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Hospitalized hidradenitis suppurativa patients at a university clinic: a fifteen-year retrospective analysis of hospitalized patients with a focus on sex differences

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Abstract

Introduction: Hidradenitis suppurativa (HS) is a chronic skin disease marked by recurrent abscesses, sinus tracts, and scarring, often accompanied by systemic symptoms. Diagnosed clinically, HS affects around 0.4% of people in western populations, but standardized treatment options are limited, leading to inconsistent outcomes. This study retrospectively analyzes 15 years of HS cases in southeastern Europe to better understand regional characteristics and treatment responses.
Methods: This is a retrospective, cross-sectional study encompassing 103 HS patients hospitalized from 2007 to 2022 at a university dermatology and venereology clinic.
Results: Women were younger than men at onset of HS (19 vs. 28 years old) and at first hospitalization (31 vs. 39 years old). Men were most often diagnosed as Hurley stage III at hospital admission (50.8%), whereas women predominantly had Hurley stage II (57.5%, $p = 0.032$). Trunk involvement was more prevalent in women (62.5% vs. 41.3%, $p = 0.036$) and the back of the neck in men (30.2% vs. 7.5%, $p = 0.006$). Obesity was the most commonly found concurrent disease (35.9%) overall, and a history of acne was the most frequent dermatological comorbidity (29.1%). HS patients had a fivefold increase in their chance of having psoriasis. The most commonly employed systemic treatments were oral antibiotics: rifampicin with clindamycin (62.1%) followed by tetracyclines (42.7%).
Conclusions: HS patients had a fivefold higher likelihood of having psoriasis. Female patients were less likely to experience severe disease presentations. Although metabolic syndrome and its components were relatively common, they showed no correlation with disease severity. Treatment approaches for HS varied notably between males and females.

Keywords: hidradenitis suppurativa, inverse acne, psoriasis, retrospective study, single-center study

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Introduction

Hidradenitis suppurativa (HS) is a chronic follicular occlusive skin disorder characterized by recurrent abscesses, draining sinuses, and scarring, with a multifactorial pathogenesis. HS may be considered a systemic disease due to the presence of accompanying systemic manifestations (1).

The estimated prevalence of the disease is around 0.4% when combining western European and Scandinavian countries, the United States and Australia (2). Diagnosing HS mainly relies on clinical presentation, which consists of double or multi-ended comedones, painful nodules, abscesses, and sinus tracts with frequent scar formation. Localization of the lesions and chronicity are crucial for diagnosis (3, 4). For assessing the clinical severity, the most widely used staging is the one proposed by Hurley, which categorizes patients into three groups based on the extent and severity of the clinical presentation (5).

Along with the distress emerging from the pain and inflammation, many other factors can contribute: delay in diagnosis, a broad spectrum of comorbidities associated with HS, or social habits. One of the main contributing factors is the lack of standardized treatment regimens for HS, and foremost often incomplete response to these therapeutics, which is especially true when novel treatment options are unavailable.

Although clinical characteristics of HS and associated diseases have been well studied, data from southeastern Europe are sparse. Therefore, this study investigates the degree to which these factors are displayed in hospitalized patients diagnosed with HS in a 15-year retrospective study at a university clinic of dermatology and venereology.

Methods

Study population

A retrospective, cross-sectional study was conducted, encompassing hospitalized patients at a university clinic of dermatology and venereology from 2007 to 2022. The patients included in this study were hospitalized for the first time during this period, and HS was the main cause of hospital admission. Data regarding demographic characteristics, including smoking habits (current and previous), disease duration, clinical presentation, laboratory findings, concomitant diseases, and treatment regimens, were taken from the electronic national healthcare data system (Heliant), as well as from hard copies of hospital patient histories.

Assessment of clinical features

Disease severity was assessed using the Hurley classification system. To determine the localization of lesions, typically affected

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areas were divided into occipital and neck, axillary, trunk, gluteal, and genital and groin area. Patients were classified into non-overweight (BMI < 25 kg/m²) and overweight (BMI ≥ 25 kg/m²).

