Role of Lifestyle Modifications in the Management of Hidradenitis Suppurativa in Adults:

A Systematic Review

An EBP Capstone Project submitted to the St. David's School of Nursing at Texas State

University in partial fulfillment of the requirements for the degree of Master of Science in

Nursing

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NURS 5391: Translational Science for Evidence-Based Practice and Innovation (Capstone)

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November 19, 2023

Abstract

Introduction: Hidradenitis suppurativa is a chronic inflammatory skin disease characterized by recurrent abscesses. The exact cause is unknown, but there is an association with obesity, diabetes, and pro-inflammatory habits like smoking. The purpose of this systematic review is to appraise existing information on lifestyle modifications, their impact on hidradenitis suppurativa, and identify knowledge gaps.

Methods: A systematic review of hidradenitis suppurativa, obesity, smoking, and diet was performed using MEDLINE, CINAHL and PubMED databases. The search strategy yielded seven articles that met inclusion criteria. There was a total of 1,710 patients, four cross-sectional studies (n=1,397), two retrospective studies (n=233), and one case control study (n=80). Article results were synthesized into a table.

Results: The severity of hidradenitis suppurativa was most closely related to smoking status and obesity. Alternatively, symptomatic improvement was reported in patients who stopped smoking or reduced their weight. Dietary modifications, specifically following a Mediterranean diet, were also associated with lower self- reported disease severity.

Discussion: Recurrence and severity of hidradenitis suppurativa may possibly be mitigated with lifestyle modifications. However, randomized controlled trials are needed to determine how much lifestyle modification independently affects hidradenitis suppurativa.

Keywords: Hidradenitis suppurativa, smoking, obesity

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Introduction

Hidradenitis suppurativa (HS) is a chronic inflammatory condition of the follicular skin that disproportionately affects women and persons of color by more than double. This recurrent and often treatment-resistant skin disorder can potentially cause severe infections and even disfigurement (Goldburg et al., 2020). While estimates predict that only about 0.1% of the population is affected by HS, the condition deserves attention from the dermatological community (Alikhan et al., 2019). HS has far-reaching impacts on the sufferer's quality of life. Painful and frequently prominent abscesses prevent many patients from fully participating in their lives. Depression (42.9%), pain (97%), and unemployment (25.2%) are often associated with HS because of their negative influence on patient's self-esteem (Goldburg et al., 2020). A very concerning statistic is the two-fold increase in suicide risk compared to other chronic skin diseases (Goldburg et al., 2020).

Unfortunately, the pathogenesis of HS is still poorly understood, specifically its relationship to other inflammatory conditions and comorbidities like obesity. Most evidence focuses on pharmacological treatments and less on lifestyle modifications. Reviewing the available literature aims to identify beneficial, modifiable risk factors.

Background and Significance

Also known as acne inversa, HS is a recurrent disease of hair follicles. Commonly affected body sites are the axillary, inguinal, and anogenital regions (Goldburg et al., 2020). People with HS can experience lesions with facial hair follicles. The current pathophysiological hypothesis identifies follicular hyperkeratosis that causes obstruction. This obstruction and subsequent dilation of the follicle prevents secretion of the apocrine and sebaceous glands and

leads to rupture. An aggressive immune response occurs, releasing Tumor necrosis factor-alpha (TNF-a) and Interleukin 17 (IL-17). Chronic inflammation, abscess formation, and development of sinus tracts are sometimes complicated enough to require intravenous antibiotics or surgical excision. Scaring is common, and around 4.6% of cases will develop into squamous cell carcinoma (Goldburg et al., 2020).

HS has a significant comorbid disease burden and is challenging to manage. HS patients also tend to have metabolic syndromes. 75% of HS patients are obese, with a three-fold increased likelihood of type 2 diabetes mellitus (Alikhan et al., 2019). Hyperlipidemia, hypertension, and atherosclerotic disease are common co-occurring conditions (Alikhan et al., 2019). There is limited data on whether lifestyle modifications, such as diet, exercise, and smoking cessation, reduce the severity of HS as with metabolic disease (Alikhan et al., 2019).

While new treatment modalities are emerging, such as biologics and radiotherapy, systemic antibiotics are still the primary therapeutic intervention for mild to severe cases (Alikhan et al., 2019). As previously stated, HS is a recurrent condition whose inflammatory process differs from an isolated acute infection. HS is not considered an infectious disease, although most treatment recommendations are long-term courses of multiple antibiotics (Fischer et al., 2017).

HS recurrence and severity is a multi-factorial condition. Conducting a literature review of currently available data on lifestyle modifications is needed to either aid the discovery of alternative interventions, identify research needs, or assess the clinical relevance.

