

Quality Resource Guide

First Edition

Nutrition in Dental Practice

Author Acknowledgements

GEORGIANA S. GROSS, MPH RDN LD

Assistant Professor, Clinical
Dental Nutrition Education/Research
Department of Comprehensive Dentistry
UT Health San Antonio School of Dentistry
San Antonio, Texas

Ms. Gross has no relevant financial
relationships to disclose.

Educational Objectives

Following this unit of instruction, the learner should be able to:

1. Discuss the characteristics of the Western diet and its impact on systemic and oral health.
2. Describe the diet's impact on major oral diseases (caries, periodontal disease, and oral cancer).
3. Discuss the three prominent disease-related causes of tooth erosion.
4. Discuss the characteristics of a healthy diet.
5. Discuss the relevance of dietary supplements in a healthy diet.
6. Discuss the oral healthcare provider's role in identifying and educating the patient on proper nutrition.

MetLife designates this activity for **1.0 continuing education credits** for the review of this Quality Resource Guide and successful completion of the post test.

The following commentary highlights fundamental and commonly accepted practices on the subject matter. The information is intended as a general overview and is for educational purposes only. This information does not constitute legal advice, which can only be provided by an attorney.

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Introduction

The modern Western diet is characterized by the intake of excessive unhealthy fats, refined grains, sugar, alcohol, and other harmful elements.^{1,2} It is now widely accepted as a key driver to the increasing prevalence of noncommunicable chronic disorders (NCDs) affecting modern society (**Table 1**). Other well-established contributing factors promoting NCDs include a sedentary lifestyle and the consumption of alcohol, drugs, cigarette smoke, and excess salt.¹ The burden of NCDs is profound, and according to the World Health Organization, it is estimated to account for 74% of all deaths globally.¹ The purpose of this Guide is to review the impact of nutrition and diet on oral health. The characteristics of a healthy diet will also be reviewed to assist the oral healthcare team in promoting healthy changes for their patients.

Table 1- Some NCDs Associated with the Western Diet

Alzheimer's disease
Anxiety
Autoimmune diseases
Cancer
Cardiovascular diseases
Depression
Inflammatory bowel disease
Irritable bowel syndrome
Metabolic syndrome
Obesity
Type 2 diabetes

Diet and Caries Risk

Sugary and fermentable carbohydrate-rich foods, such as soft drinks, pastries, and candies provide an energy source for cariogenic bacteria like *Streptococcus mutans*, leading to acid production and enamel demineralization.³ Sticky foods, including dried fruits and caramel, adhere to tooth surfaces, prolonging acid exposure and increasing caries risk.⁴

Fortunately, many foods contribute to a healthy oral environment. Dairy products, such as cheese and yogurt, contain casein, calcium, and phosphate,

which promote remineralization and buffer oral acids, reducing enamel breakdown.⁵ Fibrous foods like apples, celery, and carrots stimulate saliva flow, which neutralizes acids, washes away food particles, and supports enamel integrity.⁶ Green and black teas contain polyphenols that inhibit bacterial growth, reducing plaque formation and acid production.⁷ Additionally, xylitol-containing products, such as sugar-free gum, help lower *S. mutans* levels, reducing the cariogenic potential of the oral microbiome.⁵

Diet and Periodontal Health

Diet plays a crucial role in maintaining the health of the periodontium by influencing inflammation, immune response, and tissue integrity. A diet high in refined sugars and processed foods contributes to systemic inflammation and oxidative stress, which can exacerbate periodontal disease progression.⁸ Deficiencies in key nutrients, such as vitamin C, have been linked to impaired collagen synthesis and weakened gingival tissues, increasing susceptibility to periodontal infections and gingival hemorrhage.⁹ Omega-3 fatty acids, found in fish and flaxseeds, have been shown to reduce inflammation and support periodontal health by decreasing pro-inflammatory cytokines.¹⁰ Additionally, calcium and vitamin D are essential for alveolar bone density, and their deficiencies have been associated with an increased risk of periodontal disease and tooth loss.¹¹ Polyphenol-rich foods, such as green tea and berries, exhibit antimicrobial and antioxidant properties that may help reduce periodontal inflammation and bacterial growth.¹² By maintaining a balanced diet rich in essential nutrients and minimizing pro-inflammatory foods, individuals can support periodontal health and potentially reduce the risk of developing periodontitis.¹³⁻¹⁵

