Diabetes and tooth loss

An analysis of data from the National Health and Nutrition Examination Survey, 2003–2004

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Tooth loss and edentulism (complete absence of teeth) both are considered poor health outcomes that have a negative impact on a person's quality of life.[1] The prevalence of tooth loss increases with age and is a major problem for people 60 years and older. Adverse consequences of tooth loss include difficulty in chewing and speaking, esthetic dissatisfaction and social stigma.[2-5] Moreover, investigators have reported an association between tooth loss and lower consumption of dietary fiber, fruits and vegetables, as well as with a high intake of cholesterol and saturated fatty foods.[6-9] In addition, the results of epidemiologic studies suggest that edentulism and tooth loss are associated independently with chronic heart disease, hypertension, stroke, cancer and other systemic diseases.[10-14]

According to the National Health and Nutrition Examination Survey (NHANES),[2] the prevalence of edentulism was 31 percent and 25 percent among people 60 years and older during the years 1988-1994 and 1999-2002, respectively; and the average number of teeth in the

A B S T R A C T

Background. The authors conducted an analysis of data from the National Health and Nutrition Examination Survey (NHANES) to understand the association between diabetes and tooth loss in the United States.

Methods. The authors analyzed the oral examination and self-reported diabetes data obtained from the NHANES 2003-2004 cycle and included 2,508 participants representing a civilian, noninstitutionalized U.S. population 50 years and older. The authors calculated the prevalence of edentulism and the number of missing teeth among dentate people, and they used multiple regression analyses to assess the association between diabetes and tooth loss.

Results. The prevalence of edentulism was 28 percent and 14 percent among people with and without diabetes, respectively. The multiple logistic regression analysis revealed that people with diabetes were more likely to be edentulous than were those without diabetes (adjusted odds ratio = 2.25; 95 percent confidence interval, 1.19-4.21). Among dentate adults, those with diabetes had a higher number of missing teeth than did adults without diabetes (mean [standard error {SE}] = 9.8 [0.67]), mean [SE] = 6.7 [0.29]); $P < .01$.

Conclusions. These study results revealed that adults with diabetes are at higher risk of experiencing tooth loss and edentulism than are adults without diabetes. One of every five cases of edentulism in the United States is linked to diabetes.

Practical Implications. Although the association between diabetes and periodontal disease is well established, health care professionals also need to recognize the risk of tooth loss and its effect on quality of life among people with diabetes.

Key Words. Diabetes; tooth loss; edentulism; National Health and Nutrition Examination Survey (NHANES).
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oral cavity was 18.4 and 19.4 among dentate people 60 years and older during the same years in the United States, respectively.[2] Although the prevalence of tooth loss has declined over the past few decades, it still is a significant public health problem that will continue to affect the baby-boomer generation in the United States. Chronic periodontal disease and severe dental caries are the primary reasons for tooth loss in adults.[15] Investigators in several studies have reported that factors such as age, level of education, family income, geographical location, access to care, smoking history and health insurance coverage are associated with tooth loss.[16-18] The prevalence of periodontal disease is higher among people 50 years and older and and among those in low socioeconomic groups in the United States than in other segments of the population.[19,20] The findings of previously published narrative reviews suggest a strong association between diabetes and periodontal disease.[21,22]

It is important to consider diabetes as a major factor when trying to understand the reasons for tooth loss, because the condition affects more than 26 million (8.3 percent) people in the United States. Among people 65 years and older, 11 million (27 percent) are affected by diabetes.[23] Diabetes is associated with periodontal disease and other systemic complications.[21,24] A review of the literature consistently has shown a higher prevalence, incidence, severity and progression of periodontal disease in people with diabetes; yet, when one examines the same variables as they relate to dental caries, the results are inconsistent.[16,21,25] One of the objectives of Healthy People 2020 is that by 2020, at least 61.2 percent of people with diabetes have at least an annual dental examination (objective D-8).[26] Given all the supportive evidence of an association between diabetes and periodontal disease, it is surprising that researchers in only two population-based studies reported an association between diabetes and tooth loss.[27,28] Therefore, we conducted a study to understand the association between diabetes and tooth loss in the United States.

METHODS

We accessed the publicly available NHANES data for the 2003-2004 cycle.[29] Since 1999, the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC) has collected data continuously in two-year cycles. In the 2003-2004 cycle, NHANES investigators collected detailed oral health examination data, which we used for this analysis.

NHANES uses a complex, stratified, multistage probability sample to measure the health and nutritional status of adults and children who represent the civilian, noninstitutionalized population in the United States. Detailed description of selection of participants is provided elsewhere.[29] To obtain precise estimates for specific groups, especially people older than 60 years, the survey cycle oversampled this age group in the 2003-2004 period. Tooth loss is more prevalent in people 50 years and older; hence, we restricted our analysis to this age group.[19] We included 2,508 participants who were 50 years and older and for whom there were oral health status and self-reported diabetes data. The confidentiality of sample participants was protected by means of masked identifiers.

Data collection. We used the diabetes questionnaire to assess the participants' self-reported diabetes status. The questionnaire did not differentiate between type 1 or type 2 diabetes. NHANES field office staff members reviewed all data for accuracy and completeness. Participants were asked the following question by trained interviewers in their homes: "Have you ever been told by a doctor or health care professional that you have diabetes or sugar diabetes?" Responses were entered as "yes," "no" or "borderline." Self-diagnosed diabetes, prediabetes, high sugar, and any conditions other than "diabetes" or "sugar diabetes" were not included during the interview. We categorized the participants with borderline diabetes as having diabetes, whereas we excluded from the analyses those who responded "refused" and "don't know." We divided the presence of exposure as a dichotomous variable into participants reporting they had diabetes and those reporting they did not have diabetes. We considered women who had had diabetes only during the time of pregnancy to not have diabetes at the time of data collection if they were not pregnant.

Tooth loss was the principal outcome of interest. We calculated the prevalence of edentulism and the number of missing teeth among dentate people 50 years and older.

Oral examinations were performed by trained dental examiners in mobile examination centers (MEC). Examiners assessed tooth count separately for each tooth space and reported the par-

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ABBREVIATION KEY. CDC: Centers for Disease Control and Prevention. **DPCPs:** Diabetes prevention and control programs. **GED:** General Educational Development. **IDF:** International Diabetes Federation. **MEC:** Mobile examination center. **NHANES:** National Health and Nutrition Examination Survey. **PAR:** Population attributable risk.