Review of the Literature

HS patients are often encouraged to lose weight, although documentation of successful remission is lacking (Alikhan et al., 2019). No consensus exists on what percentage reduction in body mass index (BMI) correlates to reduced HS recurrence. A systematic review for the Journal of Clinical and Experimental Dermatology does identify obesity as having a negative influence on both pro-inflammatory states and treatment response (Mintoff et al., 2023). Their search strategy included English-language articles from January 1980 through January 2023. Searches in PubMed, Medline, and Google Scholar databases yielded results using multiple terms related to HS, obesity, metabolic, acne inversa, exercise, and glucagon-like peptide drugs (Mintoff et al., 2023). Authors excluded articles that only addressed avoidance of certain foods but not weight management. The authors identify 3 to 5 population-based studies identifying obesity as an independent risk factor for HS, specifically severe and recalcitrant HS (Mintoff et al., 2023). Interestingly, their review noted that obesity was associated with poorer responses to immune modulators but not clindamycin (Mintoff et al., 2023). There were several conflicting findings in this review. Obesity is identified as a companion feature in HS, but synthesized data specific to weight loss and recurrence is not presented. Also, no information is available comparing weight loss to oral antibiotic therapy. Another drawback is the references to European HS guidelines and limited inclusion of primary research based in the United States. No grants or funding from private or public entities supported the review, and the first author declared all sources of past research funding.

Dempsey et al. (2019) analyzed a cross-sectional study of 242 HS patients, examining their dietary alterations over six months. Patients rated their monthly consumption of 10 potentially inflammatory foods on a 9-item scale. One hundred eighty-three participants reported making changes to their diet, most often reducing intake of gluten (48.4%), dairy (43.8%), and refined sugar (39.6%) (Dempsey et al., 2019). The survey sought to identify what dietary

changes HS patients had tried and whether those changes correlated with the patient's perceived symptom improvement. 356 HS patients initiated the survey, but 83 failed to complete the survey, four declined, and 14 were excluded at the beginning (Dempsey et al., 2019). Enrollees were overwhelmingly female (212), white (191), and middle-aged (Dempsey et al., 2019). 65% of respondents reported positive changes to their HS, with 30% qualifying the changes as much better (Dempsey et al., 2019). Dempsey et al. (2019) acknowledged that limitations were recall bias and disproportionate sample characteristics. BMI and boil occurrence were only recorded at the beginning of the study. Therefore, it is unknown whether the aforementioned dietary changes affected weight. Participants were only asked about reducing the intake of some foods. The fact that participants were reducing or eliminating more than one food category leaves confounding variables. Moreover, how the individuals reporting improvement in HS activity graded their symptom severity initially is unknown.

Smoking is a controversial modifiable behavior in HS severity. A retrospective analysis by Garg et al. (2018) reviewed the medical records of more than 3 million American smokers for the incidence of HS. During the three-year study period, the incidence of newly diagnosed HS doubled in smokers compared to non-smokers (Garg et al., 2018). The odds of developing HS were unchanged when adjusted for demographics and BMI (Garg et al., 2018). This study adds to the generalization that smoking cessation benefits HS patients, but it remains to be seen if or how it improves HS (Alikhan et al., 2019).

From the perspective of the Advanced Practice Registered Nurse, a potential prescriber to patients with HS, it could be beneficial to have a frame of reference for how these modifications compare with typical treatment. The information on comparative effectiveness needs to be improved, and this review seeks to find and include any available data.

Purpose and Clinical Question

Several pro-inflammatory comorbidities present in HS have modifiable factors. The condition is recurrent, and preventative measures are preferable to chronic treatment (Goldburg et al., 2020). The purpose of this systematic review is to define what role lifestyle modifications play in the management of severity and recurrence.

Conceptual Framework

Concept phases from the practice oriented Stetler Model assisted the direction of this project. Stetler (2001) designed a direct process to prepare for, validate, compare, apply, and evaluate research for evidence-based change. This review's purpose proved complicated after exhausting all available studies to narrow the topic. Stetler (2001) recognizes that hypotheses and the utility of research are ever evolving. Even if the practice question remains unanswerable, available data is still articulated and synthesized in a new manner.

<div align="center">

Methods

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Project Design

A systematic review of literature served as the design for this project. This type of research is a rational choice for the topic, as no consensus on the practice question has been determined. Guidance from the Stetler Model assisted in defining the intended purpose of this work firstly through preparation and validation (Stetler, 2001). The creation of search terms, critique of studies, comparison, validity, and applicability followed the flow plan of Stetler (2001).

