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ABSTRACT

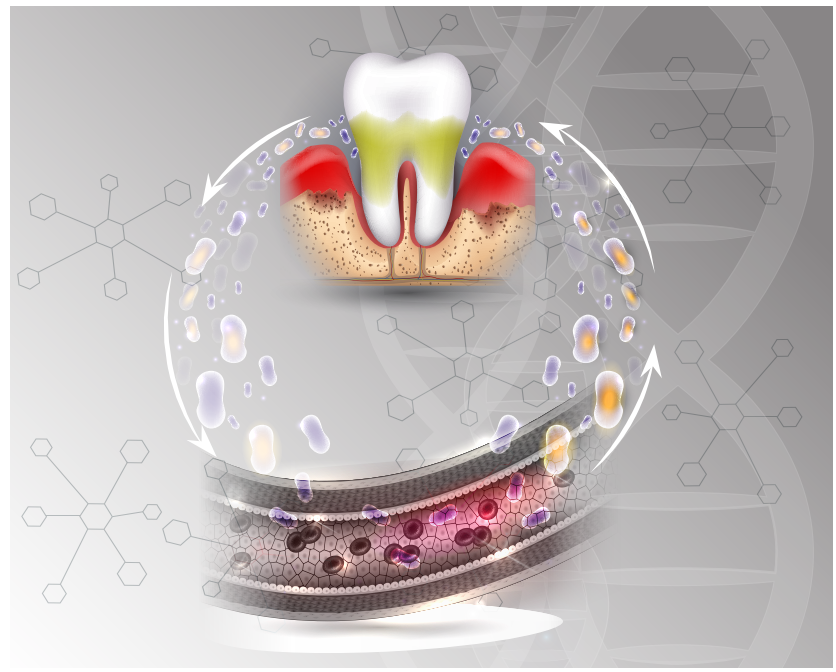
The relationship between periodontitis and diabetes has been well documented. Periodontitis is characterized by chronic inflammation and an accumulation of bacteria involving the gingiva and alveolar bone. Individuals with periodontitis have a 50% increased risk of developing diabetes. The risk and severity of periodontitis is increased by two- to threefold in people with diabetes.

This bidirectional relationship can be linked to chronic inflammation and altered autoimmune responses. In patients with uncontrolled diabetes, nonsurgical periodontal therapy has been associated with improved hemoglobin A1c. Further studies imply a decrease in diabetes-related health-care costs after periodontal therapy. Therefore, dental and medical professionals have an integral role in supporting disease management by implementing strategies in the clinical setting.

EDUCATIONAL OBJECTIVES

Upon completion of this course, the dental professional should be able to:

1. Recognize and discuss the bidirectional relationship between periodontitis and diabetes.
2. Identify and list blood glucose and A1c goals for patients with diabetes to improve periodontitis.
3. Exhibit increased confidence when educating patients with diabetes and periodontitis.
4. Implement strategies into daily dental and medical practice to improve clinical outcomes.



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Periodontitis and diabetes: Navigating a two-way street

A PEER-REVIEWED ARTICLE | by Nykkia Sellers, DNP, FNP, BC-ADM, CDCES and Tameka S. Lee, MPA, RDH

Approximately 58% of people with diabetes (PWD) also have periodontal disease.[1] This bidirectional relationship can be linked to various autoimmune components. Likewise, individuals with periodontal disease were found to have a 50% increased risk of developing diabetes.[2]

As the prevalence of diabetes continues to increase, avenues and interventions to prevent diabetes-related complications should be a priority of health-care professionals. Oral health in PWD may be underaddressed in clinical practice.[3] Each person living with diabetes should be considered at risk for developing periodontal disease.

Integrating oral health interventions into routine diabetes care and incorporating collaboration between dental and medical professionals may help ameliorate health-care outcomes for PWD and periodontal disease.

