

DIABETES MELLITUS: STRATEGIES FOR PROVIDING COMPREHENSIVE CARE

BY: JOANN R. GURENLIAN, RDH, PHD

Diabetes mellitus is a chronic metabolic disorder that has reached epidemic proportions in the United States. The disease affects 18.2 million Americans, yet approximately one-third of these individuals remains undiagnosed. An additional 41 million individuals have prediabetes. It is estimated that one in three that were born in the year 2000 will have diabetes, and that diabetes will increase by 225% between 2000 and 2050.^{1,2}

Diabetes is the sixth leading cause of death in the U.S. Among middle-aged people with diabetes, life expectancy is reduced by 5–10 years. For the entire population with diabetes, an estimated 13 years is lost by both men and women.¹

There are multiple complications associated with diabetes mellitus. In 2000, 37.2% of individuals with diabetes age 35 years and older reported receiving a diagnosis of cardiovascular disease.¹ Heart disease and stroke are the leading cause of diabetes-related deaths in individuals with diabetes mellitus. Diabetes is the leading cause of new cases of blindness among adults, and the leading cause of treated end-stage renal disease. Severe forms of diabetic nerve disease are a major contributing cause of lower extremity amputations. Aggressive periodontitis is recognized as the sixth complication of diabetes.³ Diabetes can cause risks of birth defects and spontaneous abortions during pregnancy. Further, individuals with diabetes are more susceptible to pneumonia and influenza.

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Given these statistics and complicating factors, it is incumbent upon all health care providers, including dental professionals, to be knowledgeable of the signs and symptoms of diabetes, and to participate in programs related to diabetes prevention and control. The purposes of this paper are to provide an overview of diabetes and to present strategies for providing comprehensive oral health care.

Types of Diabetes

There are five types of diabetes mellitus. The most recognized types of diabetes include Type 1 and Type 2. The other types of diabetes include gestational diabetes, secondary diabetes, and maturity-onset diabetes of the young.

Type 1 diabetes was formerly referred to as insulin-dependent diabetes mellitus or juvenile diabetes. It comprises 5%–10% of all cases of diabetes mellitus and affects young children and adolescents. It is characterized by the marked inability of the pancreas to secrete insulin caused by an immunologically mediated destruction of β cells.⁵ Individuals are insulin-dependent and produce no exogenous insulin. If insulin is withdrawn, ketosis and eventually ketoacidosis develops. Ketoacidosis can occur rapidly and can lead to coma and death. The male to female ratio for this disease is 1:1. Caucasians are more affected with Type 1 diabetes than other racial groups.¹

Approximately 90%–95% of individuals with diabetes mellitus have Type 2 diabetes. This typically occurs in older individuals with a family history of diabetes; however, it is being seen more frequently in younger individuals due to the rising prevalence of childhood obesity. It reflects peripheral insulin resistance associated with insulin secretory defect, which varies in severity, and is caused by a failure of the beta cells to meet an increased demand for insulin. Individuals with Type 2 diabetes are considered to be insulin-requiring, not insulin-dependent. Type 2 diabetes is more prevalent among Hispanic, African-American, Native American and Asian-American racial groups.¹

Gestational diabetes refers to any degree of glucose intolerance with onset or first recognition during pregnancy. Secondary diabetes is caused by other illnesses or medications that lead to destruction of pancreatic beta cells or the development of peripheral resistance. Maturity-onset diabetes of the young (MODY), is a form of Type 2 diabetes that affects many generations in the same family. The onset of this type of diabetes

occurs before the age of 25.⁴

Risk Factors

There are multiple risk factors associated with Type 2 diabetes. Age greater than 45 years is the primary risk factor. This risk is increased when associated with the following risk factors:

- Obesity
- Family history of type 2 diabetes mellitus
- Racial descent
- History of gestational diabetes or history of delivering a baby weighing greater than 9 pounds
- History of prediabetes, that is impaired glucose tolerance or impaired fasting glucose
- Hypertension (>140/90 mm Hg)
- Dyslipidemia (HDL cholesterol <35 mg/dL or triglyceride level >250 mg/dL)⁵

