

Exploring the cardiovascular risk factors in patients with hidradenitis suppurativa: a six-year cross-sectional study

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Background: Hidradenitis suppurativa (HS) is a chronic inflammatory skin disease that significantly impairs quality of life and is associated with multiple comorbidities, including cardiovascular risk factors. Delayed diagnosis, often averaging seven years, exacerbates disease progression. This study aims to evaluate the clinical and demographic characteristics of HS patients, focusing on cardiovascular risk factors.

Methods: A cross-sectional study was conducted involving 128 patients diagnosed with HS, treated at Razi Dermatology Hospital between March 2017 and March 2023. Demographic data, smoking status, disease duration, and cardiovascular risk factors-including obesity, diabetes, hyperlipidemia and hypertension- were retrospectively collected from patient records. Data were analyzed using descriptive statistics via SPSS software (version 28).

Results: The mean patient age was 32.02 ± 10.39 years, with a disease duration of 6.7 ± 5.20 years. Sixty percent of the patients were male, and 34% were daily smokers. Cardiovascular risk factors were prevalent: 32% of patients were overweight, and 45% were classified as obese. Additionally, 12.5% had hypertension, 12% had diabetes, and 8% had hyperlipidemia. Only 3% of patients were diagnosed with ischemic heart disease. A significant portion (36.5%) had no identifiable risk factors, while 27.5% had multiple risk factors.

Conclusion: This study highlights a significant prevalence of cardiovascular risk factors among HS patients, emphasizing the importance of early screening and management. HS patients are at an increased risk of cardiovascular events, and addressing these risk factors could reduce the long-term health burden. Further research is needed to explore preventive strategies and improve patient outcomes.

Keywords: hidradenitis suppurativa, heart disease risk factors, metabolic syndrome, obesity, hypertension

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What is already known on the subject?

- Previous studies have shown that hidradenitis suppurativa is associated with an increased risk of cardiovascular disease, obesity, diabetes, and smoking. The chronic inflammation observed in HS patients contributes to these comorbidities, with prior research establishing links between HS and elevated rates of myocardial infarction and ischemic stroke.

The study's main messages:

- Our study underscores that 27.5% of HS patients had multiple cardiovascular risk factors, emphasizing the extent of cardiovascular vulnerability within this population.
- It provides new insights by identifying the variability in the distribution of risk factors, emphasizing the need for targeted preventive care for HS to reduce long-term cardiovascular complications.

INTRODUCTION

Hidradenitis suppurativa (HS) is a chronic, recurrent inflammatory skin disease with a prevalence of 1 to 4%. It is characterized by clusters of abscesses or subcutaneous lesions. These lesions can be painful and deep, accompanied by pustules, nodules, fistulas, and scarring. They predominantly occur in areas rich in apocrine glands, including the axillae, inguinal area, and genitals¹.

HS predominantly manifests during the second and third decades of life and is rarely observed prior to puberty. It is also more common in females. This disease is associated with numerous other conditions and significantly reduces quality of life. The interval between the emergence of HS symptoms and diagnosis is approximately seven years, and this delay has serious consequences for the patient's health. Consequently, prompt diagnosis and intervention are critically important².

The characteristic feature of suppurative hidradenitis is the presence of double Comedones - blackheads with two or sometimes several surface openings beneath the skin that communicate with the skin surface. This distinctive lesion may persist for years before other symptoms appear. Unlike acne, it is progressive and permanent once the disease begins. Extensive and deep inflammation of the skin

leads to the formation of large, painful abscesses. The healing process causes permanent changes to the skin, resulting in crisscross bands of scar tissue in the armpits and groin. Re-epithelialization leads to twisting the sinus ducts with an epithelial lining, thereby trapping foreign substances and bacteria. The sinus tract may be small and be mistaken for a cystic lesion. This process varies among individuals, ranging from a cyst in the armpit to a diffuse abscess in the inguinal area³.

The underlying pathophysiology of this disease remains to be clearly defined. The excessive regulation of cytokines, including TNF- α , IL-1, IL-17, IL-23, and other molecules, appears to be associated with this inflammatory condition. Additionally, various cells, such as T-Helper 1 and 17, lymphocytes and keratinocytes, seems to be involved in this disease⁴.

The diagnosis of HS is primarily clinical, and a tissue sample is rarely required. Three factors must be evaluated to diagnose the disease: the morphology of the lesions, their distribution, and their recurrence⁵.