Search Strategy

Some boolean search terms included combinations of "hidradenitis suppurativa, "obesity," "lifestyle modifications or changes, "smoking" and "diet." Search terms were inserted into CINAHL, PubMed, and Medline databases. The ancestry of practice question relevant

articles was also perused but yielded mostly duplicates or works outside the date range. To qualify for initial inclusion criteria, articles needed to be peer-reviewed and relevant to the practice question, published in English between 2017 and 2023, and have full text available. A rapid critical appraisal tool for quasi-experimental studies was implemented for most works, using a cut off score of 7 (Figure A1)

Selection Process

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram assisted categorization and screening (Figure A2). The combination of search terms returned 32 articles in the data range that were then screened for relevance, duplications, and lack of full text. After a title review, two articles were excluded because the population was adolescents. Another 10 articles were removed for being expert panels, systematic reviews, immunotherapy studies, and guidelines. Seven articles were given full review and included in the synthesis table. The search was performed by one researcher without outside assistance. Articles were collected in Zotero software (Corporation for Digital Scholarship, 2016). Categories analyzed for risk of bias include randomization, blinding, allocation concealment, attrition, and reporting. The PRISMA 2020 checklist methods and results section was reviewed to determine the risk of bias (Page et al., 2021).

Synthesis Method

Articles were organized into an evidence synthesis table (Appendix A). The table was designed to succinctly describe the methods, frameworks, sample characteristics, and results. Data was analyzed to establish lifestyle modifications most closely correlating with subjective or objective HS severity and recurrence measures.

Results

An integrative review approach, as described by Whittemore and Knafl (2005), guided

the discovery of a thematic analysis across the selected literature. This review's selection,

appraisal, and presentation strive to conform to PRISMA guidelines (Page et al., 2021).

Search Results

Search terms were limited to expressly modifiable risk factors and hidradenitis

suppurativa (HS). Preemptive, algorithmic exclusion was initiated for non-peer-reviewed

articles, those older than five years, and lack of full text. These efforts eliminated erroneous hits,

resulting in a more focused and productive sampling. A summative total of 32 studies were

retrieved and screened for duplicates, non-full text, and non-English publications, eliminating 12

documents (Figure A2). Citation management software stored and compiled the remaining

reports, but one human reviewed each abstract for inclusion. Three studies either were systematic

reviews or had components therein. Two articles addressed emerging trends in the importance of

modifiable risk factors but were expert opinions. A decision was made also to exclude any

individual case studies, of which there were two. While their inclusion may support future

discussions, they did not meet the evidence standard for this review. Two other reports were

excluded for having pediatric or adolescent populations, and three studies did not examine

lifestyle modifications or modifiable risk factors as their primary foci (Figure A2). The

remaining eight underwent rapid quality appraisal (see Table 1), with seven meeting the cut-off

score.

Characteristics of Studies

Four cross-sectional studies (Barrea et al., 2018; Kjærsgaard Andersen et al., 2017;

Lorite-Fuentes et al., 2022; Macklis et al., 2021), one case-control (Akdogan et al., 2018) and

two retrospective studies (Canard et al., 2021; Nweze et al., 2018) had their evidence synthesized

(e.g., Table 1). Barrea et al. (2018) and Lorite-Fuentes et al. (2022) both examine nutritional behaviors and HS, centering attention on the Mediterranean Diet (MD). The Macklis et al. (2021) survey had the largest sample size (n=591) with the most numerous lifestyle modifiers. Additionally, independent risk factors for severity and recurrence are explored (Akdogan et al., 2018; Kjærsgaard Andersen et al., 2017; Nweze et al., 2018). The aggregate sample size across all studies was 1,710. The smallest sample came from a retrospective study on 19 post-bariatric surgery patients with HS (Canard et al., 2021).

There are similarities in collecting demographic and anthropometric data (e.g., Table 1). Body mass index (BMI), nutritional status, smoking status, and physical activity level are repeatedly cited in this review. In the self-reported surveys, Hurley Staging or the Dermatology Life Quality Index (DLQI) was used for data collection.

Synthesis Across Studies

Two overarching themes emerged during this review that bolster the hypothesis that HS patients may experience improvement or degradation of symptoms according to lifestyle. Findings across all studies indicate smoking and obesity are both independent risk factors for HS and that weight reduction and smoking cessation improve HS severity and recurrence.

