found between these factors and HS severity ($p > 0.05$).

Conclusion: In conclusion, HS primarily affects young, unmarried Saudi female patients, many of whom are smokers and have comorbid conditions such as asthma and skin disorders. Clinicians should carefully assess the risk profiles of patients, particularly those with smoking habits and comorbidities, and consider screening for HS in high-risk groups.

Keywords: hidradenitis suppurativa, epidemiology, severity, phenotypes, central Saudi Arabia

Introduction

Hidradenitis suppurativa (HS) is a chronic inflammatory skin condition that is characterized by painful, recurrent abscesses and deep-seated nodules that affect mainly the apocrine glands of affected skin.[1,2] HS is more prevalent and severe in African Americans than in other populations, and it affects more women than men (3:1 ratio).[3] Its burden varies across regions, ranging from 0.00033–4.1%.[4]

While the exact mechanism underlying HS has not been fully revealed, the literature suggests that primary contributors to HS include follicular hyperkeratosis and apocrine gland inflammation.[5,6] Moreover, immune dysregulation with inflammatory cytokines plays a crucial role in the pathogenesis of HS.[7,8] The pathogenesis of HS is complex and multifactorial; both genetic and epigenetic factors have been identified as key contributors to the etiology of HS.[9] Genetic studies have revealed the involvement of specific susceptibility genes.[3,10] Moreover, the occurrence of HS is associated with patient family history, with approximately one-third to one-half of patients having a positive family history, indicating a genetic predisposition to the disease.[11] Concurrently, epigenetic modifications, such as changes in

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DNA methylation, are emerging as interesting research topics that could shed light on the molecular intricacies underlying HS.[9]

There are co-occurrences of other factors, such as obesity and smoking, among patients with HS.[12] For example, 50–75% of patients with HS are obese, whereas 70–90% of patients with HS smoke.[13,14] Furthermore, patients with HS experience other comorbidities that negatively affect their quality of life.[15] For example, discomfort, purulent discharge, malodor, and deformity due to HS have a significant impact on afflicted individuals, resulting in isolation and insecurity because of stigmatization at work and in their personal lives.[16] Other comorbidities associated with HS include cardiovascular disease; hypertension; diabetes; dyslipidemia; mental disorders, such as depression and anxiety; and inflammatory bowel disease.[17–22]

Unfortunately, HS is very complex, and therefore, it is often misdiagnosed; additionally, there is a large gap, 7.2 years on average, between the onset of symptoms and the establishment of a diagnosis.[23] This indicates the need for physicians to be familiar with the disease presentation and clinical phenotypes. Owing to delayed diagnosis, patients are not properly treated in a timely manner; therefore, they suffer multiple adverse outcomes. The lack of understanding of the disease perhaps occurs due to a lack of available data on the risk factors, clinical features, and determinants of the severity of the disease. Our understanding of the epidemiology of HS is likely to evolve as HS phenotypic subtypes begin to be recognized. A limited number of studies have been conducted to identify the clinical epidemiology and phenotypes of HS patients in the Middle Eastern population.[24,25] Hence, we aimed to understand the clinical epidemiology and phenotypic characteristics of HS in the central region of Saudi Arabia.

Materials and Methods

Study Design and Setting

A cross-sectional study was conducted for approximately 12 months at King Khalid University Hospital (KKUH), Riyadh, Saudi Arabia.

Study Sample and Eligibility Criteria

The target population included all patients with HS who were followed at KKUH from December 2020–December 2021. Patients outside of Saudi Arabia and those whose diagnosis was not confirmed were not included in the study. Assuming a margin of error of 5% and a 95% confidence level, the statistically appropriate sample size to achieve the desired confidence level and margin of error was estimated to be 384 with the following formula: n= (Zalpha/2)2/4(e2).

Data Collection

Data on clinical and epidemiological variables and other comorbidities were collected. For example, with respect to clinical and epidemiological variables, data on sex, HS prevalence, and race were collected. In addition, data on other comorbidities, such as metabolic syndrome, arthritis, inflammatory eye disease, depression, anxiety, degree of pain, and pruritus, were also collected. We collected data on sociodemographic variables such as age, sex, nationality, height, weight, body mass index (BMI), family history of HS, and smoking status. The HS clinical phenotype was assessed by dividing the patients into three groups according to Canoui-Poitrine's classifications,[1] which categorized HS patients into three phenotypes: the axillary-mammary, follicular, and gluteal phenotypes. The axillary-mammary phenotype is the "typical" phenotype observed in European populations. The follicular phenotype is characterized by comedones, other follicular lesions, and severe acne. The gluteal phenotype has a predilection for the buttocks. Patients who fit more than one phenotype were labeled as having the "mixed phenotype."