Types of diabetes

It is estimated that over 37 million Americans are living with diabetes.[4] Diabetes occurs due to hyperglycemia from beta cell destruction or from decreased insulin secretion and/or insulin resistance.[3] The most

common types of diabetes include type 1, type 2, and gestational diabetes.

Type 1 diabetes is an autoimmune disease in which the body attacks the beta cells in the pancreas.[5] People with type 1 diabetes must take insulin daily to survive. In type 2 diabetes, pathophysiological defects in multiple organs and systems contribute to glucose intolerance and insulin resistance. Type 2 diabetes, which accounts for 90%–95% of all cases of diabetes, can be managed with lifestyle changes, oral medications, injectables, or insulin. Gestational diabetes is a serious pregnancy condition that occurs due to impaired glucose tolerance and hyperglycemia during gestation in women without a known history of diabetes.[6]

Defining diabetes and hemoglobin A1c

Diabetes is diagnosed with a fasting plasma glucose ≥ 126 mg/dl (fasting is defined as no caloric intake for at least eight hours), two-hour plasma glucose ≥ 200 mg/dl, or an A1c ≥ 6.5%.[7] Additionally, patients who exhibit symptoms of hyperglycemia with a random plasma glucose ≥ 200 meet the criteria for a diagnosis of diabetes.[7]

The hemoglobin A1c measures the level of glycemic control in PWD. The A1c is a summary of serum glucose levels over a three-month period. In people without diabetes, the average A1c is less than 5.5%.[8] The American Diabetes Association recommends an A1c less than 7% for most nonpregnant adults. An A1c of 8.0% or higher suggests poor glycemic control.[8]

According to the United Kingdom Prospective Diabetes Study (UKPDS), with every 1% reduction in A1c, there is a significant reduction by 25% in microvascular complications such as diabetes-related retinopathy, diabetes-related neuropathy, and diabetes-related nephropathy.[9] Additionally, a 12% reduction was found in other diabetes-related complications. Reductions in A1c have also been shown to decrease the risk of macrovascular complications such as cardiovascular atherosclerotic disease and myocardial infarctions among PWD.[9] The UKPDS concluded that long-term complications can be prevented or delayed with intensive blood glucose control and improvement in A1c.[9] Therefore, controlling A1c is vital to management of diabetes.

Oral manifestations of diabetes

Many living with diabetes are unaware of the multitude of associated oral complications. Xerostomia, dental caries, lichen planus, candidiasis, and other dental conditions are associated with diabetes.[10] Additionally, geographic tongue, burning mouth syndrome, salivary and taste dysfunction, and halitosis can occur in PWD.[10]

Some medications that are commonly prescribed in people with diabetes, such as calcium channel blockers (e.g., amlodipine), may cause gingival overgrowth. Metformin, which is a common diabetes medication, can cause lichen planus.[8] However, the most common oral complication associated with diabetes is periodontal disease.[10] The risk of periodontal disease is increased by glucotoxicity (high levels of glucose) and the duration of diabetes.[3]

Periodontitis

Periodontitis, also known as periodontal disease, is a common chronic inflammatory disease found in adults, characterized by the destruction of supporting tissues, including periodontal ligament fibers, cementum, and alveolar bone surrounding teeth.[11] The earliest form, gingivitis (inflammation of the gums), can be reversed.[12] However, once the inflammation results in the loss of periodontal attachment, periodontitis becomes irreversible.[12] According to the Centers for Disease Control and Prevention (CDC), more than 47% of adults aged 30 and older have some form of periodontal disease.[13]

Periodontal disease initiates from an immune response to an accumulation of bacteria and plaque biofilm beneath the gingival margin.[14] However, periodontitis does not develop from bacteria alone. A susceptible host and predisposing risk factors, such as smoking and systemic diseases, are an integral part of the disease status.[14] The defensive host's response against bacteria signals an infiltration of white blood cells into the junctional epithelium and gingival sulcus, causing early breakdown of collagen fibers.[11]