We recorded the presence of concomitant systemic and/or skin diseases from the patients' medical files. Available data on metabolic parameters were used to determine the presence of metabolic syndrome in the patients, as proposed by the International Diabetes Federation (IDF) classification system (6). The treatment regimens included the following: topical and/or systemic antibiotics, systemic retinoids, systemic corticosteroids, oral dapsone, biological therapy (secukinumab, ustekinumab, adalimumab), and surgery.

Statistical analysis

Statistical analyses were performed using SPSS® 27.0 (IBM, New York, USA); $p < 0.050$ was considered significant. Descriptive analyses were given as proportions, frequencies, and central tendency measures presented as mean ± standard deviation. The Mann–Whitney *U* or Kruskal–Wallis test was employed because the numerical data did not follow a normal distribution, whereas the chi-squared test or Fisher's exact test was used for categorical data. Binary logistic regression analyses were employed to evaluate the predictive strength of clinical parameters on the severity of HS. The logistic regression model included variables that showed an association with HD severity ($p < 0.100$) in univariate analysis.

Results

Patients' characteristics and differences between sexes

Table 1 summarizes the sociodemographic and clinical data of all hospitalized patients and highlights the differences between men and women. In the given timeframe, out of 119 patients that were hospitalized for diagnostic and treatment purposes, 103 were included in this study (63 males and 40 females). Sixteen patients were excluded from further analyses because of insufficient clinical and laboratory data. The mean age of disease onset was 28.3 ± 12.6, and the mean age of first-time hospitalization was 37.7 ± 14.3 years. The age of disease onset ranged from 6 to 59 years. Only one patient was in the first decade (6 years old) at disease onset. The mean duration of the disease before hospitalization was 9.2 years. There was a statistically significant earlier age of women versus men for onset (19 vs. 28 years, $p = 0.020$) and age of first-time hospitalization (31 vs. 39 years, $p = 0.004$). The percentage of smokers among men was significantly higher than among women (92.1% vs. 60.0%, $p < 0.001$).

Thirteen patients (12.6%) were classified as Hurley I, 48 (46.6%) as Hurley II, and 42 (40.8%) as Hurley III stage. There were significant differences in Hurley stage frequencies between sexes: most men (50.8%), had Hurley stage III, whereas most women (57.5%) had Hurley stage II ($p = 0.032$). Regarding localization, genital and inguinal areas were most commonly involved, present in 81 (78.6%) patients. Differences between the sexes were also observed, with more frequent trunk involvement in women and the back of the neck in men (30.2% vs. 7.5%, $p = 0.006$). In 40 patients (38.8%), three regions were involved, and seven patients (6.8%) had lesions in all five areas. The number of affected regions was similar in both sexes.

Major comorbidities, further subclassified by sex, are presented in Table 2. Women had a higher prevalence of increased fasting glucose levels ($p = 0.046$), obesity ($p = 0.051$), and thyroid disease ($p = 0.005$). However, there was no significant difference regarding the presence of metabolic syndrome between sexes ($p = 0.192$). Acne was the most commonly associated skin disease in our patients (in 29.1%), and women had atopic dermatitis (AD) more frequently than men (12.5% vs. 0%, $p = 0.008$). Approximately one in 10 patients had psoriasis along with HS. Two patients had associated acne and pyoderma gangrenosum, constituting PASH syndrome (pyoderma gangrenosum, acne, suppurative hidradenitis). One patient had follicular occlusion triad syndrome.

