SKIN

IN-DEPTH REVIEW

Nutrition Education Toolbox for Hidradenitis Suppurativa

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ABSTRACT

Diet has been shown to influence disease activity in hidradenitis suppurativa (HS). Modification of dietary intake is the most commonly used lifestyle intervention in HS, and patients frequently report HS improvement after implementing dietary changes. Providing nutrition education may be perceived as not feasible within the time constraints of an outpatient office visit, and many physicians may also not feel equipped to do this. In addition, most insurances have limited coverage for nutrition visits. However, dietary changes may be employed as a low-cost adjunctive treatment option that can be combined with conventional medical treatment to mitigate HS symptoms. Though dietary modification has been increasingly recognized as a commonly used and influential factor in HS management, there is no comprehensive HS nutritional guide. Herein, we provide tools for both physicians and patients to facilitate evidence-based nutrition education in HS through collaboration with dermatologists specializing in HS, a registered dietitian, and a culinary specialist.

INTRODUCTION

Background

Emerging evidence suggests that diet influences hidradenitis suppurativa (HS) symptoms.[1–4] Recent survey studies indicate that up to 90% of HS patients have attempted to manage HS through dietary changes, with up to 65% of patients reporting that dietary changes were beneficial.[1,5] Price et al. identified dietary modification to be the most commonly self-employed complementary alternative medicine (CAM) intervention implemented by HS patients.[5] Though current evidence supporting dietary recommendations in HS is low to moderate in quality,[6] patients still frequently express interest in discussing dietary changes with their healthcare providers. However, providing nutrition education during clinic visits can be time consuming, and physicians may not feel equipped to do this. Referring patients to a registered dietitian (RD) for HS is often not feasible due to limited insurance coverage for nutrition visits. Though dietary changes are commonly implemented by HS patients, there is currently no comprehensive HS nutritional guide. Our goal is to provide practical, cost-conscious nutrition recommendations as an adjunct to conventional medical treatments for HS. Herein, we provide information in a handout that was developed with input from HS specialists, a registered dietitian, and a culinary specialist.

Impact of diet

The proposed mechanism of dietary involvement in HS is largely extrapolated from the literature on acne given the similar pathogenesis.[7,8] Refined carbohydrates

increase insulin levels, and dairy increases insulin and insulin-like growth factor-1 (IGF-1).[9,10] Subsequent hyperinsulinemia causes a nuclear androgen repressor, forkhead box protein O1 (FOXO1), to enter the cytoplasm, activating mTORC1 (the kinase mammalian target of rapamycin complex 1) signaling, leading to increased sebaceous lipogenesis and contributing to follicular occlusion.[9,10] Increased androgenic signaling due to exogenous hormones in dairy products and lack of nuclear androgen suppression with FOXO1 may increase the production of keratinocytes and induce subsequent follicular blockage in acne and HS.[9] As such, it may be beneficial for patients to avoid dairy and refined carbohydrates.

Additionally, hyperglycemia due to excessive carbohydrate consumption can increase circulating inflammatory cytokines.[11–13] An imbalance of omega-6 to omega-3 fatty acids can lead to production of prostaglandins, thromboxanes, and leukotrienes through the arachidonic acid pathway, and excessive saturated fat intake can have inflammatory effects by disrupting normal immune cell function.[12,14,15] High salt intake can also alter immune activity and inhibit growth of beneficial bacteria that are part of a healthy gut microbiome.[16,17] Dietary intake is immediately modifiable with minimal side effects, making diet an important target for disease management. Physicians should counsel patients that improvement in HS symptoms after dietary changes may take time and may require long-term dietary adjustments. Given this, dietary interventions may be more suitable for a more motivated subset of patients.

Impact of weight, diabetes, and metabolic syndrome

Obesity is associated with insulin resistance and chronic low-grade inflammation due to circulating cytokines such as tumor necrosis factor (TNF) and interleukin (IL)-6.[18] The excessive adipocytes present with obesity can perpetuate production of inflammatory cytokines such as TNF that are also implicated in HS pathogenesis.[19] Obesity correlates with increased HS disease severity and is commonly observed in HS patients.[20] More than half of HS patients are either overweight (27%) or obese (36%).[20] Obesity likely contributes to increased HS severity through inducing inflammation and excessive friction.[21] Weight loss of more than 15% is associated with a clinically significant decrease in HS severity.[22] Diabetes and metabolic syndrome can also accompany HS. Rates of diabetes mellitus in HS patients range from 5% to 20%,[23] and approximately 40% of HS patients have metabolic syndrome.[24] Obesity and diabetes can both cause hyperinsulinemia, promoting excessive lipogenesis and contributing to follicular occlusion in HS.[7]