Diet and Oral Cancer Risk

Diet plays a role in the incidence and progression of oral cancer, with certain dietary patterns either increasing or reducing the risk. A diet high in processed meats, refined carbohydrates, and alcohol has been associated with an elevated risk of oral cancer due to their pro-inflammatory and carcinogenic effects.¹⁶ Excessive alcohol

consumption, especially when combined with tobacco use, significantly increases oral cancer risk by promoting mucosal irritation and DNA damage.¹⁷ Conversely, a diet rich in fruits and vegetables, particularly those high in antioxidants, vitamins A, C, and E, and polyphenols, has been shown to have a protective effect by neutralizing free radicals and supporting DNA repair.¹⁸ Cruciferous vegetables, such as broccoli and kale, contain glucosinolates that have been linked to reduced cancer risk due to their detoxifying properties.¹⁹ Omega-3 fatty acids, found in fish and flaxseeds, may play a protective role by reducing inflammation and inhibiting cancer cell proliferation, but supporting evidence is weak.²⁰ Maintaining a nutrient-rich diet while avoiding known dietary carcinogens can help lower the incidence of oral cancer and support overall oral health.

Tooth Erosion and Diet

Diet may play a role in the development of tooth erosion, which results from the chronic exposure of the tooth to acids, whether extrinsic (e.g., diet, medications) or intrinsic (e.g., disease-related). Frequently consuming carbonated soft drinks, citrus fruits, sports drinks, and acidic foods lowers oral pH, leading to enamel demineralization and increased susceptibility to tooth erosion.²¹ Unlike caries, which involves bacterial acid production, tooth erosion is a direct chemical process that weakens enamel without bacterial involvement.²² Additionally, individuals with high dietary acid intake, such as those consuming vinegar-based foods or excessive fruit juices, are at greater risk of erosion.²³ Protective dietary factors include dairy products, such as milk and cheese, which have a neutralizing effect on acids and contribute to enamel remineralization due to their calcium and phosphate content.²⁴ Furthermore, frequent water intake and the use of sugar-free gum to stimulate salivary flow act to buffer acids and aid in enamel repair.²⁵

However, the potential and severity of diet-related tooth erosion pales when compared to the erosion attributable to gastroesophageal reflux disease (GERD), bulimia nervosa (BN), and anorexia nervosa (AN).

- **GERD** is a common disorder affecting 10% - 30% of the population.²⁶ Characteristic signs and symptoms are heartburn or retrosternal burning and acid regurgitation. The main complications of GERD are erosive esophagitis and Barrett's esophagus. Severe cases may predispose to esophageal and stomach cancer.²⁶ Medical management consists of lifestyle modifications (e.g., weight loss, alcohol and tobacco cessation, avoiding eating 2-3 hours before going to sleep, elevating the head of the bed) and, if necessary, antacids, histamine-2 receptor antagonists, and proton-pump inhibitors.²⁷
- The lifetime prevalence of **BN** is 3% for females and 1% for males.²⁸ Chronic BN can lead to persistent GERD, dysphagia, dyspepsia, and potentially life-threatening acid-base and electrolyte imbalances.²⁹ Additionally, nutritional deficiencies common in individuals with bulimia, such as vitamin and mineral deficiencies, can contribute to delayed wound healing, xerostomia, and an increased susceptibility to periodontal disease.³⁰ Salivary gland hypertrophy, particularly in the parotid glands, is another oral manifestation, often leading to noticeable facial swelling.³¹ The medical management of bulimia is multidimensional and includes selective serotonin reuptake inhibitors (as well as other classes of antidepressants) and cognitive behavioral therapy (CBT).²⁹
- The lifetime prevalence of **AN** may approach 4% for females and 0.3% for males.²⁸ AN is the deadliest mental illness, with a mortality rate of 5%.³² Classic features of AD include intentional caloric restriction, intense fear of gaining weight, and body image distortions. A specific form of AD characterized by binge-eating and purging is now recognized. Characteristic medical findings include severe weight loss, comorbid mental disorders, left ventricular atrophy, amenorrhea, osteopenia/osteoporosis, generalized brain atrophy, and cognitive deficits.³² The medical treatment of AD is challenging and varies based on the patient's age and level of available care.

The repeated gastric acid exposure observed in GERD, BN, and AN causes progressive tooth erosion, especially on the palatal surfaces of

maxillary teeth (aka perimolysis).^{33,34} Some patients may also manifest mucosal erosions. Preventive measures such as rinsing with water or a fluoride mouthwash after vomiting, avoiding immediate tooth brushing, and maintaining a nutrient-rich diet are recommended to mitigate tooth damage.³⁵ Most importantly, any patient suspected of having uncontrolled or undiagnosed GERD, BN, or AN should be referred for medical assessment and management as appropriate.