All HS patients were contacted by phone or interviewed and examined in the clinic to assess their level of pruritus and pain, the effect of HS on their quality of life, and the presence of depression. Informed consent was obtained from the patients, and their right to withdraw from the study was explained to them. Pruritus and pain intensity were assessed with a visual analog scale (VAS), a 10-cm long horizontal line numbered from 0 to 10. The participants indicated the maximum and average pruritus and pain intensities they had experienced from HS lesions during the previous 7 days by selecting a number from 0 (no pruritus/pain) to 10 (worst imaginable pruritus/pain). With respect to VAS scoring, scores

of >0–<3 points, ≥3–<7 points, and ≥7–10 points were considered to indicate mild, moderate, and severe pain/pruritus, respectively.[2] Furthermore, the severity of HS was measured with the Hurley staging system, which is an important indicator of HS severity. According to the Hurley stage, HS is classified into three stages: stages 1, 2, and 3. Stage 1 is described as the formation of an abscess but no sinus tract or cicatrization, stage 2 is described as the formation of a recurrent abscess with sinus tract formation or cicatrization, and stage 3 is defined as involving a diffuse area with several interconnected tracts.

Ethical Considerations

The study adhered to ethical standards and was carried out after the approval of the IRB office at King Saud University with a project approval number (E-22-6758). Oral and written informed consent was obtained from all the patients. The authors declare that they have no conflicts of interest. All the procedures involving human participants were performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. We confirm that informed consent was obtained from a parent or legal guardian for participants under 18 years of age.

Statistical Analysis

Descriptive statistics (eg, the means, standard deviations, frequencies, and percentages) were used to describe the quantitative and categorical variables. Bivariate statistical analysis was carried out using the chi-square test or the Fisher exact test as appropriate based on the type of study and outcome variables. Variables associated with the severity of HS were assessed. A p value of <0.05 was used to report statistically significant differences. The data were analyzed with SPSS version 24.0 statistical software.

Study Results

Sociodemographic Characteristics of the Patients with Hidradenitis Suppurativa

Table 1 shows the sociodemographic characteristics of the patients with HS. Approximately one-third of the patients (37.80%) were aged 31–50 years, and 54.80% were aged 15–30 years. More than half of the patients (57.04%) were female, and 95.56% were from Saudi Arabia. One-third of the patients (32.59%) were married, and 52.59% had either a bachelor's degree or a diploma. Nearly half (45.93%) were unemployed, and a similar proportion of the patients (48.89%) were obese, whereas approximately one-fifth (20.74%) were overweight. Fewer than 10% of the patients had hypertension, 17.04% had diabetes or impaired glucose levels, and 18.52% had dyslipidemia. Approximately one-third of the HS patients (34.07%) were current smokers, and 35.56% had a previous smoking history.

Table 1 Sociodemographic Characteristics of the Patients with Hidradenitis Suppurativa (n=135)

Age	n	%
15–30	74	54.80
31–50	51	37.8
51–65	10	7.4
Gender		
Female	77	57.04
Male	58	42.96

(*Continued*)

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Table 1 (Continued).

Nationality		
Non-Saudi	6	4.44
Saudi	129	95.56
Marital Status		
Divorced	2	1.48
Married	44	32.59
Single	89	65.93
Education		
Bachelors/Diploma	71	52.59
High school	30	22.22
Intermediate	7	5.19
Masters/Postgraduate/PhD	13	9.63
Primary school or lower	14	10.37
Occupation		
Medical professional/Engineer	9	6.67
ND	5	3.70
Office job	34	25.19
Others	20	14.81
Teaching profession	5	3.70
Unemployed	62	45.93
BMI		
Moderately Obese	13	9.63
Normal weight	26	19.26
Obese	66	48.89
Overweight	28	20.74
Underweight	2	1.48
Hypertension		
No	122	90.37
Yes	13	9.63
DM or impaired glucose		
No	112	82.96
Yes	23	17.04

(*Continued*)

Table 1 (Continued).