This disease progresses through three clinical stages. In Stage I, patients present with small, isolated lesions without scarring or duct involvement. The condition may be overlooked due to long intervals between flare-ups, often leading to delayed diagnosis. Stage II is characterized by recurring abscesses or multiple lesions, frequently accompanied by sinus tracts and scarring. At this stage, the disease known as HS, is typically diagnosed. Stage III, the most severe phase, involves extensive areas of interconnected sinus tracts and multiple abscesses, with prominent scarring and oozing lesions. Surgical intervention is often recommended at this stage, although alternative treatments may also be considered⁵.

Some initial treatment recommendations include washing the area with regular soap and water, losing weight, using disinfectants and warm compresses, and wearing loose clothing⁶.

Oral antibiotics are typically the first-line treatment for HS. In milder cases, they can help reduce inflammation. Antibiotics commonly prescribed for acne, such as erythromycin, tetracycline, minocycline, and doxycycline, are often used at higher doses to manage HS. Combination regimens, including tetracycline, clindamycin, and rifampin, have also shown effectiveness in improving lesions. Additionally, nonsteroidal anti-inflammatory drugs

(NSAIDs) are commonly used to alleviate pain associated with the condition ⁷.

In more severe cases of the disease, immunosuppressive treatments, such as TNF- α inhibitors including adalimumab and infliximab, can be beneficial. In incurable and recalcitrant cases, surgery to completely remove the lesion and laser therapy may be effective. Most nodules resolve without drainage; however, incision and drainage are recommended if the nodules are extensive and painful ⁸. Radical surgery, although invasive, is the most effective treatment for late-stage HS. For successful treatment, the entire affected area and scar tissue must be excised, which may necessitate skin grafting following complete excision ⁹.

In general, patients with HS should be referred to a plastic and reconstructive surgeon and collaborate closely with infectious disease specialists. Additionally, referral to an immunologist may be necessary to identify any underlying immune system-related conditions contributing to the disease ⁸. Furthermore, various studies have shown that patients with HS have an increased risk of cardiovascular diseases. According to a cohort study, the risk of major adverse cardiovascular events increased by 53%, ischemic stroke by 33%, and myocardial infarction by 57% compared to the control group ¹⁰.

Given the critical role of the skin in maintaining overall health and its significant impact on mental well-being, it is clear that skin diseases warrant special attention. In the case of HS, research has established a link between this condition and cardiovascular risk factors. To contribute to a better understanding of these risks, we aim to take a small but meaningful step by further investigating patients with (We hope that this study, along with similar research, will provide a foundation for future studies and offer deeper insights into this disease.

METHODS

This cross-sectional study evaluated patients diagnosed with HS who were admitted to Razi Dermatology Hospital over a six-year period, from March 2017 to March 2023. The study focused on assessing the clinical and demographic characteristics of HS patients, with data collected from their medical records. Variables analyzed included patient demographics such as age and gender, as well as

clinical factors including family history, disease duration, history of cardiovascular conditions, smoking habits, presence of diabetes, hyperlipidemia, hypertension, obesity, and any cardiac consultations conducted during their care.

Inclusion Criteria

- Patients aged 18 years or older.
- Diagnosis of HS confirmed by a dermatologist.
- Willingness to provide informed consent and to allow their data to be used for research purposes.
- No chronic conditions, such as chronic kidney disease or liver disease.
- No history of immunodeficiency or active infectious disease.
- Patients with HS who had undergone medical or surgical treatment at Razi Dermatology Hospital were eligible.

Exclusion Criteria

- Patients who declined or withdrew consent at any stage of the study.
- Individuals under the age of 18 years.
- Presence of other dermatological or systemic conditions that could interfere with the diagnosis or treatment of HS, such as chronic infectious diseases or active malignancies.
- Participants with incomplete medical records or those lost to follow-up were also excluded.

In accordance with ethical research guidelines, all patients were thoroughly informed about the study's objectives and scope, including the potential risks and benefits of participation. Written informed consent was obtained from each participant or their legal guardian before the study commenced, as required by the ethics committee.

Given that patient data were extracted retrospectively from medical records, strict protocols were implemented to ensure confidentiality. No personal identifiers were used during data analysis to protect participant privacy. All records were stored securely and accessed only by authorized personnel involved in the research. Ethical approval for the study was granted by the Tehran University of Medical Sciences under the ethics code IR.TUMS.MEDICINE.REC.1399.989, and the study was conducted in accordance with the Declaration of Helsinki. Coordination with hospital authorities was maintained throughout the study to

ensure full compliance with data privacy regulations.