Signs and Symptoms

Classic signs and symptoms of diabetes include polydipsia (insatiable thirst), polyuria (frequent urination), nocturia (urination at night), and polyphagia (extreme hunger). Other signs and symptoms that may appear to be subtler include unexplained weight loss, general fatigue, increased infections, leg cramps, pins and needle sensations in the fingers and toes, impotence, and blurred visions. These symptoms may be overlooked for an extended period of time and contribute to the high number of cases of diabetes that are undiagnosed.⁵



FIGURE 1
Periodontal Abscess/Type 1 Diabetes Mellitus
Slide from "Diabetes and the Dental Professional"
Courtesy of Colgate-Palmolive Company



FIGURE 2
Candidiasis

Slide from "Diabetes and the Dental Professional"
Courtesy of Colgate-Palmolive Company

There are multiple oral signs and symptoms of diabetes as well. These symptoms include xerostomia, burning mouth syndrome, gingival proliferation, abnormal wound healing, multiple carious lesions, gingivitis, periodontitis, periodontal abscesses (Figure 1), candidal infection (Figure 2), acetone (fruity) breath, increase salivary viscosity, and asymptomatic parotid gland swelling. These findings may be related to the excessive loss of fluids through frequent urination, the altered response to infection, microvascular changes, and increased glucose concentrations in saliva.^{6,7} The periodontal changes of diabetes also reflect host-response abnormalities such as nonenzymatic glycation and oxidation, imbalance in lipid metabolism, altered collagen metabolism, and neutrophil dysfunction.⁸ Bacterial invasion of the gingiva stimulates the formation of inflammatory mediators including interleukin-1, tumor necrosis factor-alpha (TNF- α), and prostaglandins or cytokines. These inflammatory mediators produce and activate enzymes that destroy gingival connective tissue and resorb bone. In diabetes, it appears that there is an impairment to produce new bone after bone loss occurs. The cytokines that stimulate loss of tissue, most notably (TNF- α), may be responsible for killing cells that repair damaged connective tissue or bone. Further, there may be more (TNF- α) produced, which can lead to an even more limited ability to repair periodontal tissues.⁹

Treatment

Treatment for diabetes varies depending upon the type of diabetes. For Type 1 diabetes mellitus, treatment consists of insulin therapy administered by subcutaneous injection or through the use of an insulin pump. Regimens for

administering insulin injections, onset, peak activity and duration of action vary by type of exogenous insulin used. Because severe hypoglycemia (insulin shock) may result as a consequence of insulin injections, and severe hyperglycemia and ketoacidosis may occur from the use of the insulin pump, dental professionals must be knowledgeable about dosage, type of insulin, peak activity, and duration of action before providing treatment to the patient with diabetes.

Treatment for patients with Type 2 diabetes may include oral medications or a combination of insulin and oral medications. In addition to medications for Types 1 and 2 diabetes, nutrition counseling, regular exercise and stress reduction are recommended. Controlled trials have demonstrated that maintenance of modest weight loss through sustained lifestyle interventions that include diet and physical activity reduces the incidence of type 2 diabetes in high risk persons by 40%–60% over 3 to 4 years.^{1,10}

Regular monitoring of blood glucose levels is another important treatment consideration. Individuals with diabetes mellitus must maintain glycemic control. They should use a battery-operated glucometer at home and regularly record blood glucose data. The glucometer measures the glucose in a drop of blood obtained by a finger stick with a sterile lancet. The patient should perform this test typically 4 to 6 times per day. Without careful glucose monitoring, patients with diabetes may be placing themselves at risk for life-threatening situations.

Strategies for Providing Oral Health Care

When scheduling an initial office appointment for an individual with diabetes, it is important for the front office staff to be educated so that person is properly prepared for their appointment with the dentist or dental hygienist. A telephone script can be created that allows the staff to screen for diabetes and customize the first appointment. Patients should be advised that they should bring a list of medications they are taking, family practitioner and specialist contact information, and to arrive early so they can complete health history forms.¹¹ If ample time permits, health history forms can be mailed in advance and the patient can bring completed forms to the first appointment. The patient should be informed that the first appointment would include extra time for thorough dental, periodontal, and dental hygiene assessments and oral health education to occur. When scheduling dental and dental hygiene appointments, morning appointments should be offered. If it is anticipated that the appointment

may be lengthy, offer the patient a short break and/or a small nutritious snack.