The continued progression of periodontitis is distinguished by inflammation, ulceration of the junctional epithelium, loss of connective tissue and alveolar bone, and exposed cementum. This causes apical migration of the junctional epithelium and pocket formation.[14]

Early periodontitis is typically painless; however, if left untreated, periodontitis can cause receding gums, tooth sensitivity, tooth mobility, and tooth loss.[11] Periodontitis may also influence well-being, comfort level, mastication, food choices, and self-confidence.[15] The presence of periodontal disease has been linked to many systemic conditions such as diabetes, cardiovascular disease, and Alzheimer's disease.[15] People with periodontal disease also have higher rates of respiratory tract infections and adverse pregnancy outcomes.[15]

Risk factors associated with periodontitis

There are several risk factors that predispose people to periodontitis. The following are common risk factors for periodontitis: age, genetics, obesity, inadequate nutrition, disease states such as diabetes, vitamin deficiencies, poor oral health, recreational drug use, and tobacco use.[16-18] Diabetes and tobacco use are the most common contributing factors.[17] Smoking tobacco and the

use of tobacco products significantly increases the risk of periodontitis and impairs treatment response. Cessation of tobacco use can prevent further deterioration of periodontal health.[12]

In addition to the listed risk factors, misaligned teeth, which are difficult to keep clean, may lead to increased plaque and inflammation.[19] Certain medications can also affect periodontal health. Several medications can cause dry mouth, gingival enlargement, and other oral manifestations.[8,10] Hormonal changes associated with pregnancy and menopause place women at an increased risk for gingivitis and periodontal disease.[15] Additionally, people with conditions that impair immunity, such as human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), leukemia, and cancer, are at a higher risk of developing periodontitis.

Disease states, such as diabetes, cardiovascular disease, rheumatoid arthritis, and Crohn's disease, are associated with a greater incidence of developing periodontitis.[15,20]

Diabetes and periodontitis

Previous literature has elucidated the bidirectional relationship between periodontitis and diabetes. Over time, prolonged hyperglycemia, associated with diabetes, causes increased inflammation, which can cause gingival disease.[21] Additionally, alveolar bone loss is increased with hyperglycemia.[22] Patients with diabetes and periodontitis have higher levels of local inflammatory mediators, such as TNFa, IL-1ß, and prostaglandin E2, which causes prolonged osteoclast formation and activity.[21] In addition, inflammation is increased with the accumulation of reactive oxygen species and oxidative stress.[22,23] The gastrointestinal tract, which includes the oral cavity, has large amounts of microbiota bacteria. People with type 2 diabetes, compared to people without diabetes, often lack antibodies to pathogens and bacteria, which increases the risk of periodontitis.[22] Similarly, higher levels of glucose interfere with healing.

According to the CDC, every 1% increase in A1c increases the risk of periodontal disease by 18%.[24] It has been found that periodontal disease in PWD also increases the risk of cardiovascular disease, retinopathy, and nephropathy.[25] Moderate periodontal disease consists of advanced bone and tissue destruction. Periodontal disease is considered severe with extensive bone and tissue loss.[19] People with moderate to severe periodontal disease have higher rates of diabetes-related deaths, 19.6% to 28.4% respectively, compared to people without diabetes.[26]

Burden of disease

The risk of diabetes-related complications is increased with poorly controlled diabetes. Poorly controlled diabetes increases the economic burden of patients, patients' families, and the health-care system. Diabetes is one of the most expensive chronic diseases that negatively impacts health care. The estimated cost of diabetes is $327 billion, with $237 billion in direct costs and $90 billion in decreased productivity.[27] Likewise, the economic burden of periodontal disease in the United States is substantial. Periodontal disease costs an estimated $154 billion annually. The cost of diabetes and periodontal disease significantly influences the health-care system.[28]

