

Diabetes

A growing epidemic of all ages

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Diabetes mellitus is a major, although sometimes overlooked, cause of morbidity and mortality in the United States.¹ This chronic metabolic disorder is known to affect at least 5 percent of the population, while another 2 to 3 percent of the population may have the disorder but have not been diagnosed.² Major medical complications associated with diabetes include nephropathy, retinopathy, neuropathy, peripheral vascular disease and coronary heart disease.^{1-3,4} With the increasing percentage of older Americans predicted for the next few decades, the number of patients with diabetes who visit dental offices is likely to increase.

Dentists have an opportunity to educate patients with diabetes about the oral complications of the disease.

CLASSIFICATION OF DIABETES

Dichotomies used to describe and classify diabetes have included “juvenile-onset diabetes” and “adult-onset diabetes,” as well as “insulin-dependent diabetes mellitus,” or IDDM, and “non-insulin-dependent diabetes mellitus,” or NIDDM. The current classification of diabetes includes three general clinical categories (type 1 diabetes, type 2 diabetes, gestational diabetes), as well as other specific types.³⁻⁶

INCIDENCE AND PREVALENCE OF DIABETES

Accurate assessments of the incidence and prevalence of diabetes are complicated for many reasons. Lack of prospective data from large representative national samples often precludes accurate estimates. Prevalence of diabetes can vary widely depending on geography, age, sex and race/ethnicity status. Assessing trends in prevalence is complicated by changes in population demographics over time and changing diagnostic criteria. Data sources using older and less-stringent diagnostic criteria must be adjusted when determining trends in

Background. The incidence and prevalence of diabetes mellitus are increasing, with more than 135 million people affected worldwide. Despite greater knowledge of the disease, one-third of people with the disease are undiagnosed. Recent estimates indicate that one in three U.S. children born in 2000 will develop diabetes.

Overview. Diabetes is not equally distributed within the U.S. population. Type 1 diabetes occurs most frequently in white non-Hispanic children. A higher prevalence of type 2 diabetes is seen among those who are older, female and overweight. Non-Hispanic African-American and Hispanic populations in the United States also have been found to be at greater risk of developing type 2 disease. Among certain older patient populations, the prevalence of type 2 diabetes may be as high as 20 to 25 percent. As the percentage of older Americans increases and as the prevalence of obesity increases, a greater number of patients with diabetes will be seen and treated by dental practitioners.

Conclusions and Practice

Implications. Oral health complications, including extensive periodontal disease, tooth loss, soft-tissue pathologies, xerostomia and burning mouth syndrome have been reported among patients with long-standing and poorly controlled diabetes. Dentists have an opportunity and responsibility to educate patients with diabetes about the oral complications of the disease, and to promote proper oral health behaviors that limit the risks of tooth loss, periodontal disease and soft-tissue pathologies.

disease burden. In many published reports, diagnostic criteria are not mentioned and/or the distinction between type 1 and type 2 diabetes is often based on an arbitrary age cutoff point.

Type 1 diabetes. There is evidence indicating that the prevalence of type 1 diabetes is increasing in the United States. Among those younger than age 15 years, the number of cases is expected to increase from 812,500 in 1995 to 1,087,800 by the year 2010.⁷

However, the prevalence of type 1 diabetes in Central and South America generally is well below the prevalence

BOX**DIABETES EPIDEMIOLOGY FACT SHEET.**

- In 1995, 135 million people were diagnosed with diabetes worldwide.
- By 2025, 300 million people worldwide are predicted to develop diabetes.
- One of every three children born in the year 2000 will develop diabetes.
- As many as one-third of people with diabetes are unaware that they have the disease.
- Screening for diabetes is recommended for people with any of the following characteristics, which put them at risk of developing diabetes:
 - age 45 years or older;
 - obesity (body mass index \geq 30 kilograms per square meter);
 - Hispanic-American or African-American race;
 - hypertension;
 - dyslipidemia;
 - previously identified impaired glucose tolerance.
- The obesity epidemic in the United States is closely related to increased incidence of type 2 diabetes.