Because many individuals with diabetes remain undiagnosed for a period of time, it is important for the dentist and dental hygienist to recognize early signs of the disease in an unsuspecting person. Careful, thorough review of the medical history is an essential component of the examination process at each appointment. Evaluation of oral manifestations of the disease must be performed. A medical referral is warranted if the oral health professional suspects a patient has diabetes.

For those patients already diagnosed with diabetes, document the medications taken, frequency of blood glucose screenings and results, frequency of hypoglycemic episodes, and any oral complaints. If the patient is taking insulin as part of their treatment regimen, document the type, how often it is administered, when peak insulin activity occurs, and the type of carbohydrate consumed before the appointment. Obtain a blood glucose reading at each appointment and note that reading in the dental chart.

Oral care for patients with diabetes includes frequent oral debridement (i.e., 2–3 months) to minimize periodontal infection. The dental hygienist will need to determine a continuing care schedule based on individual needs, signs of periodontal disease, and response to treatment. Periodontal infections should be treated aggressively. Since diabetes challenges the host, host-modulation therapy using antibiotics or a subantimicrobial agent may be indicated. Wound healing and response to debridement therapy should be monitored 4 to 6 weeks post-treatment.

For those patients who are poorly controlled, prophylactic antibiotic therapy may be indicated before periodontal debridement.^{6,7,12}

Eye Care

Recent changes in eyesight: blurred vision, blindness, floaters, flashlights, signs of infections (red, painful eyes)

Remind patient to seek annual dilated eye examination yearly or immediately if above eye changes occur

Remind patient to keep eye glasses/contact lens prescriptions current

Foot Care

Remind patient to inspect feet daily for signs of infection of neuropathy (foot ulcers, redness, burning, tingling, numb or cold feet)

Remind patient to have periodic exams (every 3-4 mos) with foot care specialist and not to cut toe nails or self-treat foot problems

Remind patients to remove their shoes every time they see a medical primary care provider

Pharmacy

Take all medications as prescribed

Ask the pharmacist if any prescribed medications, vitamins, or herbal products will affect diabetes

Oral Care

Encourage patient to maintain daily mouth care, brushing teeth after eating to remove plaque and flossing at least once each day

Remind patient to conduct a monthly self-examination and to contact the dental hygienist or dentist if they notice signs of infection, such as sore, swollen, or bleeding gums, or mouth ulcers

Encourage patient to eat healthy snacks, choosing foods that are low in sugar and fat

Remind patients to have periodic dental and periodontal examinations, every 3 months or more, as recommended by their oral health professional

Encourage patients to achieve their best glycemic control possible; controlled diabetes improves oral health and maintaining good oral health helps to control diabetes

Other Health Messages

Do not smoke or chew tobacco

Have blood pressure and cholesterol checks performed regularly

Exercise regularly

Reduce stress

Eat a healthy diet

Get vaccinated to protect against pneumonia and flu

Adapted from: Centers for Disease Control and Prevention. Working Together to Manage Diabetes: A Guide for Pharmacists, Podiatrists, Optometrists, and Dental Professionals. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 2004.

For clinicians who plan to administer local anesthesia during periodontal therapy, use local anesthetics with vasoconstrictors with caution. Epinephrine antagonizes the action of insulin and, in large doses, can cause hyperglycemia. It is important to ascertain that the patient who is taking insulin has done so before treatment.

As part of oral health education, reinforce the need for proper nutrition, exercise, adherence with medication regimens, and regular monitoring of blood glucose levels. In addition, patients should understand the relationship between their oral health and diabetes. Specifically, patients need to know that with diabetes they have an increased risk for periodontitis and that periodontal disease is a recognized complication of diabetes. They need to understand that individuals with diabetes react with an abnormally high degree of inflammation to an equivalent bacteria burden as compared to those without diabetes. Well-controlled individuals with diabetes have less severe periodontal disease than those with poorly controlled diabetes. Further, poorer glycemic control leads to both an increased risk for alveolar bone loss and more severe progression than those without diabetes.¹²⁻¹⁷ Patients need to be advised that meticulous plaque control and regular periodontal care appointments can help them maintain glycemic control. Likewise, glycemic control can have a positive influence on their periodontal health.