Nutritional Guidelines for Caries Prevention

Reduce free sugar intake: Reducing free sugars is crucial in preventing caries development. The World Health Organization (WHO) recommends limiting free sugar intake to less than 10% of total daily calories, with an ideal reduction to below 5% for enhanced dental health.³⁶ Key dietary strategies include avoiding frequent consumption of sugary beverages and snacks; replacing sucrose-containing foods with whole fruits, dairy, and fiber-rich alternatives; and encouraging the sugar-free sweetener like xylitol, which has potential cariostatic properties.^{37,38}

Optimize meal timing and frequency: A stable blood glucose level is an accepted marker of good health and supports oral health by reducing acid attacks on enamel.^{39,40} Recommendations include encouraging structured meal patterns with minimal snacking, consuming carbohydrates with proteins or fats to mitigate rapid glucose spikes and acid production, and drinking water or dairy-based beverages after meals to buffer acids and enhance remineralization.^{38,41}

Eat nutrient-dense anti-cariogenic foods and maintain hydration: A nutrient-dense diet supports healing and oral tissue integrity, and saliva plays a vital role in neutralizing acids and re-mineralizing enamel.⁴² Dietary choices for caries prevention include dairy products like milk, cheese, and yogurt, which are rich in calcium and phosphates to enhance remineralization.⁴¹ Protein-rich lean meats, fish, nuts, and legumes contribute to saliva production and tissue repair. Crunchy, fiber-rich foods like carrots and apples help cleanse tooth surfaces and stimulate salivation.³⁸

Food combinations also influence these effects; pairing dairy products with acidic foods can help neutralize acidity, while consuming crunchy fruits alongside sticky foods may help dislodge residue from teeth. Additional measures to ensure adequate hydration include increasing water intake, particularly fluoridated water, to support enamel strength, using sugar-free gum or lozenges with xylitol to enhance salivation, and avoiding acidic beverages, such as sodas and citrus juices, that erode enamel.³⁸

Nutritional Guidelines for Periodontal Health and Oral Cancer Prevention

As periodontal health is considered a potential window to overall health, diets that promote periodontal health are likely to reduce the risk of numerous NCDs.^{43,44} Given the metabolic diversity of each individual, there is no specific one-size-fits-all diet. However, it is generally agreed that a healthy diet should reflect the intake of a diversity of plant-based foods and a reduced intake of ultra-processed foods.¹ The 2020–2025 Dietary Guidelines for Americans (**Table 2**) focus on the quality of the diet rather than the quantitative intake of calories.⁴⁵ Specifically, it promotes eating vegetables, fruits, grains, dairy, and vegetable oils while limiting added sugar, saturated fat, and sodium. It further recommends that nutritional needs be met primarily from foods and beverages – specifically those that are nutrient-dense.

A dietary supplement is any product intended to supplement the diet that contains one or more dietary ingredients (including vitamins, minerals, herbs or other botanicals, amino acids, and other substances) intended to be taken by mouth as a pill, capsule, tablet, or liquid.⁴⁶ Fifty-eight percent of adults take at least one dietary supplement, and the annual expenditure on dietary supplements exceeded \$55 billion in 2020.⁴⁷ Most are marketed to improve weight control and overall health. Dietary supplements are not a substitute for a healthy diet, pose potential health risks due to excessive intake, and are neither recommended nor necessary unless the patient has a documented deficiency.^{48,49}

Finally, oral and pharynx cancer risk is strongly associated with tobacco and alcohol use and human papillomavirus (HPV) infection. Tobacco and/or alcohol users should be encouraged to quit, and patients at risk for HPV infection should be vaccinated against HPV.

Oral healthcare professionals should integrate dietary screening into their routine patient evaluation protocol to identify dietary risks that negatively impact oral health and patients at risk for food insecurity. There are numerous questionnaires available, such as the American Dental Association *Caries Risk Assessment Form*, which is accessible to members on the ADA website. Regarding food security, a simple two-question instrument (**Table 3**) was found to have a sensitivity of 95.4% and a specificity of 83.5% in identifying patients at risk of food insecurity.⁵⁰

The clinician must acknowledge potential patient-specific resource limitations, taste preferences, and cultural influences when promoting healthy dietary changes.¹ The office should have a list of local resources (e.g., food banks, pantries, registered dietitians/nutritionists) for patients needing nutritional counseling and/or food assistance. A more detailed food security survey and a listing of food assistance resources are available in Appendices 1 & 2.