Factors affecting food choices

Many factors may contribute to food selection in HS patients, such as limited mobility which may affect the ability to go food shopping, low socioeconomic status (SES), unemployment, financial hardship, poor mental health, and cultural preferences. HS is associated with low SES and with high levels of anxiety, depression, and loneliness and low self-esteem.[25] Characteristic symptoms of HS including pain, malodorous discharge, and itch are major contributors to physical disability.[26]

NUTRITION RECOMMENDATIONS

Research shows that several of the diets studied in HS may attenuate disease severity including the Mediterranean diet, a brewer's yeast-free diet, and a dairy-free diet.[7,27,28] Sample nutrition handouts for HS patients incorporating recommendations based on

these studies are provided in Figures 1, 2, 3, and 4.[7,9,10,27–30] While daytime fasting over a prolonged period of time has been shown to decrease the number of abscesses and draining fistulas,[3] persistent fasting is likely impractical for most patients. Thus, a well-balanced diet with an appropriate caloric intake may serve as a better approach for HS patients.

Foods to Avoid

Yeast

Diets restricting the intake of yeast have shown positive results in HS, including brewer's yeast that leads to fermentation in alcohol and baker's yeast that causes baked products to rise; these yeasts are each comprised of a different strain of Saccharomyces cerevisiae, a single-celled fungal organism.[4,28] In an initial study with a small cohort, twelve HS patients followed a wheat and brewer's yeast-free diet for 12 months after surgical excision of HS lesions and were instructed to avoid baked goods (such as pizza, cake, bread, etc.), vinegar, black tea, soy sauces, beer, wine, fermented cheese, and mushrooms.[28] All 12 patients experienced regression of HS lesions, with immediate reappearance of lesions upon reintroduction of brewer's yeast, beer, or wheat and subsequent disappearance of lesions after those agents were removed from the diet again.[28] A larger follow up study evaluated 37 HS patients who followed a yeast-free diet for six years after excision of HS lesions, with 70% reporting improvement in HS symptoms without other accompanying treatment, and 87% reporting recurrence of HS symptoms within a few days after consuming a restricted food.[4] Though the sample sizes in these studies are small and patients were also treated with surgery, the results after implementation of a yeast-free diet are promising.

Carbohydrates

Refined carbohydrates

Refined carbohydrates can lead to hyperinsulinemia which may exacerbate follicular occlusion.[9,10,31] Refined carbohydrates come from sweets, sugar-containing beverages, many snack foods, and refined grains such as white rice, white bread, and pasta.

Grains

At least half of all grains consumed should be whole grains such as 100% whole wheat bread, whole-grain pasta, and brown rice.[32]

Added sugars

Dietary Guidelines for Americans 2015-2020 recommended that less than 10% of daily calories come from added sugars, a major dietary source of refined carbohydrates.[32] Nearly 80% of added sugars are from beverages, snacks, and sweets,[32] so replacing these items with healthier options may significantly decrease intake of added sugars. Sugar-sweetened beverages like soda, juice, and sports drinks contain calories but have minimal nutritional value. Fruit drinks are often thought of as a healthy option, but they frequently contain added sugar. If fruit juice is consumed, it should be "100% fruit juice", and it should be consumed in limited quantities (4-6 oz/day).[32] Low-calorie beverages without added sugars should be encouraged. Seltzer water, with a splash of 100% juice, or club soda with wedges of lemons, limes, or oranges can be a refreshing alternative to traditional juices and sodas. Adding fresh fruit such as raspberries or vegetables such a sliced cucumber to water can also add a hint of flavor. Unsweetened tea is a healthier alternative for sweetened tea.

Nutrition for Hidradenitis Suppurativa

Nutrition recommendations for hidradenitis suppurativa (HS):

- Maintain a healthy weight.
- **Recommended foods**: Anti-inflammatory foods such as vegetables, fruits, chicken, fish, whole grains.
- **Foods to limit or avoid**: Refined carbohydrates, dairy, alcohol.

Anti-inflammatory foods

What types of foods can fight inflammation? Fruits, vegetables, and foods high in omega-3 fatty acids (a type of healthy fat).