The collected data were entered into IBM SPSS Statistics software (version 28, Armonk, NY, USA) for analysis. Descriptive statistics were used to summarize the characteristics of the study population, with continuous variables presented as means and standard deviations, and categorical variables as frequencies and percentages. This analysis provided a comprehensive overview of the patient demographics and clinical variables relevant to the study, establishing a foundation for further investigation into the relationship between HS and potential cardiovascular risk factors.

RESULTS

This study included a total of 128 patients diagnosed with HS. The mean age of the patients was 32.02 ± 10.39 years, ranging from 13 to 58 years. Of these patients, 51 (40%) were female, and 77 (60%) were male. The average duration of the disease was 6.7 ± 5.20 years, with a range of 1 year to 30 years.

Of the total participants, 96% reported no family history of HS. Regarding smoking habits, 66% of the patients were non-smokers, while 34% were daily smokers. Concerning cardiovascular disease, 97% of the patients had no history of such conditions, whereas 3% -all male and over 45 years of age- were diagnosed with ischemic heart disease. Regarding hypertension, 87.5% of patients had no history of the

condition, while 12.5% had a history of hypertension. Diabetes was absent in 88% of the participants, with 12% reporting positive history. Additionally, 92% of the patients had no history of hyperlipidemia. The distribution of these health factors is detailed in the Figure 1.

The Distribution of BMI and Number of Cardiovascular Risk Factors

The analysis of BMI distribution among the 128 patients revealed a range of weight categories. Only one patient (1%) fell into the underweight category, with a BMI below 18.5. A total of 28 patients (22%) had a normal BMI (18.5–24.99), and 41 patients (32%) were categorized as overweight, with a BMI between 25 and 29.99. Obesity class I (BMI 30–34.99) was observed in 39 patients (30.5%), while 13 patients (10%) were classified as obesity class II (BMI 35–39.99). Finally, six patients (4.5%) fell into obesity class III, having a BMI of 40 or higher.

Regarding the distribution of cardiovascular risk factors—defined as obesity, hypertension, diabetes, hyperlipidemia, and smoking—the analysis revealed that 47 patients (36.5%) had no identifiable risk factors. In contrast, 46 patients (36%) presented with a single cardiovascular risk factor. Eighteen patients (14%) had two risk factors, while ten patients (8%) exhibited three risk factors. Notably, seven patients (5.5%) had more than three cardiovascular risk

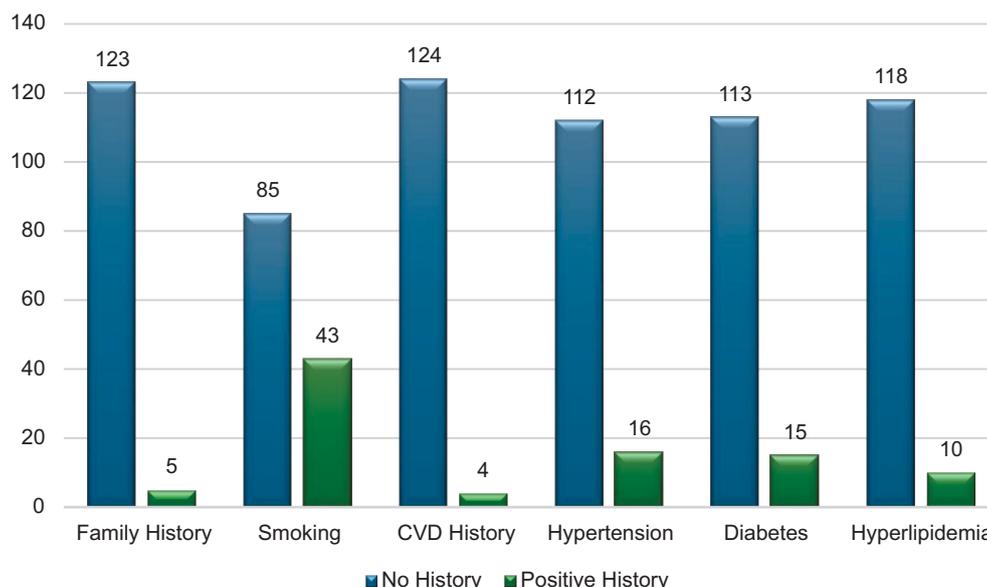


Figure 1. The distribution of various health factor is compared.

factors. These findings underscore the considerable variability in the prevalence of cardiovascular risk factors within this patient population, highlighting the need for targeted clinical attention for those with multiple risk factors.