Elevated BMI was associated with increased HS symptom severity across four studies (Barrea et al., 2018; Canard et al., 2021; Kjærsgaard Andersen et al., 2017; Nweze et al., 2018). More interestingly, weight loss was a factor in symptom improvement across three studies (Canard et al., 2021; Macklis et al., 2021; Nweze et al., 2018). HS patients who had undergone bariatric surgery, losing an average of 29kg, showed a dramatic decrease in the Hurley stage and number of affected sites (Canard et al., 2021). Similarly, a loss of 50 lbs or more improved subjective Hurley staging by more than 0.6 levels (Macklis et al., 2021). Furthermore, despite surgical intervention, 66.7% of HS patients with recurrent eruptions were obese (Nweze et al.,

2018). Obesity is an independent risk factor for recurrent and severe HS, and weight loss greater than 50lb may relieve the disease burden.

As noted in the literature review, the incidence of HS is higher among the smoking population, occurring at a rate of roughly 20% (Garg et al., 2018). Smoking status was collected in all studies, but four studies specifically address it as a modifiable risk factor for HS (Akdogan et al., 2018; Kjærsgaard Andersen et al., 2017; Macklis et al., 2021; Nweze et al., 2018). A 14.85-fold increase in HS incidence was seen among smokers by Akdogan et al. (2018). This fact remained true when adjusting for BMI and gender. Nweze et al. (2018) found that half of smoking HS patients experience recurrence. Smoking cessation, on the other hand, improved Hurley stage symptom severity more than any other modifiers (Macklis et al., 2021). Smoking is an independent risk factor for recurrent and severe HS, and cessation may relieve the disease burden.

In two European studies, HS patients with a greater adherence to a MD tended to have a healthy BMI, lower HS severity scores, and greater quality of life (Barrea et al., 2018; Lorite-Fuentes et al., 2022). Consumption of poly and mono-unsaturated fats is a core tenet of a MD (Barrea et al., 2018). There is also less intake of sugar and processed food. Questions remain regarding whether a MD improves HS or if it is a weight reduction component. Surprisingly, serum insulin weakly correlated with HS severity in one report, and another found no meaningful association between diabetic diagnosis and HS (Akdogan et al., 2018; Nweze et al., 2018).

Synthesis of best evidence, as described by Stetler (2021), was the framework guiding the selection of these themes. Emphasis was placed on the two most robust components, smoking, and BMI, as potential applicability to practice is the goal (Stetler, 2001).

Discussion

The purpose of this review was to identify modifiable risk factors in HS and examine the relative impact modification could have on HS management. Following Stetler (2021), the research should either prompt a change integration whose outcomes are quantifiable and monitored or be rejected for its lack of meaningful contribution.

Reccomendations from Findings

Experts in dermatology acknowledge lifestyle modifications as part of the treatment plan in HS (Alikhan et al., 2019). Lifestyle modifications still need to be incorporated fully into the management of HS. A consensus on what factors to modify has yet to be established. Some unexpected findings may be due to the limited understanding of the pro-inflammatory and endocrine relationships present. One should not discount, however, the potential benefit to the patient of implementing lifestyle changes. This review recommends that clinicians discuss weight reduction and cessation of smoking with their HS patients.

Limitations

Three significant limitations are applicable across all studies (e.g., Table 1). The cross-sectional, descriptive models of most are prone to bias. Recall bias confounds self-reporting. A controlled environment could remedy this. Secondly, a lack of valid interventional, randomized control studies limits drawing any conclusions. In the studies synthesized, there were too many competing variables. A patient on immunotherapy who shows improvement after weight loss or smoking cessation cannot reliably serve as evidence for lifestyle modifications. Thirdly, concerning American patients, this data overwhelmingly comes from European nations. The major drawback with applicability is that subjects in these studies do not resemble patient populations here. Conducting more United States-based studies is recommended.

Conclusions and Implications

HS remains a poorly understood pathology, yet it is a devastating and painful condition deserving further study. Conducting this review highlighted modifiable lifestyle factors that could reduce recurrence and severity of HS. What is needed further is controlled research on a single intervention. Conducting a randomized, controlled trials examining a single modifiable factor like weight would give stronger credence. Considering the relationships between HS and metabolic disease, a cohort study of diabetics with HS would be interesting.

In the meantime, the panoramic benefits of smoking cessation and weight loss should not be left out of the plan of care for HS patients. Encouraging HS patients to incorporate more Mediterranean eating habits could also provide dual benefits of weight reduction and lower inflammation. Advanced practice nurses can improve the overall health of their HS patients with these suggested interventions.

References

Akdogan, N., Alli, N., Uysal, P., Topcuoglu, C., Candar, T., & Turhan, T. (2018). Visfatin and insulin levels and cigarette smoking are independent risk factors for hidradenitis suppurativa: A case–control study. *Archives of Dermatological Research*, *310*(10), 785–793. https://doi.org/10.1007/s00403-018-1867-z

Alikhan, A., Sayed, C., Alavi, A., Alhusayen, R., Brassard, A., Burkhart, C., Crowell, K., Eisen, D. B., Gottlieb, A. B., Hamzavi, I., Hazen, P. G., Jaleel, T., Kimball, A. B., Kirby, J., Lowes, M. A., Micheletti, R., Miller, A., Naik, H. B., Orgill, D., & Poulin, Y. (2019). North american clinical management guidelines for hidradenitis suppurativa: A publication from the united states and canadian hidradenitis suppurativa foundations.