reported in the United States,⁸ while the prevalence in the Caribbean more closely resembles the prevalence in the United States.⁹ Age-adjusted prevalence varies from a low of 0.1/100,000/year in Zunyi, China, and Caracas, Venezuela, to 36.8/100,000/year in Sardinia and 36.5/100,000/year in Finland.⁹

In Sweden, during a 16-year period, the incidence of type 1 diabetes did not increase in the 0- to 34-year-old age group, while the median age at diagnosis decreased. A shift to younger age at diagnosis may explain the increasing incidence of childhood type 1 diabetes in Sweden.¹⁰

In the United States, incidence of type 1 diabetes varies from 11.7 to 17.8 cases per 100,000 people per year depending on the data source.⁹ Diabetes incidence among U.S. white non-Hispanic children is nearly twice as high as that among African-Americans, although the incidence among black children has been shown to be on the rise.¹¹ Hispanics of Puerto Rican origin have rates similar to those among white non-Hispanics, while Mexican-Americans have low rates similar to those among blacks.¹

Type 2 diabetes. The prevalence of type 2 diabetes is increasing both in the United States and worldwide. The increase in prevalence of type 2 diabetes is owed in part to a decrease in mortality and in part to the increased incidence of obesity.^{12,13} Prevalence of type 2 diabetes had been estimated at 4 percent for the world population in 1995, and is expected to rise to 5.4 percent by 2025.¹⁴ In the United States, the prevalence of

diagnosed type 2 diabetes in adults increased from 4.9 percent in 1990 to 6.5 percent in 1998.¹⁵ As the world population increases, the number of diagnosed cases of type 2 diabetes is expected to increase from 135 million in 1995 to 300 million by 2025¹⁵ (Box).

Most of this increased disease burden will occur in developing countries. Among the possible reasons for this estimated increase are shifts toward a modern Western lifestyle with high-calorie diets, decreased physical activity and greater obesity. However, in spite of a marked increase in body mass index, or BMI (in kilograms per square meter), a group of Swedish researchers found no increased prevalence of adult diabetes over a 13-year observation period.¹⁶ A shift from abdominal obesity to more distal fat distribution, a diet with less saturated fat and lower glycemic index and fewer regular smokers in the population were proposed as possible contributing factors for this observation.

The prevalence of undiagnosed diabetes may be as high as 2.7 percent of the adult population in the United States.² Benjamin and colleagues¹⁷ used data from the Third National Health and Nutrition Examination Survey (1988-1994), or NHANES III, to assess the relationship between weight and diabetes.¹⁷ They found that 25 percent of overweight adults had prediabetes (impaired glucose tolerance defined as a two-hour post-75-gram oral glucose tolerance test value of 140-199 milligrams per deciliter or impaired fasting glucose, or IFG, defined as 110-125 mg/dL). This equates to approximately 12 million people.¹⁷ In addition, the researchers found that Mexican-American men were more than twice as likely as Mexican-American women to have IFG (16.5 percent versus 7.6 percent) and that prediabetes was higher among Mexican-Americans than among non-Hispanic blacks (27.3 percent versus 18.9 percent).¹⁷

As can be seen in the figure, the prevalence of diabetes in adults is slightly higher in women and increases significantly with age.¹⁸ For patients aged 60 to 74 years, the prevalence of diabetes may be as high as 20 to 25 percent.¹ Importantly, when considering all classifications of diabetes, prevalence is nearly twice as high in blacks as it is in whites. Compared with the prevalence in non-Hispanic whites, type 2 diabetes is two to three times more prevalent in Mexican-American populations. Cuban-Americans have lower rates than those among Mexican-Americans, although

they still are 30 percent higher than those among whites.¹⁹

An estimate of the lifetime risk of developing diabetes mellitus has been calculated by Narayan and colleagues.²⁰ Using data from the annual National Health Interview Surveys, they estimated that one in three U.S. children born in the year 2000 will develop the disease.²⁰ Hispanic children may face even worse odds, with estimates of lifetime risks of nearly one in two.