When considering oral health recommendations, advise the patient with diabetes to brush, floss, and use an antiseptic mouth rinse twice daily. Recommend products that have been well researched and demonstrate safety and efficacy. For example, Peridex[®] and Listerine[®] Antiseptic Mouthrinse are the only two antiseptic mouth rinses that have been approved by the American Dental Association's Council on Scientific Affairs. Similarly, Colgate[®] Total[®] is the only toothpaste that contains triclosan, an antibacterial ingredient that adheres to the oral mucosa for 12 hours and directly inhibits potent mediators responsible for gingival inflammation.^{17,18} It is the only toothpaste accepted by the Food and Drug Administration and the American Dental Association for the treatment of gingivitis, plaque, caries, calculus and oral malodor. Given its anti-inflammatory effects, Colgate[®] Total[®] would be an excellent toothpaste recommendation for individuals with diabetes. Although the oral health educator will make specific recommendations based on each patient's needs, consideration should be given to recommending powered driven toothbrushes vs. manual toothbrushes. Use of daily fluoride therapy, home irrigation, host modulation therapy, etc., should be based

on clinical presentation, response to initial therapy, and evidence to support use.

Although major efforts should be placed on the prevention of oral manifestations of diabetes, it is also important to educate individuals with diabetes about ways to maintain total health and glycemic control. Table 1 includes key messages that may help patients with diabetes realize how to better control their disease. These messages can be customized and offered throughout a series of periodontal therapy appointments.

Finally, during each dental or dental hygiene appointment, the dental professional should monitor the patient's vital signs and evaluate for signs of hypoglycemia and insulin shock. These signs include: weakness, hunger, trembling, sweating, tachycardia, confusion, and anxiety. These symptoms can progress to combativeness and incoherence, which can lead to unconsciousness, sweating, hypotension, and hypothermia. In these situations, the patient needs to be treated immediately with the administration of glucose. If patients are taking alpha glucosidase inhibitors (Precose[®] or Glyset[®]) and experience hypoglycemia, they must receive glucose, not fructose or sucrose. During a hypoglycemic episode if the patient is conscious, administer 15 grams of carbohydrate (4–6 ounces of juice or cola, 4 tsp. table sugar, or cake icing). If the patient is sedated, administer 20–25 ml 50% dextrose IV or 1 mg glucagons IM or subQ, or 1 mg glucagon IV. Patients who are using an insulin pump must be monitored for signs of hyperglycemia, which can lead to diabetic ketoacidosis and diabetic coma. Signs of diabetic ketoacidosis include nausea, abdominal cramping, disorientation, and fatigue. In this circumstance, administer a small bolus of insulin to treat the hyperglycemia. If the hyperglycemia persists, the patient's physician should be contacted and referred for immediate medical evaluation.

Conclusion

Diabetes mellitus is a chronic disease that can be managed through medication and lifestyle changes. Serious systemic and oral complications can occur as a result of this disease. Because the disease has reached epidemic proportions in the U.S., it is incumbent upon all dental professionals to assess patients carefully to identify those who are at risk for the disease, to identify the disease in undiagnosed individuals, and to assist those with diabetes in achieving optimum oral and total health.