Journal of the American Academy of Dermatology, *81*(1), 76–90.
https://doi.org/10.1016/j.jaad.2019.02.067

Barrea, L., Fabbrocini, G., Annunziata, G., Muscogiuri, G., Donnarumma, M., Marasca, C., Colao, A., & Savastano, S. (2018). Role of nutrition and adherence to the mediterranean diet in the multidisciplinary approach of hidradenitis suppurativa: Evaluation of nutritional status and its association with severity of disease. *Nutrients*, *11*(1), 57. https://doi.org/10.3390/nu11010057

Canard, C., Cives, A., Gaubil-Kaladjian, I., Bertin, E., & Viguier, M. (2021). Impact of bariatric surgery on hidradenitis suppurativa. *Acta Dermato Venereologica*, *101*(6), adv00471. https://doi.org/10.2340/00015555-3830

Corporation for Digital Scholarship. (2016). *Zotero* (Version 6) [Computer software]. https://www.zotero.org

Dempsey, A., Butt, M., & Kirby, J. (2019). Prevalence and impact of dietary avoidance among individuals with hidradenitis suppurativa. *Dermatology*, *236*(4), 289–295. https://doi.org/10.1159/000503063

Fischer, A. H., Haskin, A., & Okoye, G. A. (2017). Patterns of antimicrobial resistance in lesions of hidradenitis suppurativa. *Journal of the American Academy of Dermatology*, *76*(2), 309–313.e2. https://doi.org/10.1016/j.jaad.2016.08.001

Garg, A., Papagermanos, V., Midura, M., & Strunk, A. (2018). Incidence of hidradenitis suppurativa among tobacco smokers: A population-based retrospective analysis in the u.s.a. *British Journal of Dermatology*, *178*(3), 709–714. https://doi.org/10.1111/bjd.15939

Goldburg, S. R., Strober, B. E., & Payette, M. J. (2020). Hidradenitis suppurativa. *Journal of the American Academy of Dermatology*, *82*(5), 1045–1058. https://doi.org/10.1016/j.jaad.2019.08.090

Kjærsgaard Andersen, R., Theut Riis, P., & Jemec, G. (2017). Factors predicting the self-evaluated health of hidradenitis suppurativa patients recruited from an outpatient clinic. *Journal of the European Academy of Dermatology and Venereology*, *32*(2), 313–317. https://doi.org/10.1111/jdv.14511

Lorite-Fuentes, I., Montero-Vilchez, T., Arias-Santiago, S., & Molina-Leyva, A. (2022). Potential benefits of the mediterranean diet and physical activity in patients with hidradenitis suppurativa: A cross-sectional study in a spanish population. *Nutrients*, *14*(3), 551. https://doi.org/10.3390/nu14030551

Macklis, P. C., Tyler, K., Kaffenberger, J., Kwatra, S., & Kaffenberger, B. H. (2021). Lifestyle modifications associated with symptom improvement in hidradenitis suppurativa patients. *Archives of Dermatological Research*, *314*(3), 293–300. https://doi.org/10.1007/s00403-021-02233-y

Melnyk, B. M., & Fineout-Overholt, E. (2019). Critically appraising knowledge for clinical decision making. In K. R. Stevens (Ed.), *Evidence-based practice in nursing & healthcare: A guide to best practice* (Fourth ed., pp. 109–117). Wolters Kluwer.

Mintoff, D., Agius, R., Benhadou, F., Das, A., Frew, J. W., & Pace, N. P. (2023). Obesity and hidradenitis suppurativa: Targeting meta-inflammation for therapeutic gain. *Clinical and Experimental Dermatology*, *48*(9), 984–990. https://doi.org/10.1093/ced/llad182

Molinelli, E., De Simoni, E., Candelora, M., Sapigni, C., Brisigotti, V., Rizzetto, G., Offidani, A., & Simonetti, O. (2023). Systemic antibiotic therapy in hidradenitis suppurativa: A

review on treatment landscape and current issues. *Antibiotics*, *12*(6), 978.

https://doi.org/10.3390/antibiotics12060978

Nweze, N., Parsikia, A., Ahuja, R., & Joshi, A. R. (2018). *Axillary hidradenitis: Risk factors for recurrence after surgical excision in 214 patients*. *The American Surgeon*, *84*(3), 422–427. https://doi.org/10.1177/000313481808400328