Table 3 contains the list of therapeutic modalities and their distribution according to the sex of the patients. The most common treatment modality, used in 99% of patients, was topical clindamycin. Systemic treatment options most frequently included antibiotics, either alone or in combination with other modalities. Differences between sexes in treatment choices were observed: men were more likely to be treated with rifampicin plus clindamycin

Table 1 | **Main sociodemographic characteristics, history, and clinical data of hidradenitis suppurativa patients.**

	Total ($n = 103$)	Men ($n = 63$)	Women ($n = 40$)	*p*-value
Age[a]	37.7 ± 14.3	40.0 ± 13.3	33.9 ± 15.1	**0.020**
Age at onset (years)[a]	28.3 ± 12.6	30.2 ± 11.0	25.2 ± 14.4	**0.004**
0–19, *n* (%)	30 (29.1)	9 (14.3)	21 (52.5)	
20–29, *n* (%)	33 (32.0)	27 (42.9)	6 (15.0)	
30–39, *n* (%)	21 (20.4)	14 (22.2)	7 (17.5)	**0.001**
40–49, *n* (%)	9 (8.7)	7 (11.1)	2 (5.0)	
50–59, *n* (%)	10 (9.7)	6 (9.5)	4 (10.0)	
Disease duration before first hospitalization (years)[b]	6 (3–11)	5 (2–10)	6 (3–13)	0.288
Smoking, ever, *n* (%)	82 (79.6)	58 (92.1)	24 (60.0)	**< 0.001**
Hurley stage, *n* (%)				
I	13 (12.6)	6 (9.5)	7 (17.5)	
II	48 (46.6)	25 (39.7)	23 (57.5)	**0.032**
III	42 (40.8)	32 (50.8)	10 (25.0)	
Localization of lesions, *n* (%)				
Axilla	72 (69.9)	47 (74.6)	25 (62.5)	0.192
Genital and groin	81 (78.6)	49 (77.8)	32 (80.0)	0.789
Trunk	51 (49.5)	26 (41.3)	25 (62.5)	**0.036**
Gluteal	64 (62.1)	40 (63.5)	24 (60.0)	0.722
Occipital and neck	22 (21.4)	19 (30.2)	3 (7.5)	**0.006**
No. of regions involved[b]	3 (2–3)	3 (2–4)	3 (2–3)	0.530

IQR = interquartile range.
Significant *p* values showed in bold. Data are shown as [a]mean ± standard deviation and [b]median (IQR).

(p = 0.004) and retinoids (p = 0.004), whereas women received tetracyclines (p = 0.016) and systemic steroids (0.023) more frequently. Surgery was twice as frequent as a treatment option in men compared to women (p = 0.001).

Differences according to Hurley stages

Table 4 provides insight into the characteristics of patients classified according to Hurley disease stages. In addition to the difference in sex distribution, it is possible to note differences in the frequency of hypertension and dyslipidemia across Hurley stages, both being more common in patients staged as Hurley I. Interestingly, we observed a lower prevalence of metabolic syndrome with increasing Hurley stages (p = 0.277), whereas the highest percentage of smokers was seen among Hurley stage I patients (92.3%, p overall = 0.241).

The involvement of specific lesion localizations across Hurley stages is displayed in Figure 1. Significant differences in distributions were observed regarding the genital (p overall = 0.008) and axillary (p overall = 0.048) localizations of lesions. The genital and groin localizations were more common in both the Hurley II and Hurley III groups than in Hurley I (p = 0.011 and 0.003, respectively). As for the axillae, the difference among groups could be attributed to higher prevalence in Hurley stage III compared to stage II (p = 0.017).

Almost one-third of all patients (31.1%) were treated only with systemic antibiotics in addition to different topical treatment options. More than half of Hurley I patients received only systemic antibiotics. The trend for Hurley stages II and III was more toward combinations of different systemic options, as shown in Figure 2. Twenty-one (20.4%) patients were treated with three or more systemic modalities. There was a statistically significant trend toward increased use of rifampicin plus clindamycin (p = 0.010), systemic retinoids (p = 0.019), and surgical therapy (p = 0.013) with increasing disease severity across the Hurley stages.