***What foods are high in omega*-3 fatty acids?**

- Animal sources: Salmon, mackerel, herring, halibut, tuna, shrimp, cod.
- Plant-based sources: Flaxseed oil, chia seeds, walnuts, canola oil, wheat or oat germ, spinach, tofu, edamame, refried beans, kidney beans.

How much omega-3 fatty acids do I need? Eating fish 2x/week can help you get enough of this important nutrient.

Dairy

What is dairy? Dairy products are products made from animal milk such as cow's milk, cheese, cottage cheese, and yogurt. Eggs are not considered dairy products.

What happens if I limit dairy? Because dairy products are an excellent source of calcium and vitamin D, you may need to get these nutrients from other foods or supplements.

How much calcium and vitamin D do I need? Calcium: 1000-1200 mg/day. Vitamin D: 600-800 IU/day.

Can calcium affect absorption of medications? Yes. Calcium can decrease the absorption of zinc and certain antibiotics. Do not take calcium and zinc supplements together, or within 3 hours before or 1 hour after doxycycline or minocycline.

What are alternatives to dairy? Consider trying unsweetened, calcium-fortified soymilk, rice milk, or almond milk. Soy cheese and soy yogurt are also available.

Food group	Foods high in Calcium	Foods high in Vitamin D
Animal-based	Canned sardines or salmon, shrimp	Trout, fish oil, salmon, sardines, tuna
Plant-based	Vegetables: Turnip greens, Chinese cabbage or bok choy, kale, broccoli Beans and soy products: Soy or rice milk (calcium fortified), soy cheese, tofu (made with calcium sulfate), white beans, navy beans, pinto beans, chickpeas Nuts and seeds: Almonds, sesame seeds, tahini (sesame seed butter), Brazil nuts, hazelnuts	Fortified soymilk, almond, or rice milk

Healthy Snack Options

- Air-popped popcorn without added butter; olive oil can be lightly drizzled over the popcorn for added flavor
- Tuna salad (made with low-fat mayonnaise or Greek yogurt) with tomatoes
- Nuts (almonds, peanuts)
- Whole-grain crackers and peanut butter
- Cucumber slices with hummus
- Whole grain pita chips with black beans and tomato salsa
- Whole grain toast with mashed avocado
- Fresh fruit – apples, bananas, oranges, grapes, peaches
- Baked vegetable chips

Figure 1. Nutrition handout with recommendations for anti-inflammatory foods, dairy intake, and healthy snack options.

Carbohydrates

What are carbohydrates? Carbohydrates are starches, fibers, and sugars in grains, fruits, beans, vegetables, and milk products. Carbohydrates are an important source of energy.

What carbohydrates should I avoid? Avoid refined carbohydrates because during processing, important nutrients and fiber are removed, and often extra sugar is added. Refined carbohydrates are found in many snack foods (such as chips), beverages (soda, juice, sports drinks), desserts (candy, cookies, cake), and refined grains (white bread, white rice).

What carbohydrates should I eat? Choose 100% whole-grain or 100% whole-wheat products. Select fresh or frozen vegetables and fruits over canned.

Choose this…	Rather than…
GRAINS	
Brown rice	White rice
100% whole-grain or whole-wheat bread	White bread
100% whole-grain pasta	White pasta
100% whole-wheat English muffin	Biscuit
Whole-grain oats	Sweetened instant oatmeal
FRUITS AND VEGETABLES	
Fresh or frozen	Canned (if it contains added salt or sugar)
SWEET TREATS	
Baked apple slices (sprinkle apple slices with cinnamon and microwave or bake until tender)	Apple pie
Sliced bananas lightly sautéed	Banana split
Sliced pears sprinkled with crushed walnuts	Fruit tart or pastry
Frozen fruit puree popsicles	Ice cream bar
Fruit salad topped with several tablespoons of frozen fruit sorbet	Gelato
BEVERAGES	
Club soda with a lime, lemon or orange wedge	Soda
Seltzer water; can consider adding a splash of 100% juice	Juice
- Add fresh fruit (raspberries, watermelon) or vegetables (cucumber slices) to water. - Freeze chopped fruit or vegetables in ice cube trays with water to make flavorful ice cubes.	Sports drinks
Unsweetened tea	Sweetened tea

Figure 2. Nutrition handout with recommendations for carbohydrate intake.