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S.,...Moher, D. (2021). The prisma 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, n71. https://doi.org/10.1136/bmj.n71

Peterson, M. H., Barnason, S., Donnelly, B., Hill, K., Miley, H., Riggs, L., & Whiteman, K. (2014). Choosing the best evidence to guide clinical practice: Application of aacn levels of evidence. *Critical Care Nurse*, *34*(2), 58–68. https://doi.org/10.4037/ccn2014411

Stetler, C. B. (2001). Updating the stetler model of research utilization to facilitate evidence-based practice. *Nursing Outlook*, *49*(6), 272–279.

https://doi.org/10.1067/mno.2001.120517

Appendix A

Figure 1

Rapid Critical Appraisal Questions for Quasi-Experimental Studies

VALIDITY

• Are the results of the study valid?	Yes	No	Unknown	Rationale/Comment
• Study participants in intervention and comparison groups are similar	1	2	3	
• The intervention is clearly identified.	1	2	3	
• There is a control group.	1	2	3	
• Participants in the comparison group(s) received a reasonable treatment/care to the exposure or intervention of interest given to the intervention group.	1	2	3	
• Follow-up between groups is adequately described and analysed.	1	2	3	
• Appropriate statistical analysis was used for the data gathered.	1	2	3	
• Measurement of the outcome was obtained pre and post the intervention.	1	2	3	
• The outcomes are the same across all groups were measured with the same instrument	1	2	3	
• Outcomes were measured with valid and reliable instruments	1	2	3	

RELIABILITY
• What are the results?

• What was the magnitude of the results?	
• What was the precision of the results?	

APPLICABILITY
• Will the results help me in caring for my patients?

• Were the study patients similar to my own?	1	2	3	
• Will the results lead directly to selecting or avoiding therapy?	1	2	3	
• Are the results useful for reassuring or counseling patients?	1	2	3	

Would you use the study results in your practice to make a difference in patient outcomes?

• If yes, how?
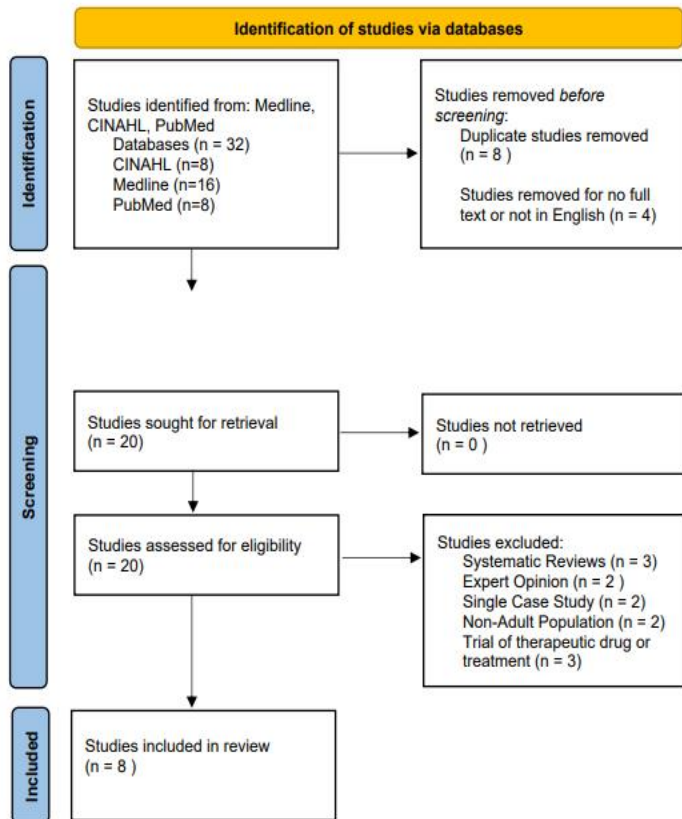• If yes, why?
• If no, why not?

Additional Comments/Reflections:

Recommendation for article use within a body of evidence:

Appendix A

Figure 2

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

Appendix B

Table 1

Evidence Synthesis Table

Author	Purpose	Frame-work	Design	Sample/ Setting	Methods	Findings	Quality Appraisal/ Limitations	Conclusions/ Application
Akdogan, 2018	Determine relevant risk factors for HS by examining biometric data, health habits, endocrine and inflammatory markers	None identified	Case Control Study	40 patients and 40 age and gender matched controls outpatient dermatology clinic of Ankara Numune Training and Research Hospital, Turkey Inclusion criteria: over age 18, no cancer history, no active or chronic infections, no anti lipid treatments, pregnancy or lactation. *males=23 females=17 mean age=35 mean BMI male=28.7 female= 29.3 smokers=33*	Demographic biometric data recorded: Hurley Stage, BMI, SBP, family history, smoking status, alcohol consumption physical activity. 8 hour fasting lab drawn for lipids, FBG, HbA1c, SIL, SVL, IMA, homocysteine, UA, ESR, CRP, and HOMA-IR calculated Multivariate logistic regression analysis, odds ratio w/95% confidence interval, significance set at $p<0.05$	Smoking 14.87 fold increase in HS ($p=0.001$, 95% CI) No statistical significance in HS severity and alcohol consumption, physical activity, family history, height, SBP, FBG, TC, LD, HbA1c, or IMA SVL ($p=0.02$), SIL ($p=0.01$), CRP ($p=0.02$) higher when adjusted for BMI and smoking 1 unit increase SVL increased risk HS 1.56 ($p=0.003$, 95% CI)1 unit increase SIL increased risk by 1.09 fold ($p=0.03$, 95% CI)	10/12 Rapid critical appraisal of descriptive studies LOE=2 Limitations of sample size and gender imbalance Other Limitations are case control design and use of only one center for participants Lack of association of alcohol consumption and HS is questionable because Turkey is a predominantly Muslim country. The majority of respondents consumed no alcohol, possibly due to religious tenets.	Strongest association was with smoking, a modifiable risk factor.

Author	Purpose	Frame-work	Design	Sample/ Setting	Methods	Findings	Quality Appraisal/ Limitations	Conclusions/ Application
Anderson, 2017	Describe associations between mental physical and biological factors and how HS patients evaluated their health status	None identified	Cross Sectional Study	503 HS patients registered with University Hospital Zealand in Roskilde, Denmark *mean age = 41 female=398 male=105 mean years diagnosed=21 mean BMI=31.3 smokers=265 known family history of HS=194*	After collection of demographic and biometric data, participants were asked to complete a questionnaire that included a DLQI, MDI, and EQ-5D which included a VAS for perceived health status. A multiple regression analysis using Windows R-3.3.1 using a p≤0.05 significance	There was a negative estimate influence on the VAS (-0.65) for every BMI point above 25 (p<0.01) smoking (-8.81) had the most negative influence (p<0.01) on VAS For each MDI point, VAS decreased (-1.06) (p<0.001) VAS decreased (-.50) for every DLQI point (p<0.05)	Score 7/10 Rapid Quality Appraisal for Qualitative Evidence LOE=3 Adequate sample size. Survey was initially sent to 805 patients, so more than half response rate (62.5%) Confounding comorbid conditions were not listed, only BMI Quantifying smoking data by pack years may have demonstrated its degree of severity better Some selection bias may be present as it is unknown whether participants were receiving any treatments at the time of the survey	Smoking and elevated BMI are shown to be independent factors for HS severity

Author	Purpose	Frame-work	Design	Sample/ Setting	Methods	Findings	Quality Appraisal/ Limitations	Conclusions/ Application
Barrea, 2018	Investigate relationship between MD, body composition and HS severity	None Identified	Cross Sectional Case Control study	41 treatment naïve patients with HS from the outpatient clinic of the Unit of Dermatology, and 41 healthy control subjects Conducted at University Federico II, Naples Jan 2017-Apr 2018 *males=28 females=54 BMI=19.2-48.1* Exclusion Criteria: receiving HS treatment, on a diet, taking supplements	Data about lifestyle habits, anthropometric measurements BP, body composition were collected. Participants then answered a questionnaire about their adherence to MD HS severity was assessed as well as LDL blood levels	No significant difference in lifestyle and measurements between HS patients and controls HS patients had the higher extra-cellular water on body composition (p<0.001) HS patients consumed less complex carbs, less mono and polyunsaturated fats, and more saturated fat (p<0.001 Highest HS severity scores correlated with lowest MD adherence (r=-0.552, p<0.001) Correlation significant after adjusting for demographics and BMI	Score 7/10 Rapid Quality Appraisal for Qualitative Evidence LOE=3 Cross sectional design prevents causal association Cut off values for predicting severity of HS based on body composition and MD adherence may be premature and a larger study is needed	Body composition and pro-inflammatory dietary habits correlated with increased HS severity
Canard, 2021	To see what impact weight loss	None Identified	Retro-spective study	HS patients hospitalized in the obesity	Identified participants completed a	Mean weight of surgery group was 91kg	8/12 Rapid Critical Appraisal of descriptive studies	Correlation between reduction in BMI and reduction in HS