SPECIAL CONSIDERATIONS

Modifiable risk factors: obesity, exercise and smoking. Obesity is a known risk factor for type 2 diabetes. The prevalence of obesity in the United States, defined as a BMI of greater than 30 kg/m², has increased from 12 percent in 1991 to 18 percent in 1998 and to 20 percent in 2000.²¹ A parallel increase is reported in diabetes prevalence from 4.9 percent in 1990 to 7.3 percent and 7.9 percent in 2000 and 2001, respectively.²² It has been suggested that patients who reduce their body mass through an increase in physical activity may reduce the risk of developing type 2 diabetes by improving insulin sensitivity.²¹

Cigarette smoking also may be a modifiable risk for type 2 diabetes. Smoking cessation may contribute to weight gain as well, but does not outweigh the diabetes risk associated with smoking.²³ Hypertriglyceridemia also has been shown to be an independent risk factor for the development of IFG and diabetes mellitus. In a study of 7,222 Japanese patients with normoglycemia in 1990, who were followed up until 1999, Kametani and colleagues²⁴ found that the multivariate-adjusted relative risks for the development of IFG were 1.38 for hypertriglyceridemia ($P = .001$), 1.30 for obesity ($P = .003$), 1.29 for hypertension ($P = .007$), 1.26 for family history of diabetes ($P = .027$) and 1.02 for age ($P = .035$). The multivariate-adjusted relative risks for the development of diabetes mellitus were 1.003 for triglyceride level ($P = .013$), 1.30 for level of BMI ($P = .003$) and 2.38 for family history of diabetes ($P = .001$).²⁴

American Indians and Alaska natives.

Although limited data are available, American Indians and Alaska natives appear to have higher prevalence rates of diabetes than does the general U.S. population.²⁵ Age-adjusted prevalence in Navajo adults has been estimated to be as high as 22.9 percent,²⁶ with prevalence estimates of more than 50 percent in Pima Indians older than 35

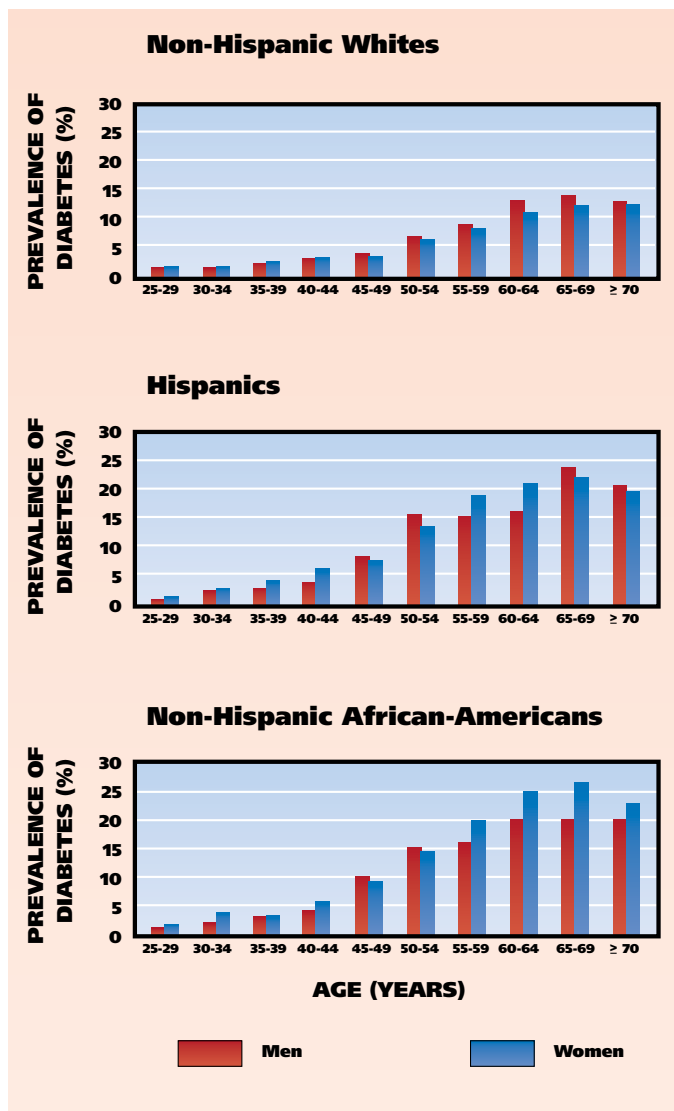


Figure. Prevalence rates for diagnosed diabetes according to age category among three populations.¹⁸