With poor oral health, PWD may also have decreased quality of life and increased incidence of depression.[15,25] Often, people with diabetes who have poor health may also have cavities and tooth loss. These conditions may affect their personal appearance and self-esteem. Periodontal treatment can also help improve oral health and quality of life. However, only 27% of patients with periodontal disease receive periodontal treatment.[29] Studies have shown that with increased dental coverage and access to care, periodontal treatment increases among patients with periodontal disease.[30]

Periodontitis treatment

Nonsurgical intervention is very effective for the management of periodontal disease and should be first-line therapy for treating periodontitis. Nonsurgical periodontal therapy, also known as scaling and root planing (SRP), includes mechanical removal of supra- and subgingival bacterial plaque and smoothing the root surface with scalers, curettes, or ultrasonic scalers.[11] After completion of SRP, patients are given thorough home-care instructions followed by periodic maintenance visits. In some cases, systemic or localized antibiotics may be used as adjunctive therapy to SRP.[11] However, in most severe cases of periodontal disease, adjunctive systemic antimicrobial therapy is frequently prescribed.[31,32]

When nonsurgical treatment does not achieve optimal results, surgical treatment may be recommended. Common surgical procedures include open-flap debridement, periodontal plastic surgery, and implant surgery.[33] According to the American Academy of Periodontology, patients with periodontitis can undergo gum graft surgery, regenerative procedures, dental crown lengthening, or periodontal pocket procedures for surgical interventions. Most procedures will restore gum and tissue damage as well as improve patients' quality of life.[34]

It is imperative that patients take an active role in periodontal treatment and diabetes management. A strict daily oral hygiene regimen must be followed to control bacterial plaque and prevent reinfection of the periodontal tissues.[19] The treatment approach for periodontitis and diabetes requires a lifelong strategy that is tailored to the clinical condition with a focus on behavior change, patient self-care,

and regular professional monitoring and support.[19]

Improvement post periodontal treatment

Poor periodontal health has been proven to alter blood glucose levels in patients with type 2 diabetes, resulting in elevated A1c levels.[20] In addition, improved metabolic control has been theorized to reduce the severity of periodontal disease.[20] Several studies have shown that periodontal treatment may reduce A1c in PWD.[25] In patients with uncontrolled diabetes with an A1c greater than 9%, periodontal treatment may reduce A1c by 0.6% without changes in medications. Patients who receive periodontal treatment and have medication changes may see a 1.4% reduction in A1c.[22] Periodontal treatment has been shown to reduce the risk of cardiovascular events such as myocardial infarction and cerebrovascular accident in patients with diabetes.[1]

Blood glucose control has a considerable clinical impact on patients' health and treatment outcomes. As previously noted, every 1% reduction in A1c reduces the risk of diabetes-related complications.[20] The exact mechanisms that may lead to improvements in A1c and hyperglycemia post periodontal treatment in PWD are not lucid.[35] However, it is hypothesized that insulin resistance and insulin stimulation may improve due to reductions in inflammation and bacteria.[35]

Barriers in oral health

There are many possible barriers that may limit oral health assessment in routine diabetes care. Medical providers and PWD may have the perception that oral health is not as important as systemic health.[2] Therefore, oral conditions may be overlooked in the clinical setting. Medical providers may not be aware or knowledgeable of the signs of periodontal disease, which may lead to untimely dental intervention. Also, lack of a standardized communication process among professions could be a barrier.[2] Additionally, patients may not be aware of the connection between periodontitis and diabetes.[1] Previous studies have deduced that PWD are not as likely to perform daily interproximal cleaning or obtain dental care.[1]

Other possible barriers to dental care include limited access, lack of dental relationships, financial restraints, and inadequate dental insurance coverage.[36] Millions of Americans are living in areas with a limited number of dental professionals.[36] Likewise, health literacy—defined as having the capability to obtain, process, and comprehend health information—is a common barrier that affects oral health. Over 88% of the population lacks health literacy.[36] Increasing access to care can improve oral health literacy.[36] Fears associated with dental procedures and misconceptions regarding dental care are potential barriers as well.[36]