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	from bariatric surgery has on HS patients			center of Reims University Hospital, France between 2012 and 2019. *Bariatric surgery patients=12 No surgery=7 Mean follow up=44.4 months post surgery, 27.6 post non-surgery*	questionnaire over the phone between Mar and Jun 2020. Demographics, onset HS, smoking status, DLQI, Hurley Stage, initial and current BMI, any HS treatment post hospital stay	compared to 115kg in non surgery group Only the bariatric surgery group reported reduced HS severity (p<0.001) and better DLQI scores (p=0.04)	Limitations are small sample size and inclusion of both gastric sleeve and bypass procedures A similar study showed and increase in HS activity after bariatric surgery, though this is believed to be from malabsorption syndromes from bypass surgery	activity/severity is still present. As many HS patients are overweight or obese, some may end up getting bariatric surgery if they are incapable of losing weight through diet and exercise. A study comparing surgical techniques and symptom reduction could be useful in helping them choose.
Lorite-Fuentes, 2022	Examine association between HS severity, MD adherence, and physical activity	None Identified	Cross-Sectional	221 adult HS patients recruited from the HS Clinic Hospital Universitario, Spain and the Spanish HS association. *Mean age=38 Male=59 Female=164 Mean BMI=29 Smokers=127*	Demographic and anthro-pometric data HS disease severity was scored. Participants completed survey on MD adherence and physical activity. multivariate logistic regression, tail cute off p<0.05	Average MD adherence 66.51%, Low 17.19%, and high 16.29% Higher MD adherence lower HS severity (β=-0.10, p<0.001) inverse trend between HS severity and increased physical activity (p=0.27)	Score 7/10 Rapid Quality Appraisal for Qualitative Evidence LOE=3 Cross Sectional design The authors included HS patients currently receiving a variety of treatments including antibiotics, biologics, diabetes drugs, anti-hypertensives and anti-hyperlipidemics	A comparative study of different healthy eating habits, MD, and HS severity would provide stronger evidence of MD benefit to HS patients. It would be interesting to know how often the highest MD adhering group required treatment intervention over the past 6 months to a year compared to average or low adhering
Macklis, 2021	Determine lifestyle modifications most likely to	None Identified	Cross Sectional Survey	846 HS patients recruited online, 591 met criteria of attempting at	Initial likert scale survey on demographics,	Tobacco cessation associated greatest	Score 7/10 Rapid Quality Appraisal for Qualitative Evidence	Results consistent with other similar studies showing improvement with

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	improve HS symptoms			least one lifestyle intervention and successful survey completion.	oral health, modifiable factors, HS severity sent to Facebook and Reddit support groups. Qualifying participants continued survey on HS duration, reported outcomes, history of autoimmune disease, smoking, diet, and personal care products Results calculated using Chi-squared testing	improvement in HS severity 2+ point Hurley improvement (p<0.0001) Highest subjective improvement anti-inflammatory, MD, gluten free diet (p<0.0001) weight loss >50lb associated 0.6 point Hurley improvement 7-20% of patients underwent menstrual regularity (IUD, BC,Hysterectomy) 1-2+ point improvement Changing soap or laundry detergent more subjective improvement	LOE=3 Only 5% of respondents were undergoing or had completed treatment, results are largely attributable to lifestyle change Limitations of recall bias No mention of identity/diagnosis verification Hurley stage can be slow to respond, causing confounding data if when more than one intervention is ongoing	moderate weight loss and smoking cessation
Nweze,	Identify factors most associated with recurrent HS	None Identified	Retro-Spective	214 adult patients with axillary HS treated surgically between Jan	Chart review for demographics, anthro-pometrics and operative data	Mean age onset=32 10.3% recurrent disease	8/12 Rapid Critical Appraisal of descriptive studies LOE=3	Smoking and obesity strongest predictors of recurrence

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				2001 and Jun 2014 at an urban teaching hospital in Philadelphia, PA	Stat association Chi square test	66.7% of recurrent disease obese 55%smokers with recurrence No association with diabetes	Lack of standardized diagnostic criteria Gender imbalance 81% female	

Abbreviations: BMI=body mass index, BP=blood pressure, CRP=c-reactive protein, DLQI=dermatology life quality index, ESR=erythrocyte sedimentation rate, EQ-5D=European quality of life 5 dimension, FBG=fasting blood glucose, HbA1c=hemoglobin A1c, HOMA-IR=homeostasis model assessment for insulin resistance, HS=hidradenitis suppurativa, IMA=ischemia-modified albumin, LDL=low density lipoprotein, LOE=level of evidence, MD=Mediterranean diet, SBP=systolic blood pressure, SIL=serum insulin level, SVL=serum visfatin level, TC=total cholesterol, UA=uric acid, VAS=visual analog scale