Dyslipidemia		
No	109	80.74
Yes	25	18.52
PCOS		
	62	45.93
No	50	37.04
Yes	23	17.04
IBD		
No	133	98.52
Yes	2	1.48
Fatty Liver		
No	127	94.07
Yes	8	5.93
Smoking		
No	89	65.93
Yes	46	34.07
Previous smoking history		
No	87	64.44
Yes	48	35.56
Type of smoking		
1st hand	50	37.04
2nd hand	8	5.93
No	77	57.04

Figure 1 shows the frequency of comorbidities among the patients with HS. Approximately one-quarter of patients (24.44%) had no comorbidities; 10.37% had acne; 8.15% had asthma; 2.22% had mental disorders; 18.52% had endocrine disorders or noncommunicable diseases; and 16.3% had urticaria, dermatitis, eczema or hair loss.

Clinical Features of Patients with Hidradenitis Suppurativa

Table 2 shows the clinical features of the patients with HS. Approximately one-third of the HS participants (29.63%) were categorized as having stages 1 and 3, whereas 40.74% were categorized as having stage 2 on the basis of the Hurley stage criteria. Approximately 80.74% of the patients had multiple affected locations; therefore, these patients were categorized as having mixed locations. Only the axillary or gluteal regions were affected in 5.19% and 7.41% of the patients, respectively, whereas only the inguinal region was affected in 3.70% of the patients. Approximately 27.41% of the HS patients had had surgery related to HS, and 46.67% of the patients reported having had other surgeries in the past. The most commonly reported previous treatments for HS included doxycycline with or without other drugs or isotretinoin with or without other drugs, followed by clindamycin and adalimumab with or without other drugs.

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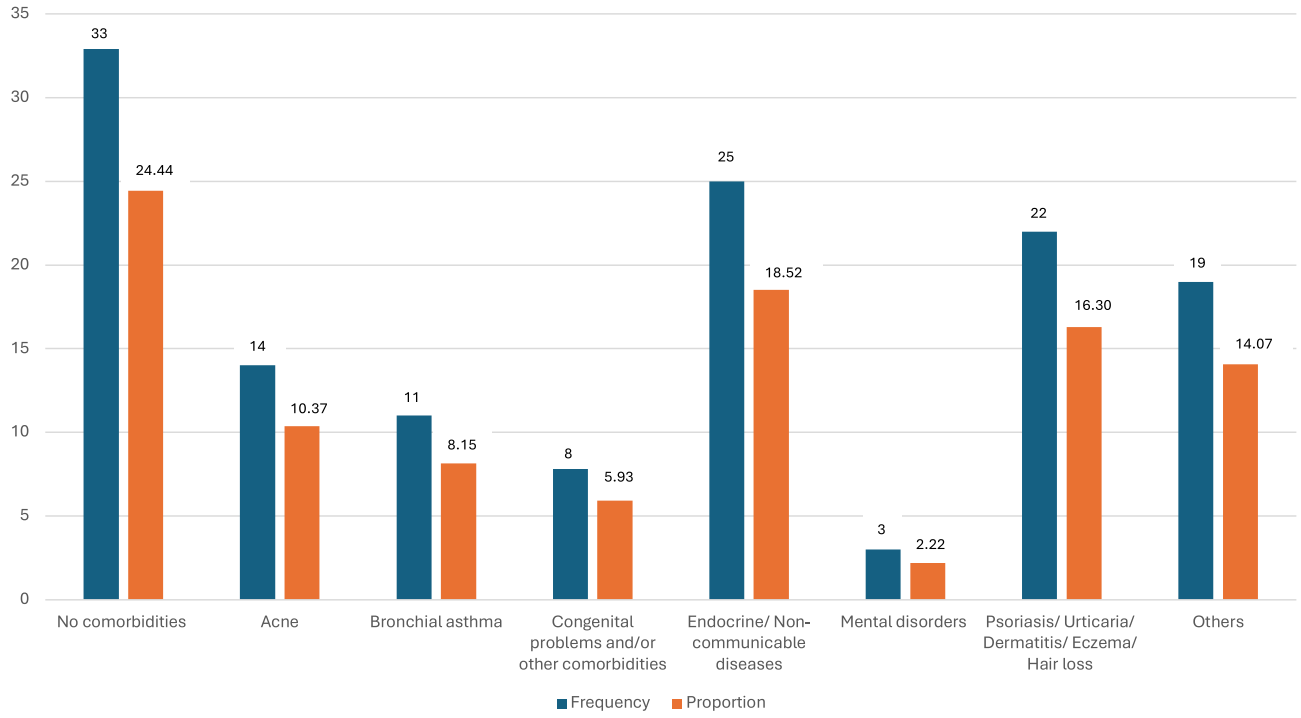

Figure 1 Frequency of Comorbidities Among Patients with Hidradenitis Suppurativa (n=135).