Medical professionals' role in oral health

Medical professionals' role in oral health can help advance efforts in dental hygiene and oral health. Medical professionals can provide oral evaluations to assess for inflammation, edentulism (evidence of loss of teeth), diastemas (teeth spreading and open spaces), dental accumulation of plaque, and gingival bleeding.[3] In fact, the International Diabetes Federation (IDF) recommends that oral care be incorporated into routine diabetes care. In 2019, the IDF published *Guideline on Health for People with Diabetes* to outline their recommendations for dental care.[3]

Hyperglycemia, associated with diabetes, causes higher levels of glucose to accumulate in the mouth and saliva, which promotes bacterial growth.[2] Medical professionals can encourage regular flossing and brushing with a fluoride-containing toothpaste. They can also educate patients on the importance of reducing carbohydrates in their diet. Carbohydrate intake should be individualized for PWD.[37]

Carbohydrates, which are composed of sugars, starches, and fibers, are commonly referred to as simple or complex carbohydrates.[37] Most carbohydrates break down into sugars, which can cause damage to teeth and gums.[37] Patients with diabetes who also have tobacco dependence have a greater risk of periodontal disease. Tobacco use and smoking cause decreased perfusion, delayed immune response, and increased inflammation.[38] Medical providers should encourage smoking cessation and offer smoking cessation aids to PWD.

Strategies and recommendations

Although periodontal disease is common, it is also preventable. However, the focus of most periodontal research is on treating the disease rather than preventing it. Prevention should focus on risk assessment, plaque control, risk modifications, and prompt detection.[19] Support from medical and dental professionals plays a critical role in prevention and management of the disease.

Strategies to improve oral health include providing education, promoting awareness, and forming partnerships between dental and medical professionals. For example, educating medical providers on the need for dental exams can help improve awareness. Medical professionals should stress the importance of routine dental visits and follow-up office visits. Additionally, protocols can be implemented into practice to increase dental referrals. Patients should receive education on the importance of oral health and possible complications. Medical professionals can promote awareness with educational materials and handouts to distribute to patients while in the clinical setting.

Dental and medical professionals can collaborate regarding patients' conditions. This collaboration can create partnerships within the community to promote oral health awareness and decrease possible complications. Patients with undiagnosed diabetes may exhibit signs of hyperglycemia at their dental office visits. According to the American Diabetes Association's *Standards of Medical Care in Diabetes*, clinical guidelines recommend that diabetes screenings occur in dental practices. It is noted that over 30% of patients seen at dental office visits also have some form of dysglycemia.[39]

This is also an opportunity for referrals to medical professionals to screen patients for diabetes. Dental professionals can inquire about recent A1c levels in patients with known diabetes.

Dental and medical recommendations

In recent years, oral health has been linked to a range of systemic conditions, emphasizing the importance of working as a team with other health-care professionals.[31] Periodontitis and diabetes are both prevalent diseases that adversely impact each other. Dental and medical professionals have a responsibility to support the management of periodontitis and diabetes. Dental and medical professionals may use the following strategies to support disease prevention and management.

Recommendations for dental professionals

- Promote dental and medical collaboration, particularly in cases of diabetes.[35]
- Inform patients of the connection between periodontal disease and diabetes.[35]
- Encourage regular periodontal monitoring.[35]
- Consider using a diabetes screening questionnaire in daily practice to assess the risk of diabetes.[35]
- Recommend regular periodontal assessments; all newly diagnosed patients with diabetes should receive periodic periodontal assessments.[35]
- Recommend follow-up with a medical professional if diabetes is suspected; possibly perform a point-of-care A1c test in the dental office.[35]
- Become knowledgeable of the potential oral side effects of medications prescribed to patients.[35]
- Provide additional preventive care and support to those at a higher risk for disease and those with decreased access to care.[35]