The final aim of this study was to identify factors associated with greater disease severity as measured by Hurley stages. For the purpose of binary logistic regression, Hurley stages I and II were analyzed together, corresponding to milder disease. As presented in Table 5, the univariate analysis identified male sex

Table 2 | **Main comorbidities of hidradenitis suppurativa patients.**

	Total (n = 103)	Men (n = 63)	Women (n = 40)	p-value
Associated metabolic diseases, n (%)				
Diabetes mellitus	14 (13.6)	10 (15.9)	4 (10.0)	0.397
Dyslipidemia	18 (17.5)	11 (17.5)	7 (17.5)	0.996
Metabolic syndrome, n (%)	17 (16.5)	8 (12.7)	9 (22.5)	0.192
Obesity	37 (35.9)	18 (28.6)	19 (47.5)	0.051
Increased TG or treatment	22 (21.4)	15 (23.8)	7 (17.5)	0.446
Low HDL	18 (17.5)	13 (20.6)	5 (12.5)	0.289
Hypertension or treatment	22 (21.4)	10 (15.9)	12 (30.0)	0.088
Increased morning glucose	32 (31.1)	15 (23.8)	17 (42.5)	**0.046**
Associated systemic diseases, n (%)				
Hypo/hyperthyroidism	8 (7.8)	1 (1.6)	7 (17.5)	**0.005**
Anemia	7 (6.8)	5 (7.9)	2 (5.0)	0.564
PCOS	—	—	7 (17.5)	—
IBD	2 (1.9)	1 (1.6)	1 (2.5)	1.000
Vasculitis	2 (1.9)	2 (3.2)	0 (0.0)	0.520
Lupus erythematosus	1 (1.0)	0 (0.0)	1 (2.5)	0.388
Associated skin diseases, n (%)				
Acne	30 (29.1)	14 (22.2)	16 (40.0)	0.056
Psoriasis vulgaris	10 (9.7)	6 (9.5)	4 (10.0)	0.937
Pyoderma gangrenosum	9 (8.7)	8 (12.7)	1 (2.5)	0.074
Atopic dermatitis	5 (4.9)	0 (0.0)	5 (12.5)	**0.008**
Alopecia areata	5 (4.9)	3 (4.8)	2 (5.0)	1.000
PASH	2 (1.9)	1 (1.6)	1 (2.5)	**1.000**
Follicular occlusion syndrome	1 (1.0)	1 (1.6)	0 (0.0)	1.000

HS = Hidradenitis suppurativa, TG = triglycerides, HDL = high-density cholesterol, PCOS = polycystic ovary syndrome, IBD = inflammatory bowel disease, PASH = pyoderma gangrenosum, acne, hidradenitis suppurativa syndrome.
Significant p values are in bold. $p < 0.050$, according to the chi-squared test / Fisher's exact test.

Table 3 | **Therapeutic modalities in patients with hidradenitis suppurativa at our center.**

	Total (n = 103)	Men (n = 63)	Women (n = 40)	p-value
Antibiotics, n (%)				
Topical clindamycin	102 (99.0)	63 (100.0)	39 (97.5)	0.388
Oral tetracyclines	44 (42.7)	21 (33.3)	23 (57.5)	**0.016**
Oral rifampicin + clindamycin	64 (62.1)	46 (73.0)	18 (45.0)	**0.004**
Other oral antibiotics	83 (80.6)	51 (81.0)	32 (80.0)	0.905
Systemic retinoids	52 (50.5)	39 (61.9)	13 (32.5)	**0.004**
Systemic corticosteroids	26 (25.2)	11 (17.5)	15 (37.5)	**0.023**
Systemic dapsone	10 (9.7)	7 (11.1)	3 (7.5)	0.546
Biologic treatment	11 (10.7)	7 (11.1)	4 (10.0)	0.859
Surgical treatment	46 (44.7)	36 (57.1)	10 (25.0)	**0.001**
Total treatment modalities, n (mean ± SD)	3.4 ± 1.1	3.6 ± 1.0	3.0 ± 1.2	**0.005**
Systemic treatment modalities, n (mean ± SD)	1.9 ± 0.9	2.0 ± 0.8	1.8 ± 1.0	0.197

SD = standard deviation.
Significant p values are in bold. $p < 0.050$, according to the chi-squared test / Fisher's exact test for categorical data, or Mann–Whitney test for numerical data.