Finding healthy and affordable snack options can be challenging, especially when. processed snacks, such as chips and cookies, are cheap and readily available

Eating fruits or vegetables as a snack can help patients reach the recommended daily intake of these food groups. While nuts are high in calories, they provide a source of healthy, anti-inflammatory fats, and unsalted nuts in ¼ cup portions make travel-friendly and convenient snacks. Air-popped popcorn or whole grain crackers with almond butter are also healthy snack options. Cravings for sweet treats can be satisfied with healthier alternatives such as baked apple wedges, sautéed banana slices, pear slices sprinkled with crushed walnuts, fruit salads, or frozen fruit puree popsicles.

Dairy

Dairy is defined as products made from the fluid form of milk such as cheese, yogurt, and cottage cheese. Dairy products contribute many essential nutrients including calcium, vitamin D, and vitamin B12, among others.[32] In a cohort of 43 HS patients who followed a dairy-free diet, 83% improved.[7] HS patients who eliminate dairy may consume inadequate amounts of calcium and may require supplementation. Other sources of dietary calcium include sardines and salmon, green leafy vegetables, soy products, beans, and nuts.[29] Soy products such as soy cheese and soymilk, almond milk, and rice milk can serve as dairy alternatives.

Foods to Consume

Anti-inflammatory foods and the Mediterranean-style diet

The Mediterranean diet and increased intake of omega-3 fatty acids are associated with lower HS severity scores.[27] Currently, there is no clear definition of an anti-inflammatory diet. However, the Mediterranean diet is regarded as an anti-inflammatory diet and has been shown to decrease risk of cancer, cardiovascular disease, and diabetes, among other conditions.[33] A Mediterranean-style diet is a plant-based diet high in fiber and omega-3 fatty acids which have anti-inflammatory effects. It is characterized by an abundance of fruits and vegetables that contain polyphenols that counteract inflammation. Vegetables and fruits have a low caloric density and are high in fiber, both of which are important for weight control. Unfortunately, only about 20% of Americans consume the recommended amount of fruits and vegetables.[32]

Major protein sources in the Mediterranean diet include fish, nuts, and beans while animal proteins such as red meat and dairy are consumed in limited quantities. Olive oil is the principal source of fat; saturated fat is limited. In addition, whole grains are emphasized over refined carbohydrates. Fatty fish such as salmon, trout, or tuna are high in omega-3 fatty acids and should be consumed two times per week.

Other Considerations

Portion sizes

Excessive portion sizes can contribute to overconsumption of calories, leading to obesity. Serving sizes vary based on whether a food is cooked (takes up less space) or raw. Serving sizes also vary for different food groups.[32] For vegetables, one serving is typically ½ cup of cooked vegetables or 1 cup raw. A serving of fruit is ½ cup chopped fruit, one small fist-sized piece of fruit, or ¼ cup dried fruit. A serving of meat is typically 3-4 oz. A portion of dairy is 1 cup of milk or yogurt or 1.5 oz of cheese. While measuring cups and scales may be the most accurate way to measure foods, patients may find it more

General Tips for Healthful Eating

- Eat slowly (20 – 30 minutes per meal)
- To limit portions, use a small- or medium-sized plates and utensils, rather than large.
- Drink water with each meal so that your body confuse hunger with thirst
- ***Healthier cooking methods***: Broiling, sautéing, baking, grilling, steaming, poaching, boiling
- ***Cooking methods to avoid***: Frying, deep frying, adding batter prior to frying

"Hand-y" Guide to Portion Sizes

Part of hand		Amount	What to use it for
Fingertip		1 teaspoon	Fats, oils
Thumb		1-2 tablespoons or 1 ounce	Peanut butter, cheese
Cupped hand		1-2 ounces or ¼ cup	Nuts, dried fruit, pretzles
Fingers of clenched fist		½ cup	Rice, pasta, beans
Entire fist		1 cup	Fresh fruit, vegetables
Palm		3-4 oz	Meat or fish

Figure 3. Nutrition handout with general tips for healthful eating and portion sizes.

Tips for Eating Out with HS

- Order from the lunch menu, portions tend to be smaller than the dinner menu
- Ask for sauce on the side or no sauce
- Ask for a to-go container when you order your food. Eat half and pack the rest for later!
- Consider splitting an entrée. Avoid buffets.
- Skip the juice, soda, and alcohol. Choose water instead to limit cost and calories.