years.²⁷ In a report by Lee and colleagues,²⁸ prevalence among participants in the Strong Heart Study (American Indians from Arizona and North and South Dakota) ranged from 38 to 72 percent, with higher rates among women than among men. When incidence rates were examined, the annual conversion from IGT to diabetes was 8.4 percent in this population.²⁸

Type 2 diabetes in youth. During the past 20 years, there has been an increase in the prevalence of type 2 diabetes in youth, particularly among minority populations, with the most pronounced increase in the adolescent age group. Investigators attribute this rise to patterns of obesity and lack of physical activity.^{29,30} In Cincin-

nati, one-third of new childhood diabetes cases in the category of ages 10 to 19 years were type 2 diabetes (annual incidence of 7.2 cases in 100,000 people), with approximately three-quarters of these cases found among black children. Among American Indian children, the prevalence of type 2 diabetes increased in age groups 10 to 14 years and 15 to 19 years during a 30-year period (1967-1996), with most of the increase attributable to an increase in weight and height, and exposure to diabetes in utero.³¹

HEALTH CARE COSTS OF DIABETES

According to a Rochester, Minn., population-based study, the mortality burden associated with diabetes has increased significantly between 1970 and 1994, probably because of increases in diabetes incidence and smaller declines in mortality for people with diabetes relative to those without diabetes.³² In the absence of improved diabetes prevention and treatment, the steady declines in mortality observed for the general population since the 1960s likely will begin to slow or even reverse.³² In 1997, the direct medical cost associated with diabetes in the United States was \$44 billion.¹⁸ By 2002, the direct medical costs for treating diabetes and its complications had increased to \$92 billion.¹⁸ Indirect costs attributed to lost workdays, restricted activities and permanent disability increased the economic burden of diabetes by \$40 billion.¹⁸ Medical costs are estimated to be 2.4 times higher compared with costs for populations without diabetes.¹⁸ These estimates of medical expenses do not include the higher needs and expenses associated with dental care, podiatric care, optometric care and vision products.

CONCLUSION

It is estimated that approximately 5 percent of all patients seen in dental offices have diabetes.³³ For patients 60 to 74 years of age, the prevalence of diabetes may be as high as 20 to 25 percent.¹² As the average age of the U.S. population continues to rise and as the prevalence of obesity continues to increase, more patients with diabetes will be seen and treated by dental practitioners.

In general, patients who maintain proper glycemic control can undergo dental treatment with only minimal restrictions. Although glycemic

control has improved in recent years, the recommendation to "normalize" glucose levels (for example, glycosylated hemoglobin level of < 7 percent) is difficult, if not impossible, to achieve by most patients with diabetes. Additionally, since one-third of patients with diabetes mellitus are undiagnosed, practitioners must be alert to the signs and symptoms of diabetes such as polyuria, polydipsia and unexplained weight loss.

The oral health complications of diabetes include extensive periodontal disease, tooth loss, soft-tissue disease, xerostomia and burning mouth syndrome. Prevention of these oral health sequelae requires education and health promotion strategies. Dental management strategies for

patients with diabetes should be individualized to meet patient needs and may include more frequent dental visits, comprehensive medical and drug use histories, dietary evaluations and counseling, smoking-cessation recommendations, assessment of salivary functions, topical fluoride application and instructions for proper oral hygiene.³⁴

Dentists have an opportunity and responsibility to educate patients with diabetes about the oral complications of diabetes and to promote proper oral health behaviors that limit the risks of tooth loss, periodontal disease and other oral soft-tissue disease. ■

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The preparation of this manuscript was supported in part by National Institutes of Health grants R01-DE13668, R21-DE14472 and R01-DK34818.

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