(p = 0.009, odds ratio [OR] 3.097) and axillary localization of lesions (p = 0.014, OR 1.507) as the predisposing factor toward severe clinical presentations. Upon inclusion of variables with univariate $p < 0.100$ in the regression model, male sex (p = 0.017, OR 3.251) and trunk lesions (p = 0.029, OR 2.736) emerged as significant predictors of more severe clinical presentation of HS.

Discussion

To the best of our knowledge, this is the first study from southeastern Europe examining the characteristics of HS patients hospitalized at a tertiary university clinic.

Compared to studies with a similar methodology, a French study had a male-to-female ratio of 1:3 (7). A male-to-female ratio of nearly 1:1, described in Canadian and Lithuanian studies, was the finding most similar to ours (8, 9). This may signify that in our study HS in men presented with more severe clinical forms, requiring hospital treatment.

As in previous studies, the age of HS onset in our series of patients was in the third decade of life (10). However, in women we found a markedly earlier onset, which is even earlier than reported in the study by Schrader et al. (11), supporting the theory that early-onset HS may be more frequent than previously believed (12, 13). In addition, the number of regions affected in our early-onset HS group and smoking status were in line with a study conducted in the Netherlands (12).

Cigarette smoking is a well-established environmental factor with an important impact on HS. A recent meta-analysis found that HS patients are about four times more likely to be smokers (7, 14). A high percentage of active/former smokers is found among our patients, as reported in many other studies (7, 14). This percentage was even more striking when comparing men and women (92% vs. 60%), in line with another study that found a significantly higher percentage of male smokers (8). The authors explained these differences with smoking being a possibly more potent risk factor in men than in women, or that the prevalence of male

Table 4 | Main demographic, clinical, and laboratory data of hidradenitis suppurativa patients, classified by Hurley stage of the disease.

Variables	Hurley I (n = 13)	Hurley II (n = 48)	Hurley III (n = 42)	p-value overall
Sex, male, n (%)	6 (46.2)	25 (52.1)	32 (76.2)	**0.032**
Age at hospitalization (years)[a]	43.3 ± 12.1	36.2 ± 14.7	37.6 ± 14.3	0.217
Age at onset (years)[a]	32.1 ± 13.9	27.4 ± 13.5	28.1 ± 11.2	0.444
Disease duration (years)[a]	12.1 ± 10.4	8.7 ± 9.4	8.8 ± 9.6	0.453
Smoking, n (%)	12 (92.3)	35 (72.9)	35 (83.3)	0.241
Associated metabolic and systemic diseases, n (%)				
Diabetes	1 (7.7)	9 (18.8)	4 (9.5)	0.356
Dyslipidemia	6 (46.2)	6 (12.5)	6 (14.3)	**0.014**
Metabolic syndrome	4 (30.8)	8 (16.7)	5 (11.9)	0.277
Obesity	4 (30.8)	19 (39.6)	14 (33.3)	0.759
Increased TG	4 (30.8)	11 (22.9)	7 (16.7)	0.521
Low HDL	4 (30.8)	4 (8.3)	10 (23.8)	0.063
Hypertension/treatment	7 (53.8)	8 (16.7)	7 (16.7)	**0.009**
Increased blood glucose	5 (38.5)	16 (33.3)	11 (26.2)	0.633
Vasculitis	0 (0.0)	2 (4.2)	0 (0.0)	NA
PCOS	0 (0.0)	4 (8.3)	3 (7.1)	NA
Lupus erythematosus	0 (0.0)	1 (2.1)	0 (0.0)	NA
IBD	1 (7.7)	1 (2.1)	0 (0.0)	NA
Anemia	1 (7.7)	3 (6.3)	3 (7.1)	NA
Hypo/hyperthyroidism	3 (23.1)	3 (6.3)	2 (4.8)	0.085
Associated skin diseases, n (%)				
Psoriasis	1 (7.7)	6 (12.5)	3 (7.1)	0.670
Acne	2 (15.4)	16 (33.3)	12 (28.6)	0.448
Pyoderma gangrenosum	1 (7.7)	5 (10.4)	3 (7.1)	0.852
Atopic dermatitis	1 (7.7)	4 (8.3)	0 (0.0)	NA
Alopecia areata	1 (7.7)	2 (4.2)	2 (4.8)	NA
PASH	0 (0.0)	1 (2.1)	1 (2.4)	NA
Follicular occlusion syndrome	0 (0.0)	0 (0.0)	1 (2.4)	NA