DISCUSSION

In this study, 128 patients were analyzed, with a mean age of 32.02 ± 10.39 years, ranging from 13 to 58 years. These results align with findings from other studies on HS but reveal some differences in patient demographics. For instance, a cross-sectional survey by G. Shalom *et al.* reported an average patient age of 39.6 ± 15.5 years. Similarly, a 2018 study by Clio Dessinioti, which examined the characteristics of patients who developed HS at different life stages, found an average age of 27 years for those with adolescent onset and 37 years for those with adult onset. Additionally, a study by J.J. Crowley, involving 154 patients reported an average age of 36.3 ± 11.76 years. These comparisons suggest that, although the patient population in our study is somewhat younger on average, the age range remains comparable to the broader epidemiological profile of HS observed in other studies¹¹⁻¹³.

In our study, 40% of patients were female, while 60% were male, which contrasts with findings from several other studies reporting a higher proportion of female patients. For example, John R. Ingram's study on the epidemiology of HS found that in Europe and North America, female patients were nearly three times more prevalent than male patients. In contrast, in South Korea, the number of male patients was approximately double that of females. Additionally, J.J. Crowley's study indicated that 71.4% of patients were women. These differences suggest significant regional and demographic variations in the gender distribution of HS, highlighting the need for further research into the underlying factors that contributing to these disparities^{11,14}.

In the present study, the average duration of the disease was 6.7 ± 5.20 years. In contrast, Clio Dessinioti's study reported an average duration of 12.6 years for patients who developed the disease prematurely, while those whose disease onset occurred in adulthood had an average duration of 8.8 years¹³.

Regarding family history, our study found that 96% of patients (123 out of 128) did not have a

family history of HS, while 4% had a positive family history among first-degree relatives. This prevalence is considerably lower than that reported in other studies. For example, John R. Ingram's study noted that approximately one-third of patients had a family history, suggesting a possible autosomal dominant inheritance pattern. Similarly, a study by J.M. Von der revealed that 38% of patients reported a positive family history. These discrepancies highlight potential genetic and familial influences that may vary across different populations^{15,16}.

The discrepancy between our study and these other findings may be attributed to incomplete documentation in patient records, which could have impacted our ability to accurately identify family history. This underscores the importance of thorough and precise medical record-keeping in understanding the hereditary aspects of HS.

In the present study, 85 (66%) of the 128 patients reported no history of smoking, while 43 (34%) identified as smokers. This contrasts with a study by G. Shalom *et al.*, which found that 47.4% of patients with HS were smokers, compared to 29.9% in the control group, with a statistically significant p-value of less than 0.01¹².

Zrinka's study highlighted multiple risk factors, including genetic predisposition, obesity, and smoking, as contributors to the development of HS. The study proposed that HS arises from with the interaction of these environmental factors in genetically susceptible individuals. Zrinka specifically identified smoking as one of the most significant environmental factors affecting HS¹⁷.

Additionally, John R. Ingram *et al.* reported a strong association between smoking and HS¹⁴.

These findings indicate that smoking may significantly contribute to the etiology of HS, further underscoring the need for targeted interventions aimed at smoking cessation in affected patients.

In this study of 128 patients, one patient (1%) had a BMI under 18.5, 28 (22%) were of average weight, 41 (32%) were overweight, and 45% were obese. J.J. Crowley's 2014 study of 154 patients found that 39% had severe HS, with 38.3% classified as having class III obesity. The prevalence of class III obesity was 14% higher among patients with severe disease, indicating a significant association between disease severity and obesity¹¹.

These findings underscore the critical link between obesity and HS, highlighting the importance of weight management as a potential factor in the disease's pathophysiology.

In this study, of the 128 patients, 124 (97%) had no history of ischemic heart disease (IHD), while 4 (3%) did. A cohort study by Sarah Reddy and colleagues assessed 49,862 patients with HS, revealing that 76.2% were women, 59.6% were White, and the average age was 38 years. This study found that the risk of vascular diseases increased by 23% in HS patients, with a notable 67% increased risk of myocardial infarction (MI) and cerebrovascular accidents (CVA) in those aged 18 to 29 compared to controls. HS is an independent risk factor for cardiovascular events, suggesting that early screening and management for these patients could be beneficial¹⁸.

A 2016 cohort study also examined patients with HS alongside a control group. The findings indicated a significant association between HS and increased risks of myocardial infarction and ischemic stroke. Cardiovascular disease mortality was the leading cause of death among HS patients, who generally died at a younger age than those in the control group. This suggests that individuals with HS may have a markedly higher likelihood of dying from cardiovascular disease compared to those without the condition¹⁹.