The Future

The rapid advances in artificial intelligence (AI), machine learning (ML), and deep learning (DL), now enable researchers to efficiently analyze and integrate specific parameters of health and disease such as genetics, microbiome, metabolic profile, health status, physical activity, dietary and behavioral habits, as well as psychosocial and socioeconomic characteristics.^{51,52} Personal and precision nutrition both aim to leverage this multidimensional information about individuals (personal nutrition) or groups (precision nutrition) to deliver nutritional advice that, in theory, would be more suitable than existing general population advice.^{51,53,54} While both hold great promise as utilities to improve health and reduce healthcare costs, concerns remain to be addressed.

Table 2 - Highlights of 2020-2025 Dietary Guidelines for Americans⁴⁵

It is never too late to modify your diet.
Customize and enjoy nutrient-dense food and beverage choices to reflect personal preferences, cultural traditions, and budgetary considerations.
<p>Core dietary elements include:</p> <ul style="list-style-type: none"> ✓ Vegetables of all types—dark green; red and orange; beans, peas, and lentils; starchy; and other vegetables ✓ Fruits, especially whole fruit ✓ Grains, at least half of which are whole grains ✓ Dairy, including fat-free or low-fat milk, yogurt, and cheese, and/or lactose-free versions and fortified soy beverages and yogurt as alternatives ✓ Protein foods, including lean meats, poultry, and eggs; seafood; beans, peas, and lentils; and nuts, seeds, and soy products ✓ Oils, including vegetable oils and oils in food, such as seafood and nut
<p>Limit intake of:</p> <ul style="list-style-type: none"> ✓ Added sugars limited to < Less than 10 percent of calories per day ✓ Saturated fat < Less than 10 percent calories per day ✓ Sodium < Less than 2,300 milligrams per day ✓ Alcoholic beverages - choose not to drink or to drink in moderation <ul style="list-style-type: none"> o 2 drinks or less in a day for men o 1 drink or less in a day for women (avoid alcohol during pregnancy)

Table 3 - Two Question Instrument to Identify Food Insecurity⁵⁰

Question	Response Options*		
1. "We worried whether our food would run out before we got money to buy more"	Often True	Sometimes True	Never True
2. "The food we bought just didn't last and we didn't have money to get more."	Often True	Sometimes True	Never True
* Any "Often True" or "Sometimes True" response suggests food insecurity			

Currently marketed personal nutrition services are expensive; robust and diverse supportive studies are lacking; marketing claims may be ahead of the available science; cost-to-benefit is unknown, and regulatory guidance remains to be established.^{51,55}

Conclusion

Oral and systemic health are intrinsically connected, and a healthy diet is crucial in maintaining optimal systemic and oral health. The modern Western diet is unhealthy and is a key driver of the increasing prevalence of a multitude of systemic chronic disorders, caries, periodontitis, and oral cancer.

Adopting a healthy and nutritious dietary regimen remains the most cost-effective and natural way for the patient to correct unhealthy nutritional imbalances. Dietary supplements are not a substitute for a healthy diet, pose potential health risks due to excessive intake, and are neither recommended nor necessary unless the patient has a documented deficiency.

Appendix 1 - Food Security Survey

Patient: _____

Date: _____

Section A: General Access to Food

1. Did you worry whether your food would run out before you got money to buy more?
 - 2 - ☐ Often true
 - 1 - ☐ Sometimes true
 - 0 - ☐ Never true
2. Did the food you bought just not last, and you didn't have money to get more?
 - 2 - ☐ Often true
 - 1 - ☐ Sometimes true
 - 0 - ☐ Never true
3. Were you unable to afford balanced meals?
 - 2 - ☐ Often true
 - 1 - ☐ Sometimes true
 - 0 - ☐ Never true

Section B: Household Impact

4. In the last 12 months, have you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?
 - 1 - ☐ Yes
 - 0 - ☐ No
5. (If yes to Q4) How often did this happen?
 - 3 - ☐ Almost every month
 - 2 - ☐ Some months but not every month
 - 1 - ☐ Only 1 or 2 months
6. Did you ever eat less than you felt you should because there wasn't enough money for food?
 - 1 - ☐ Yes
 - 0 - ☐ No
7. Were you ever hungry but didn't eat because you couldn't afford enough food?
 - 1 - ☐ Yes
 - 0 - ☐ No

Section C: Children in the Household (if applicable)