HS = hidradenitis suppurativa, TG = triglycerides, HDL = high-density cholesterol, PCOS = polycystic ovary syndrome, IBD = inflammatory bowel disease, PASH = pyoderma gangrenosum, acne, hidradenitis suppurativa syndrome, NA = not applicable due to low frequencies.
Significant p values are in bold. $p < 0.050$, according to the chi-squared test / Fisher's exact test for nominal data, or Kruskal–Wallis test for numerical data.
[a]Data are shown as mean ± standard deviation.

Table 5 | Univariate and multivariate binary logistic regression analysis for predictors of disease severity (Hurley stage III vs. stages I and II).

Variables	Univariate		Multivariate	
	p-value	OR (95% CI)	p-value	OR (95% CI)
Sex[†]				
Men	**0.009**	3.097 (1.298–7.389)	**0.017**	3.251 (1.240–8.525)
Women		Ref.		Ref.
Localization				
Trunk	0.092	1.320 (0.950–1.835)	0.029	2.736 (1.111–6.738)
Axillary	**0.014**	1.507 (1.122–2.022)	0.094	2.389 (0.861–6.631)
Atopic dermatitis	0.057	0.571 (0.481–0.678)	0.999	0.000 (0.000)

OR = odds ratio, CI = confidence interval.
Male sex, trunk and axillary lesions, and absence of atopic dermatitis, taken altogether, were significant predictors of more severe hidradenitis suppurativa (logistic regression p = 0.001, Nagelkerke R^2 = 0.230, Hosmer and Lemeshow coefficient = 0.725, correctly classified 67.0%). Significant p values are in bold.
[†]For statistical purposes, female sex was used as a reference (Ref.) for calculating the odds ratio.

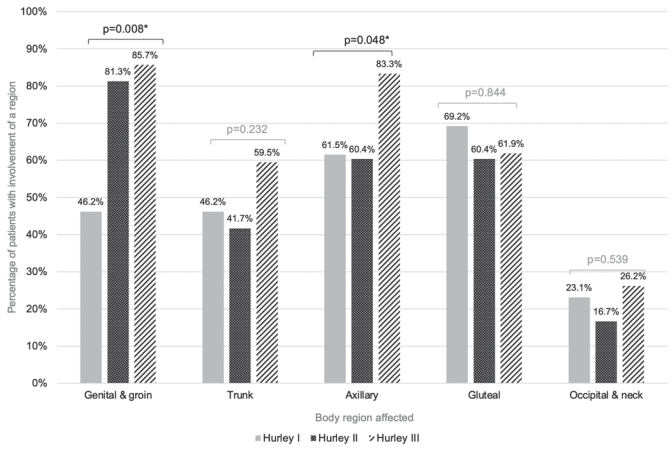

Figure 1 | Involvement of specific anatomical regions across different Hurley stages of hidradenitis suppurativa, highlighting significant variations in lesion localization within the genital, groin, and axillary areas among stages.