Recommendations for medical professionals

- Inform patients of the relationship between periodontal disease and diabetes.[35]
- Encourage regular dental visits.[35]
- Recommend a periodontal assessment for newly diagnosed patients.[35]
- Provide education regarding symptoms of periodontitis, including red, swollen, tender gums, gums that bleed easily, and chronic halitosis.[35]
- Collaborate with dental professionals regarding possible periodontal disease.[35]
- Become knowledgeable of the potential oral side effects of medications prescribed to patients.[35]
- Provide additional preventive care and support to those at a higher risk for disease and those with decreased access to care.[35]

Benefits of collaboration

Treating periodontal disease has been shown to lower health-care expenditures by improving dental care and overall health. It has also been found that treating periodontal disease can lower health-care costs by over $1,700 for PWD.[40] The associated annual cost savings for dental care with at least an annual dental exam is approximately $515–$574 per person for PWD.[41] With the collaboration of dental and medical health-care professionals, patients have increased access to care, greater health literacy, and cost-effective quality care that can improve oral health-care outcomes.[15]

Conclusion

The association between periodontitis and diabetes has been well documented. Diabetes is one of the leading risk factors for periodontitis. It is important for both disciplines—dental and medical—to be cognizant of the coexistence of periodontitis and diabetes. Both conditions can negatively affect the lives of patients with these chronic diseases. The benefits of collaboration between dental and medical professionals include increased periodontal treatment, increased access to care, improved health-care outcomes, and decreased health-care expenditures.

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1. The A1c is a summary of serum glucose levels over:
   - A. 2 months
   - B. 3 months
   - C. 4 months
   - D. 6 months

2. Diabetes can be defined as:
   - A. Fasting plasma glucose equal to or greater than 120
   - B. 2-hour plasma glucose equal to or greater than 125
   - C. A1c equal to or greater than 6.5
   - D. Both A and C

3. People without diabetes have an average A1c less than:
   - A. 7%
   - B. 6.5%
   - C. 5.7%
   - D. 5.5%

4. Which is a possible barrier for providing oral health assessments in people with diabetes?
   - A. Decreased perception of the need for oral health
   - B. Decreased knowledge of medical professionals of signs of periodontal disease
   - C. Decreased awareness of the connection between periodontal disease and diabetes
   - D. All of the above

5. Which hemoglobin A1c value suggests poor glycemic control?
   - A. 7.0%
   - B. 7.6%
   - C. 8.4%
   - D. None of the above

6. The amount of carbohydrate intake for people with diabetes should be:
   - A. 50% of dietary intake
   - B. Approximately 15 g each meal
   - C. Individualized per patient
   - D. None of the above

7. Type 2 diabetes can be managed with:
   - A. Insulin
   - B. Lifestyle modifications
   - C. Oral medications and injectables
   - D. All of the above

8. Individuals with periodontal disease were found to have an increased risk of developing diabetes by:
   - A. 50%
   - B. 59%
   - C. 68%
   - D. 25%

9. Which organization published the *Guideline on Health for People with Diabetes*?
   - A. International Diabetes Foundation
   - B. American Diabetes Association
   - C. American Dental Association
   - D. International Diabetes Society

10. Smoking and tobacco use increase the risk of periodontal disease and cause:
   - A. Increased perfusion
   - B. Decreased inflammation
   - C. Delayed immune response
   - D. Hypoglycemia

11. The percentage of patients with periodontal disease who receive periodontal treatment is:
   - A. 64%
   - B. 59%
   - C. 38%
   - D. 27%

12. Type 2 diabetes accounts for what percentage of the PWD population?
   - A. 75%–80%
   - B. 85%–90%
   - C. 90%–95%
   - D. 50%–60%

13. How can medical professionals assist with decreasing periodontal disease?
   - A. Refer patients for dental exams
   - B. Encourage brushing with fluoride toothpaste and flossing
   - C. Provide smoking cessation counseling
   - D. All of the above