8. Did you ever cut the size of your child's meals because there wasn't enough money for food?
 - 1 - ☐ Yes
 - 0 - ☐ No
 - ☐ Not applicable
9. Did your child ever skip meals because there wasn't enough money for food?
 - 1 - ☐ Yes
 - 0 - ☐ No
 - ☐ Not applicable
10. (If yes to Q9) How often did this happen?
 - 3 - ☐ Almost every month
 - 2 - ☐ Some months but not every month
 - 1 - ☐ Only 1 or 2 months

Scoring and Classification (for administrators)

- 0 - 1: Affirmative response - High food security
- 2 - 3: Marginal food security
- 4 - 6: Low food security
- ≥ 7: Very low food security

Appendix B - Food Assistance Resources

1. Feeding America

- **What it offers:** A nationwide network of food banks. You can search by ZIP code to find local food pantries.
 - **Website:** <https://www.feedingamerica.org>
-

2. Food Pantries.org

- **What it offers:** A national clearinghouse of community food pantries.
 - **Website:** <https://www.foodpantris.org>
-

3. Benefits.gov

- **What it offers:** A central location to check eligibility for government assistance programs like SNAP (Supplemental Nutrition Assistance Program).
 - **Website:** <https://www.benefits.gov>
-

4. USDA. Food and Nutrition Service. Supplemental Nutrition Assistance Program (SNAP)

- **What it offers:** Monthly benefits to purchase groceries. Applications are typically managed by each state.
 - **Start here:** <https://www.fns.usda.gov/snap>
-

5. United Way. 211.org

- **What it offers:** A free, confidential service to connect people with local resources, including food assistance, housing, and health services.
 - **Phone:** Dial 211 or visit <https://www.211.org>
-

6. USDA. Food and Nutrition Service. WIC: USDA's Special Supplemental Nutrition Program for Women, Infants, and Children.

- **What it offers:** Food assistance for low-income pregnant or breastfeeding women and children under 5.
- **Website:** <https://www.fns.usda.gov/wic>

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POST-TEST

Internet Users: This page is intended to assist you in fast and accurate testing when completing the “Online Exam.” We suggest reviewing the questions and then circling your answers on this page prior to completing the online exam.

(1.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

1. Which of the following **does not** appear to increase the risk of obesity?
 - a. Low salt diet
 - b. Sedentary lifestyle
 - c. Tobacco
 - d. Western diet
2. What effect do sticky foods, such as dried fruits, have on oral health?
 - a. They help neutralize acids in the mouth
 - b. They protect the tooth against acids
 - c. They increase the risk of plaque buildup and caries
 - d. A & B
3. How do fibrous fruits and vegetables like apples and carrots benefit oral health?
 - a. By providing an energy source for bacteria
 - b. By increasing acidity in the mouth
 - c. By stimulating saliva production, which helps neutralize acids
 - d. A & B
4. How does a deficiency in vitamin C affect periodontal health?
 - a. It leads to increased enamel strength
 - b. It impairs collagen synthesis, weakening gingival tissue
 - c. It enhances bone density
 - d. It reduces inflammation in the gingiva
5. Which foods appear to be beneficial for supporting periodontal health by reducing inflammation?
 - a. Processed meats
 - b. Fish and flaxseeds (rich in omega-3 fatty acids)
 - c. Refined sugars
 - d. Alcoholic beverages
6. What role do antioxidants from fruits and vegetables play in reducing the risk of oral cancer?
 - a. They promote mucosal irritation
 - b. They neutralize free radicals and support DNA repair
 - c. They promote inflammation in the body
 - d. They cause DNA damage in cells
7. Which of the following is characteristic of perimolysis?
 - a. It most typically affects the lingual surfaces of the mandibular teeth
 - b. It represents abrasion of the tooth surface due to gastric acid
 - c. It is associated with excess citrus intake
 - d. It may occur as a consequence of GERD or anorexia nervosa
8. The deadliest mental illness is:
 - a. Schizophrenia
 - b. Anorexia nervosa
 - c. Bulimia nervosa
 - d. Depression
9. According to the World Health Organization dietary guidelines for enhanced oral health, free sugar intake should be:
 - a. at least 20% of total daily calories
 - b. at least 10% of total daily calories
 - c. less than 10% of total daily calories
 - d. less than 5% of total daily calories
10. When promoting healthy eating habits, the oral healthcare professional needs to take into consideration the patient's
 - a. Taste preferences
 - b. Resource limitations
 - c. Cultural influences
 - d. All the above