Systemic treatment options A R S D B	Total (N=103)	Hurley I (N=13)	Hurley II (N=48)	Hurley III (N=42)
	32 (31.1%)	7 (53.8%)	15 (31.3%)	10 (25.0%)
	30 (29.1%)	2 (15.4%)	14 (29.2%)	14 (33.3%)
	11 (10.7%)	1 (7.7%)	6 (12.5%)	4 (9.5%)
	7 (6.8%)	0 (0%)	1 (2.1%)	6 (14.3%)
	4 (3.9%)	0 (0%)	4 (8.3%)	0 (0%)
	4 (3.9%)	1 (7.7%)	2 (4.2%)	1 (2.4%)
	3 (2.9%)	1 (7.7%)	0 (0%)	2 (4.8%)
	3 (2.9%)	0 (0%)	1 (2.1%)	2 (4.8%)
	2 (1.9%)	0 (0%)	1 (2.1%)	1 (2.4%)
	2 (1.9%)	1 (7.7%)	1 (2.1%)	0 (0%)
	98 (95.1%)	13 (100%)	45 (93.8%)	40 (95.2%)

Figure 2 | Frequency of various systemic therapeutic regimens used in hidradenitis suppurativa treatment, sorted by their usage frequency and further categorized by Hurley stage. The most common treatments included systemic antibiotics, combinations of antibiotics with oral retinoids, and antibiotics with systemic corticosteroids.
A = systemic antibiotics, R = systemic retinoids, S = systemic steroids, D = dapsone, B = biological therapy.

smokers in the general population is higher. Our study supports these two theories, but it must be considered that in the Serbian population there is just a slightly higher percentage of male compared to female smokers (34% vs. 30%, respectively) (15), which favors the first theory. Moreover, the number of cigarettes smoked per day might be an important element in assessing the relevance of this factor in the severity of HS and expression of the diseases among men and women.

Comorbidities found with HS in our series were comparable with the literature data (16–20). A high percentage of metabolic syndrome (MS) and its components in our group of patients was noted. Nevertheless, when comparing the presence of MS and each of the MS criteria to the Hurley stage, we did not find that MS had an impact on HS severity. This finding was already mentioned in the literature (21, 22). Our results further support the theory that chronic inflammation caused by HS does not promote the development of MS, but MS and its components might be the primary pathological event. Sabat et al. explained this connection with the hypothesis that "hypoxia, resulting from metabolic alterations, induces production of interleukin (IL)-10, which in turn decreases the production of IL-22 and IL-20, which are antibacterial proteins in epithelia. Hypoxia and reduced antibacterial properties in the epithelia then result in bacterial persistence and promote HS outbreak" (22). An additional finding in our study that showed a tendency toward significance was the percentage of overweight patients, with female patients being found to fall into the overweight category more frequently. Combining this with the finding that female sex predisposed to milder disease in our study, we can further support this hypothesis.

Acne was the primary associated condition overall, with almost 29% of our patients having a history of or current acne. A recent study found that HS patients had a 2.7-fold increase in the chance of having psoriasis (23); in our series, 9.7% of HS patients had psoriasis (in Serbia, the prevalence rate of psoriasis is 2%, meaning that in our series HS patients have a five-fold increase in the chance of having psoriasis). AD was present in 5% of our cohort—however, exclusively in women. Similar to our findings, Sherman et al. also found a female predominance in association of HS and AD, and interestingly concluded that a history of AD led to a 40% increase in the odds of HS (24). A recent meta-analysis found that patients with HS have a 4.1-fold increase in odds of having AD compared to healthy controls (25).

In our study group, two patients fulfilled the criteria for PASH syndrome (26): one female patient and one male patient. The female patient had polycystic ovarian syndrome in addition to PASH syndrome (27). The male patient had gonadotropic hypoandrogenism and was receiving testosterone supplementation. The exact relationship of this co-occurrence remains to be elucidated. Finally, it is essential to note the higher frequencies of many associated dermatological comorbidities in our study compared to a recent meta-analysis (19), which are probably due to our study population. Namely, only HS cases that were hospitalized at a tertiary center were analyzed, with more severe clinical presentation overall, including other skin comorbidities.