In this study, 16 patients (about 12%) were identified as having high blood pressure. A study by G. Shalom *et al.* found that a significant percentage of patients with HS had hypertension, showing an increase compared to the control group. Similarly, Iben Marie Miller's study reported a higher likelihood of hospitalization for patients with HS^{12,20}.

Crowley *et al.*'s study indicated that a significant portion of patients with severe HS also had hypertension. However, this was not associated with an increased prevalence of high blood pressure, despite correlations with obesity and depression. In Ingram's study, a statistically significant relationship between HS and hypertension was identified in multiple case-control studies. However, this association was not evident in earlier meta-analyses^{11,14}.

In this study, 118 out of 128 patients (approximately 92%) had no history of hyperlipidemia, while ten patients (about 8%) were identified with the condition. Research by Iben Marie *et al.* demonstrated a

significant association between reduced HDL levels in hospitalized patients with HS compared to those without HS, with elevated triglyceride levels also observed in the HS group²⁰.

A study by G. Shalom *et al.* found that nearly one-third of HS patients had hyperlipidemia, a rate higher than that observed in the control group, indicating a significant increase in hyperlipidemia among HS patients. Additionally, a systematic review by T. Tzellos *et al.* highlighted a relationship between HS and hypertriglyceridemia, reporting a notable odds ratio for hypertriglyceridemia and low HDL levels in patients with HS^{12,21}.

In our study, of the 128 patients, 113 (about 88%) did not have diabetes, while 15 (approximately 12%) were diabetic. A systematic review and meta-analysis by L. Bui *et al.* evaluated over 107,000 patients and found that the prevalence of diabetes in individuals with HS was significantly higher than in the non-HS population, with rates of 10.6% and 3.8%, respectively²².

A review and meta-analysis by Phan K. *et al.* indicated that HS is associated with a 1.69-fold increase in the likelihood of diabetes, with significantly higher rates of diabetes observed in individuals with HS compared to those without²³.

G. Shalom *et al.* reported that 11.2% of HS patients had diabetes, compared to 7.4% in the control group, highlighting a notable increase in diabetes prevalence among HS patients. Similarly, Iben Marie's study demonstrated that the odds of diabetes were significantly higher in hospitalized HS patients compared to those without HS, further emphasizing the association between HS and diabetes^{12,20}.

We assessed various cardiac risk factors-including obesity, hypertension, diabetes, hyperlipidemia, and smoking- among 128 patients. Our findings revealed that approximately 36.5% of patients had no risk factors, 36% had one, and 27.5% had multiple risk factors. Specifically, 14% had two risk factors, 8% had three, and 5.5% had more than three risk factors.

A study by Crowley and colleagues examined similar cardiovascular risk factors in 154 patients. Their findings revealed that over one-third of the patients (35.7%) had more than one cardiac risk factor, underscoring the prevalence of these risks in individuals with HS¹¹.

The cross-sectional design of this study limits

the ability to draw conclusions about causal relationships between HS and cardiovascular risk factors. Additionally, potential bias may result from incomplete patient records, particularly regarding family history and comorbidities. Furthermore, the single-center design of the study may also restrict the generalizability of the findings to broader populations. Nevertheless, the results, in line with prior research, suggest a strong association between HS, metabolic syndrome, and cardiovascular conditions. Further research is essential to identify contributing factors, which could help in developing preventive strategies to reduce cardiovascular risks in HS patients. Early screening and management of cardiovascular risk factors in younger HS patients are recommended to enable timely interventions, potentially decreasing the incidence of cardiovascular diseases and related complications.

CONCLUSION

This study demonstrates that cardiovascular risk factors—such as obesity, hypertension, diabetes, and hyperlipidemia—are prevalent among HS patients. Given the association between HS and increased cardiovascular morbidity, early identification and management of these risk factors are crucial. Comprehensive, multidisciplinary care, including collaboration with cardiologists and implementation of lifestyle interventions, can help mitigate the cardiovascular risks and improve the overall health outcomes for patients with HS. Further research should focus on elucidating the pathophysiological mechanisms linking HS and cardiovascular disease, as well as evaluating targeted interventions to reduce cardiovascular risk in this patient population.

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Authors' contribution

Study concept and design: AH. E., P. N., Z. R., and M. A.

Acquisition of data: A. E., and S. M.

Statistical analysis: A. E., Z. R., and M. A.

Drafting of the manuscript: S. M., M. K., and A. R.

Critical revision of the manuscript for important intellectual content: A. R.

Administrative, technical, and material support: P. N., M. K., and A. R.

Study supervision: AH. E.

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