HEALTHIER RESTAURANT CHOICES	
Fast food	· Grilled chicken sandwich or wrap (without cheese) · Turkey or ham sandwich (without cheese) · Side salad · Small chili
American	· Grilled chicken or fish · Baked potato or baked sweet potato rather than French fries or mashed potatoes · Roasted vegetables
Asian	· Chicken with broccoli · Chicken with mixed vegetables · Sautéed greens with garlic · Consider brown rather than white rice, or skipping the rice
Italian	· Bruschetta · Vegetable or minestrone soup · Grilled (rather than fried) calamari · Chicken in wine sauce or mushroom sauce · Pasta primavera
Mexican	· Fajitas with grilled chicken, shrimp, or peppers (you can skip the chips and tortillas to limit carbs) · Burrito bowl (instead of a standard burrito with a tortilla) · Tacos with grilled chicken or fish · Choose black or pinto beans, rather than refried beans · Limit cheese and sour cream

Figure 4. Nutrition handout with tips for eating out.

practical to use parts of the hand (such as fingertip, palm, and clenched fist) to estimate portion sizes (Figure 3).

Recommendations for eating out

While eating out can be a fun social experience, portions can be excessive, and food is often high in fat and sodium. To limit excess calories, fat, and sodium, encourage patients to order from the lunch menu as portions tend to be smaller and cheaper than the dinner menu. Ask for sauce on the side or no sauce as sauce can often be high in saturated fats. To avoid eating extremely large portions, patients may consider splitting an entrée. Alternatively, requesting a to-go container when the order is placed and putting half of the food in the container before eating can help limit excessive consumption. Avoid buffets as portion control is extremely challenging in this setting. Choose water rather than juice, soda, or alcohol to curb cost and calories.

Food assistance options

Supplemental Nutrition Assistance Program (SNAP), formerly called the Food Stamp Program, is a government assistance program that distributes benefits monthly onto an Electronic Benefit Transfer (EBT) card which can be used like a debit card.[34] It can be used at various grocery stores, dollar stores, pharmacies, convenience stores, and big-box stores (such as Walmart and Target), among others.[34] EBT cards allow purchase of fruits, vegetables, meat, poultry, fish, dairy, breads, and cereals, and other items.[34] They cannot be used for alcohol or prepared or hot foods. Food pantries and food banks are also sources of food distribution, and information about location of food pantries can be found at https://www.foodpantries.org/. As some patients may not have access to the internet, physicians may consider providing paper handouts. Using coupons can also help save money. Community Supported Agriculture (CSA) programs are subscription-based programs that local farmers participate in, where consumers who purchase a subscription receive a box of produce and other farm goods such as eggs or meat several times per month.

Insurance coverage

Approximately a third (31.5%) of HS patients are insured by either Medicare or Medicaid, which is a significantly higher proportion than age-matched controls.[35] For those with diabetes or kidney disease, Medicare Part B covers up to three visits per year with a registered dietitian,[36] and this can be considered for motivated patients who meet criteria. Medicaid nutrition benefits vary by state, and states are not required by the federal government to provide Medical Nutrition Therapy (MNT) benefits, although about half of states offer some nutrition services benefits.[37] Coverage for nutrition visits with private insurances can vary greatly, so patients should be encouraged to contact their insurance provider to inquire about coverage. Once insurance coverage for MNT is established, the website hosted by the Academy of Nutrition and Dietetics can assist physicians and patients with finding a registered dietitian in their area (https://www.eatright.org/find-an-expert).

CONCLUSION

More research is needed regarding the mechanism of diet in HS, but these studies are difficult to conduct given the unique dietary needs, preferences, and culinary and cultural practices of each individual. These studies may also require participation for an extended duration to adequately evaluate the impact of dietary modifications, which is further complicated by a high risk of poor dietary adherence. The benefit of restricting total caloric intake versus restricting specific

food groups or ingredients in HS is largely unknown, and specific dietary guidelines for HS are lacking. Nutrigenetics and nutrigenomics are at the forefront of applied nutrition research and can be incorporated into future diet-related investigations for HS patients.

Clinic visits between patients and dermatologists can often be limited by time constraints, and nutrition counseling from an RD is often not covered by insurance, so providing nutrition education to patients can be challenging. However, efforts should be made by HS physicians to address diet as part of their treatment plan. A healthy and well-balanced diet should be the foundation of dietary counseling. Recommendations should be tailored to patients of varying SES with consideration of cultural preferences, food costs, access, and preparation time. In addition, being mindful of eating behaviors and recognizing the tendency to eat when under stress, or as a response to other emotions, can help prevent unnecessary calorie consumption. These strategies can be incorporated into comprehensive treatment plans to both help manage HS symptoms and to promote overall health.

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