The role of sex, with female sex predisposing to milder disease, was already reported in the literature and recorded in our study as well (7, 12). However, this finding still needs to be fully elucidated. One proposed theory is that tobacco has a potential role in the severity of clinical presentation affecting the T helper 17 cell/regulatory T-cell axis, thus more frequently promoting a progression from Hurley II to Hurley III in the men in our study (28). Nonetheless, other mechanisms could have a simultaneous role because the higher percentage of male smokers is found only in our research and could be an incidental finding.

Few studies have discussed clinical presentation and localization of lesions as factors for disease severity. We have found a statistical significance regarding trunk involvement (more commonly involved in women) and the occipital and neck area (mostly observed in men). This is partially in line with the study by Canoui-Poitrine et al., who proposed that the front part of the body could be a hallmark of HS in women, whereas involvement of the back was characteristic for men, later confirmed in another study (7, 12). In our study, axillary localization was found to be more prevalent in the most advanced stage of HS, which is also reported in a Dutch study by Schrader et al. (12) After multivariate analysis, we found that trunk involvement also plays a role in the severity of HS, announcing a more severe clinical form. Despite the different classification system used in our study, the French study found comparable results (7).

Although significant advances have been made in the treatment of HS (European S1 guideline) (3), many newer treatment modalities are still in the approval phase or unavailable in Serbia. Only a relatively narrow spectrum of treatment modalities was used, with biologic drugs being available only for patients with other comorbidities (psoriasis and inflammatory bowel disease).

Therefore, our patients' most common treatment options were oral and topical antibiotics, retinoids, and surgical treatment.

We recorded a clear predominance of men being prescribed oral retinoids and surgical treatment. This provides a valuable clue that there was significant restraint in prescribing retinoids in female patients because of well-known teratogenicity. The risk and fear of scarring and recurrence rates after surgical procedures, shown to be 13% for wide excision and 27% for deroofing in a recent meta-analysis, was a significant factor in treatment, which is found to be especially important for women in our study group (29). In addition, we found a statistically higher total number of treatment modalities (p = 0.005) in men, which can lead to the conclusion that men were a therapeutic challenge in our study group. Furthermore, in light of the current understanding of the pathogenesis of HS, familial cases of HS may be a subset of patients with more severe clinical presentation and inadequate therapeutic responses to currently used therapeutics. This is described in a study by Zouboulis et al., in which 28.6% of patients unresponsive to adalimumab had a familial occurrence of HS (30, 31). In addition to genetic factors, epigenetic variations also influence certain enzyme profiles, such as methylation profiles of cytochrome P450 (CYP450). It is shown that variations in these enzymes can affect the extent of the disease in HS and the presence of other comorbidities, and can influence the response to the therapeutics used in HS patients. What is of particular significance is that certain CYP450 subtypes may influence a poor response to isotretinoin, one of the most commonly used conventional drugs for HS (32). Therefore, changing methylation profiles of CYP450 and recently described telomere-related genes (TRGs) could have potential disease-modifying implications, all of which could impact the therapeutic response in our study population (33, 34).

A critical aspect of managing patients with HS was deficient adherence to treatment and follow-ups, with limited resources for treatment and often unsatisfying outcomes. With biologics being more accessible, we believe significant change to this trend could occur.

Conclusions

According to our data, HS patients have a five-fold increase in the chance of having psoriasis. Women were diagnosed with HS at an earlier age than men; however, female sex was associated with milder clinical presentation. HS in men was more therapeutically challenging. Severe clinical presentation in men might be attributed to the higher prevalence of male smokers. The presence of metabolic syndrome and its components did not correlate with the severity of the disease.

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