14. People with diabetes also have a higher rate of:
   - A. Lichen planus
   - B. Xerostomia
   - C. A and B
   - D. None of the above

15. The American Diabetes Association recommends an A1c for most nonpregnant adults of:
   - A. Less than 7%
   - B. Less than 8%
   - C. Less than 5.5%
   - D. Less than 9%

16. What percentage of patients seen at dental office visits also has some form of dysglycemia?
   - A. 30%
   - B. 70%
   - C. 25%
   - D. 40%

17. Which is a sign of periodontitis that medical professionals can share with their patients?
   - A. Chronic bad breath (halitosis)
   - B. Red, swollen gums
   - C. Gums that bleed while brushing
   - D. All of the above

18. How much of a reduction in HbA1c is required to lower the risk of diabetic complications?
   - A. 2%
   - B. 4%
   - C. 1%
   - D. 0.1%

19. What systemic condition has periodontitis been linked to?
   - A. Cardiovascular disease
   - B. Diabetes
   - C. Alzheimer's disease
   - D. All of the above

20. In addition to bacteria, what other component must be present for periodontitis to develop?
   - A. Bleeding
   - B. Susceptible host
   - C. Gram-positive bacteria
   - D. Calculus

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ENDEAVOR BUSINESS MEDIA

21. Periodontitis may have an impact on which aspect of a person's quality of life?
   A. Health
   B. Mastication
   C. Self-confidence
   D. All of the above

22. Which is a risk factor for periodontitis?
   A. Smoking
   B. Brushing only once a day
   C. Not visiting the dentist
   D. Bipolar disorder

23. What is the cure for periodontitis?
   A. Nonsurgical scaling and root planing
   B. Periodontal flap surgery
   C. Tooth extraction and implant placement
   D. Periodontitis is irreversible; treatment requires a lifelong strategy.

24. What percentage of adults has some form of periodontal disease?
   A. 62%
   B. 47%
   C. 50%
   D. 38%

25. What can medical and dental professionals do to support prevention and management of disease?
   A. Identify risk factors
   B. Educate patients on the link between periodontitis and diabetes
   C. Be aware of the potential oral side effects of medications prescribed to patients
   D. All of the above

26. What exact mechanism leads to improved glycemic control following periodontal treatment?
   A. Increased A1c
   B. The release of white blood cells
   C. The exact mechanism is unclear; hypothesized that insulin resistance improves because of reduced inflammation and reduced bacterial load systemically
   D. Reducing the periodontal pocket depth

27. What can patients do to lower the risk of periodontitis?
   A. Visit the dentist regularly to receive periodontal assessment
   B. Adhere to a strict plaque control regimen
   C. Become a vegetarian
   D. A and B

28. What is the increase in periodontitis risk caused by diabetes?
   A. 10%
   B. Two- to threefold
   C. 90%
   D. 15%

29. Periodontal disease has been demonstrated to alter blood glucose levels in patients suffering from:
   A. Type 2 diabetes
   B. Gingivitis
   C. Kidney disease
   D. Oral cancer

30. What should prevention of periodontitis focus on?
   A. Risk assessment/early detection
   B. Plaque control
   C. Lowering risk factors
   D. All of the above

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Periodontitis and diabetes: Navigating a two-way street

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EDUCATIONAL OBJECTIVES

1. Recognize and discuss the bidirectional relationship between periodontitis and diabetes.
2. Identify and list blood glucose and A1c goals for patients with diabetes to improve periodontitis.
3. Exhibit increased confidence when educating patients with diabetes and periodontitis.
4. Implement strategies into daily dental and medical practice to improve clinical outcomes.

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1. Were the individual course objectives met?
   Objective #1: Yes No Objective #3: Yes No
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Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

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6. Please rate the author's effectiveness. 5 4 3 2 1 0
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    _____

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7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	22.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
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9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	24.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	25.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	26.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	27.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
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