However, the most common current treatment was clindamycin with or without other drugs, followed by adalimumab with or without other drugs and doxycycline with or without other drugs, as shown in Table 2 below. With respect to weight loss interventions, 60.74% had tried lifestyle modifications alone, 13.33% had tried medications, and 13.33% had tried bariatric surgery.

Table 2 Clinical Features of Hidradenitis Suppurativa (N=135)

Hurley Stage		
1	40	29.63
2	55	40.74
3	40	29.63
Locations affected		
Axilla	7	5.19
Breasts	2	1.48
Genital	1	0.74
Gluteal	10	7.41
Thighs	1	0.74
Inguinal	5	3.70
Mixed	109	80.74

(*Continued*)

Table 2 (Continued).

Past Surgical history related to HS		
No	95	70.37
Yes	37	27.41
Missing	3	2.22
Other past surgical history		
No	65	48.15
Yes	63	46.67
Missing	7	5.19
Past medical treatment for HS		
Adalimumab with without other drugs	4	2.96
Chlorhexidine	3	2.22
Clindamycin with or without other drugs	21	15.56
Doxycycline with or without other drugs	32	23.70
Isotretinoin with or without other drugs	30	22.22
Other antibiotics	45	33.33
Current medical treatment for HS		
Adalimumab with without other drugs	37	27.41
Chlorhexidine	4	2.96
Clindamycin with or without other drugs	50	37.04
Doxycycline with or without other drugs	20	14.81
Isotretinoin with or without other drugs	12	8.89
Other antibiotics	5	3.70
No medication	7	5.19
Weight Loss Interventions		
Bariatric surgery	18	13.33
Medications	9	6.67
Lifestyle modification only	82	60.74
Lifestyle modification plus medicine	18	13.33
Lifestyle plus medicine/surgery	8	5.93

Factors Associated with the Severity of Hidradenitis Suppurativa

Table 3 shows factors associated with the severity of HS. Overall, there were no differences in the factors associated with the severity of HS. For example, 35% to 40% of the patients were in all stages in all age groups, with a nonsignificant p value of 0.58. However, 50.3% of the patients in stage 3 were young, but a similar proportion of the patients in stage 1 were also young, indicating no difference in the stage of HS according to age (P value: 0.58). Similarly, of the patients in stage 3, approximately 50% were male and 50% were female, whereas a greater proportion of the patients in stage 1 (65%) were female than male

Table 3 Factors Associated with the Severity of Hidradenitis Suppurativa (n=135)

	Hurley Stage						
	Stage 1		**Stage 2**		**Stage 3**		**P-value**
	n	**%**	**n**	**%**	**n**	**%**	
Age							
15–30	20	50	34	61.8	20	50.3	
31–50	16	40	19	34.5	16	40.0	0.58
51–65	4	10	2	3.6	4	10.0	
Gender							
Female	26	65	31	56.4	20	50.0	0.39
Male	14	35	24	43.6	20	50.0	
Nationality							
Non-Saudi	3	7.5	1	1.8	2	5.0	
Saudi	37	92.5	54	98.2	38	95.0	0.41
Marital Status							
Divorced	0	0	1	1.8	1	2.5	
Married	16	40	15	27.3	13	32.5	0.65
Single	24	60	39	70.9	26	65.0	
BMI							
Morbidly Obese	3	7.5	8	14.5	2	5.0	
Normal	9	22.5	8	14.5	9	22.5	0.78
Obese	18	45	27	49.1	21	52.5	
Overweight	9	22.5	11	20	8	20.0	
Underweight	1	2.5	1	1.8	0	0	
Hypertension							
No	37	92.5	50	90.9	35	87.5	0.74
Yes	3	7.5	5	9.1	5	12.5	
DM or impaired glucose							
No	33	82.5	48	87.3	31	77.5	
Yes	7	17.5	7	12.7	9	22.5	0.45
Dyslipidemia							
No	32	80	44	80	33	82.5	
Yes	8	20	11	20	7	17.5	0.94

(*Continued*)

Table 3 (Continued).