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CONTINUING EDUCATION TEST QUESTIONS

ANSWER SHEET ON BACK COVER

- 1. When does the CDC recommend using an alcohol hand rub?**
 - A. At any time
 - B. Only before sterile gloving for surgery
 - C. At the end of the day
 - D. When the hands are not visibly soiled
- 2. Which of the following is true about containers for hand-washing agents?**
 - A. Must be made of glass
 - B. Should be washed before refilling
 - C. Are to be labeled with a biohazard symbol
 - D. Must be closed before moving
- 3. Which two agents have only recently been recommended by the CDC for use in dentistry?**
 - A. Nonantimicrobial hand-washing agents and alcohol hand-rubs
 - B. Spore tests and chemical indicators
 - C. Hand lotions and antimicrobial handwashing agents
 - D. Surface disinfectants and liquid sterilants
- 4. What is the Environmental Protection Agency standard for the maximum allowable level of total bacteria in drinking water?**
 - A. 200,000 CFU/mL
 - B. 1,000 CFU/mL
 - C. 500 CFU/mL
 - D. 200 CFU/mL
- 5. What is the maximum acceptable level of bacteria in water exiting a dental unit as recommended by the CDC?**
 - A. 200,000 CFU/mL
 - B. 1,000 CFU/mL
 - C. 500 CFU/mL
 - D. 200 CFU/mL
- 6. What role does dental unit waterline biofilm play in the microbial contamination of dental-unit water?**
 - A. Biofilm does not form in dental unit waterlines.
 - B. Biofilm forms but plays no role in water contamination.
 - C. Biofilm forms and traps bacteria from the incoming water thus lowering the level of bacteria in the outgoing water.
 - D. Biofilm forms and sheds bacteria into the flowing water causing increased levels of bacteria in the outgoing water.
- 7. Which of the following is an example of a clinical contact surface?**
 - A. Sink in the operator
 - B. Dental chair light handle
 - C. Floor in the operator
 - D. Wall next to the dental chair
- 8. When should clinical contact surfaces be cleaned and disinfected?**
 - A. After it becomes contaminated and before use with the next patient
 - B. Every time after the removal of a plastic surface barrier
 - C. At the beginning and end of the day
 - D. Only after treating patients known to have a bloodborne diseases
- 9. A hospital disinfectant is a:**
 - A. Sterilant.
 - B. High-level disinfectant.
 - C. Intermediate-level disinfectant.
 - D. Low-level disinfectant.
- 10. According to CDC, how often should a sterilizer be mechanically monitored?**
 - A. Annually
 - B. Monthly
 - C. Weekly
 - D. Every load
- 11. Any items that is used in the mouth and will be reused on another patient is to be cleaned, packaged and _____ between uses.**
 - A. Disinfected
 - B. Sterilized
 - C. Decontaminated
 - D. Monitored
- 12. What type of additional label claim does a low-level EPA-registered hospital disinfectant need to have before it should be used on a clinical contact surface?**
 - A. Tuberculocidal activity
 - B. Inactivates bacterial spores
 - C. Kills HBV and HIV
 - D. Destroys Staphylococcus aureus
- 13. The sterilizing agent (active ingredient) in an autoclave is steam, in a dry heat oven is hot air and in an unsaturated chemical vapor sterilizer is:**
 - A. Warm water
 - B. Formaldehyde
 - C. Hydrogen peroxide
 - D. Glutaraldehyde
- 14. During a "Boil Water Advisory" what should not be used for hand hygiene?**
 - A. Tap water
 - B. Bottled water
 - C. Antiseptic towelettes
 - D. Alcohol hand-rubs
- 15. How many disinfectant wipes should be used when cleaning and disinfecting a clinical contact surface?**
 - A. One
 - B. Two
 - C. Three
 - D. Four
- 16. When should unwrapped instruments processed through an unwrapped sterilization cycle be used for patient care?**
 - A. After one day of storage
 - B. Between 1 and 4 hours after sterilization
 - C. Within one hour after sterilization
 - D. Immediately

CONTINUING EDUCATION ANSWER SHEET

DIABETES MELLITUS: STRATEGIES FOR PROVIDING COMPREHENSIVE CARE

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ANSWER SHEET

- | | |
|--------------------|---------------------|
| 1. (A) (B) (C) (D) | 9. (A) (B) (C) (D) |
| 2. (A) (B) (C) (D) | 10. (A) (B) (C) (D) |
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| 6. (A) (B) (C) (D) | 14. (A) (B) (C) (D) |
| 7. (A) (B) (C) (D) | 15. (A) (B) (C) (D) |
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