	Hurley Stage						
	Stage 1		Stage 2		Stage 3		P-value
	n	%	n	%	n	%	
Smoking							
No	27	67.5	35	63.6	27	67.5	
Yes	13	32.5	20	36.4	13	32.5	0.89
Previous smoking history							
No	26	65	36	65.5	25	62.5	
Yes	14	35	19	34.5	15	37.5	0.95
Type of smoking							
1st hand	13	32.5	22	40	15	37.5	
2nd hand	6	15	1	1.8	1	2.5	0.08
No	21	52.5	32	58.2	24	60.0	

(35%). However, there was no significant difference in the HS stage according to sex, as reflected by the p value of 0.39. Similarly, nationality was not found to be associated with the stage of HS, as more than 90% of the patients in each stage were Saudi descent (P value: 0.41). Similarly, the p value for marital status and severity of HS was 0.65, indicating no difference in the severity of HS according to marital status. In addition, approximately 20% of the patients in all stages were overweight, and more of the patients in stage 3 (52.5%) were obese than the patients in stages 1 and 2 (45% and 49%, respectively). However, obesity was not significantly associated with the severity of HS, as indicated by a p value of 0.78. With respect to the associations between comorbidities such as hypertension, we found that more of the patients in stage 3 (12.5%) had hypertension than the patients in stages 1 and 2 (7.5% and 9.1%, respectively). However, the difference was not statistically significant (P value: 0.74). Similarly, the data revealed that approximately one-quarter of the patients with stage 3 disease (22.5%) had DM, whereas 17.5% of those with stage 1 disease and 12.7% of those with stage 2 disease had DM; however, the difference was not statistically significant (P value: 0.45). There was no statistically significant difference in the severity of HS according to smoking status (P value: 0.89), as almost one-third of the patients in each stage reported current or past smoking.

Discussion

This study aimed to increase the understanding of the clinical epidemiology and phenotypic characteristics of HS disease in the central region of Saudi Arabia. The study findings revealed that the majority of the patients with HS were young, unmarried females and residents of Saudi Arabia. Unsurprisingly, one-third of these patients were smokers, and they also had associated comorbidities such as asthma, skin conditions, endocrine problems, and other noncommunicable diseases. Additionally, an equal proportion of the patients had stage 1 or 3 disease, and most of the patients had involvement of multiple sites, such as the axilla, gluteal region, breasts, and inguinal region. While assessing the factors associated with the severity of HS, we found no significant differences among the three stages in terms of demographic and clinical factors, such as age, sex, nationality, marital status, BMI, smoking status, or other comorbidities. However, a greater proportion of the patients in stage 3 than in stages 1 and 2 had hypertension or impaired glucose levels.

Our findings regarding the greater proportion of female patients with HS are consistent with other studies across the world, suggesting that female patients are more likely than male patients to have HS.[26,27] However, a recently conducted study in Saudi Arabia reported the opposite findings, with a greater proportion of male patients with HS than female patients.[24] This difference between the two studies conducted in the same country could be due to random variability, or

it is likely that the female patients in the previous study were drawn from a population with lower access to health care.[28] Hence, the proportion of female patients represented in the sample appears to be underreported compared with the proportion of male patients.[28] Furthermore, we found that the majority of the patients with HS in our study were obese. These findings are consistent with those of a previously conducted study in Saudi Arabia.[24] In addition, several studies across the world have suggested that being overweight or obese is associated with HS and its severity.[12] One possible explanation for the co-occurrence of obesity and HS could be the mechanical irritation and maceration resulting from hormonal changes (androgenic effects) among obese patients.[29–32] Despite the high prevalence of obese patients in our sample, we did not find any significant association between obesity and the severity of HS on the basis of the Hurley stages. These findings are consistent with those of a previous study conducted in Saudi Arabia.[24] These similar findings from the two studies could indicate an overall greater burden of obesity in Saudi Arabia.[33,34]

We found that approximately one-third of the patients with HS were smokers, and approximately one-fifth had impaired glucose levels or dyslipidemia. This suggests that HS is not limited to the skin; rather, it affects multiple body organs and systems due to the disease's systematic nature.[4,21,35] While we did not find any association between smoking and the severity of HS in the current study, this could be due to the limited power to detect the association between the two. However, smoking is an established risk factor for HS, as it increases inflammatory responses and is also considered a promoter of follicular occlusion; therefore, it can lead to or even exacerbate HS.[36,37] With respect to the affected location, the current study revealed that there was no predilection for a single site; rather, multiple body parts, such as the axilla, gluteal region, groin, and breasts, were affected together. This finding contrasts with findings from Saudi Arabia[24] and Turkey;[38] the axilla was the most commonly affected area in these populations, followed by the inguinal region. These differences could be due to differences in the study samples or perhaps differences in the data collection methods, as we collected data directly from patients, whereas previous studies relied on electronic health records.

In addition, we reported the co-occurrence of several other comorbidities, such as acne, pruritus, eczema, hair loss, congenital disorders (mainly Down syndrome), and endocrine disorders, such as hypo- and hyperthyroidism. Overall, our findings regarding the cooccurrence of other comorbidities were consistent with the literature, with slight differences. For example, a study conducted in Saudi Arabia reported that approximately 12% of HS patients had acne vulgaris.[24] However, another study reported opposite findings, indicating that acne vulgaris was not, indeed, more common in patients with HS than in healthy controls.[39] However, the coexistence of Down syndrome and HS is consistent with previously conducted population-based and facility-based studies, suggesting a link between the two conditions.[40] The proportion of patients with IBD was lower in our study, and this finding is consistent with that of a study conducted in Saudi Arabia.[24] Nevertheless, this finding contradicts that of another study that reported a greater prevalence of IBD among patients with HS, suggesting the possibility of a similar pathogenesis for these two diseases. Our study builds on the findings of Alsadhan et al[24] by offering expanded insights into HS in Saudi Arabia and emphasizing unique sociodemographic and clinical details. While both studies identify young adults as the primarily affected age group, this study provides more granular data, including a higher proportion of Saudi nationals and specific dermatological comorbidities such as acne, eczema, and urticaria, which were previously less emphasized. Additionally, it highlights weight-loss interventions, such as lifestyle modifications, medications, and bariatric surgery, offering a novel perspective compared with the limited focus on these factors in the work of Alsadhan et al. Temporal trends in treatment approaches, such as the current dominance of clindamycin and doxycycline, further illustrate evolving clinical practices. Both studies reported no significant associations between HS severity and factors such as age, sex, nationality, obesity, or smoking, reinforcing the consistency of these observations. By expanding on regional prevalence, comorbidities, and treatment patterns, this study complements and enhances the foundational work of Alsadhan et al, contributing to a more comprehensive understanding of HS in Middle Eastern populations.

Strengths and Limitations

The current study is unique in that it provides insights into the clinical epidemiology and phenotypic characteristics of HS in the central region of Saudi Arabia. The consistent findings between the current study and studies previously conducted in Saudi Arabia increase confidence in the epidemiology of and risk factors for HS in the central region of Saudi Arabia. Additionally, we collected data by contacting patients by phone or through face–to–face interviews instead

of reviewing the secondary data collected in medical records. Finally, this study was conducted in the central region of Saudi Arabia; therefore, the findings can be generalized to similar settings in or outside of Saudi Arabia. However, the study findings should be interpreted with caution in light of several limitations. First, this was a cross-sectional study, which limited our ability to understand the temporal relationships between various demographic and clinical factors and the severity of HS. Second, the sample size was smaller than those of other studies, which may have resulted in a lower power to detect significant associations between clinical factors and disease severity. Finally, the sample was not randomly drawn from the underlying population, thus posing a threat to the validity of the findings due to selection bias.

Conclusion and Recommendations

The current study reveals important findings about the clinical epidemiology and phenotypic characteristics of HS disease in the central region of Saudi Arabia. Although we did not find significant differences in the severity of disease according to demographic or clinical factors, this study has several important implications. Although the disease prevalence is not higher in Saudi Arabia, its chronic, inflammatory nature can lead to several short- and long-term consequences that should be considered. Owing to signs and symptoms that commonly overlap with other disorders and to its rare occurrence, the condition is not easily diagnosed. Hence, physicians and dermatologists should consider HS to be one of the differential diagnoses in patients presenting with similar signs and symptoms. The risk profiles of patients need to be thoroughly evaluated in the clinic, and young patients who smoke and have other comorbidities should be screened for HS. Furthermore, prevention programs should also raise awareness about the course and nature of the disease.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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