

Mini Review

Relationship between Type 2 Diabetes and Periodontitis: Recommendation for Diabetes Screening In Specialty Periodontal Practices

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Type 2 diabetes has reached epidemic proportions globally. Medical care for the complications of diabetes costs billions of dollars and it is estimated that, by 2030, these complications will be a leading cause of mortality. The undiagnosed prediabetic population is an even bigger concern. There are strong links between type 2 diabetes and periodontitis. As such, dental practices have a unique opportunity to implement prediabetes screening tests. These include the CDC Prediabetes Screening Test questionnaire, as well as new technology available to conduct reliable chairside tests of glycated haemoglobin (HbA1c). We recommend the implementation of such a program in dental clinics to identify individuals at risk for prediabetes, and present one example of a case in which a prediabetic individual was identified by a periodontist. Practice-based research networks could pool data from such programs to evaluate the concept and, based on the outcomes, recommend appropriate changes in health policy.

Keywords: Type2 diabetes; Periodontitis; Risk prevention; Prediabetes; HbA1c testing; CDC prediabetes screening test**Introduction**

Diabetes is a progressive chronic disease with multifactorial pathophysiological abnormalities, resulting in sustained hyperglycemia. It greatly increases the risk of micro and macro vascular diseases and, when left uncontrolled, is a major cause of mortality [1]. Globally, it has acquired epidemic proportions with 4.6 million deaths annually attributable to diabetes, and the number of people with diabetes is predicted to rise from over 366 million in 2011 to 552 million by 2030, or one adult in ten [2]. Based on reports published by the Canadian Diabetes Association (CDA) and Centers for Disease Control and Prevention (CDC), 8.9 to 9.3 percent of the general population in Canada and the US have been diagnosed with diabetes [3,4] and there is an even larger number with undiagnosed prediabetes [3-5]. These people are at high risk of becoming diabetic. However, early diagnosis and modification of life style can prevent progression of the disease and the resulting serious complications. A large number of individuals with diabetes or prediabetes are unaware of their condition and have never been tested for elevated blood glucose levels [6].

In the US and Canada, approximately 70 percent of the population visit their dentist at least once a year [7,8]. As such, the US Department of Health and Human Services promotes the active participation of dentists in monitoring and preventing diseases like diabetes [9]. This can be done through the identification of dental conditions associated with the disease. For example, within the clinical literature, there is a plethora of evidence on the association of elevated blood sugar levels and the severity of periodontitis [10-18]. Periodontitis is an inflammatory condition of the supporting structures of teeth caused by polymicrobial biofilms, containing predominately gram negative anaerobic bacteria [19]. Host immune response plays a role in tissue

destruction and, if left untreated, periodontitis results in tooth loss [10,20]. Glycated haemoglobin (commonly known as HbA1c or A1c) levels of nine percent are considered indicative of uncontrolled blood glucose, and elevated HbA1c is one of two significant risk factors (the other being heavy tobacco smoking) for severe periodontitis [10,20]. Family dentists refer patients with moderate to advanced periodontitis to periodontal specialists. The majority of patients with periodontitis are unaware of their higher than normal risk of elevated blood glucose levels.

Despite the association between periodontitis and uncontrolled blood glucose, dental practitioners do not routinely screen periodontal patients for diabetes. However, Strauss et al. has estimated that 93.4 percent of patients with periodontitis should qualify for diabetes screening [6]. In addition, the American and Canadian Diabetes Associations recommend screening of all patients ≥ 45 years of age, with BMI $\geq 25\text{kg/m}^2$, and one or more risk factors for diabetes [21,22]. The Dental Practice-Based Research Network has looked at the feasibility of random glucose testing in the general patient population [23]. In a Michigan study, a high burden of dysglycemia was found in a general dental practice patient population [24]. The authors of this study recommended chairside blood glucose testing to identify prediabetic patients. This concept of chairside testing of blood glucose levels for the diagnosis of prediabetes is not unique to the Michigan study, since it has been previously described [25,26]. However, it is reported that less than 10 percent of dental practices routinely screen patients for diabetes and more than 98 percent do not have blood glucose monitors available on site [23]. Considering the close association of elevated blood glucose levels and the severity of periodontitis, periodontists and other dental practitioners are uniquely positioned to monitor blood glucose levels or other

Table 1: CDC Prediabetes Screening Test [32].

Prediabetes means your blood glucose (sugar) is higher than normal, but not yet diabetes. Diabetes is a serious disease, which can cause heart attack, stroke, blindness, kidney failure, or loss of toes, feet or legs. Type 2 diabetes can be delayed or prevented in people with prediabetes, however, through effective lifestyle programs. Take the first step. Find out your risk for prediabetes.

Take the Test — Know Your Score!

Answer these seven simple questions. For each “Yes” answer, add the number of points listed. All “No” answers are 0 points.

	Yes	No
Are you a woman who has had a baby weighing more than 9 pounds at birth?	1	0
Do you have a sister or brother with diabetes?	1	0
Do you have a parent with diabetes?	1	0
Find your height on the chart. Do you weigh as much as or more than the weight listed for your height? (See chart below)	5	0
Are you younger than 65 years of age and get little or no exercise in a typical day?	5	0
Are you between 45 and 64 years of age?	5	0
Are you 65 years of age or older?	9	0

Total points for all “yes” responses: _____

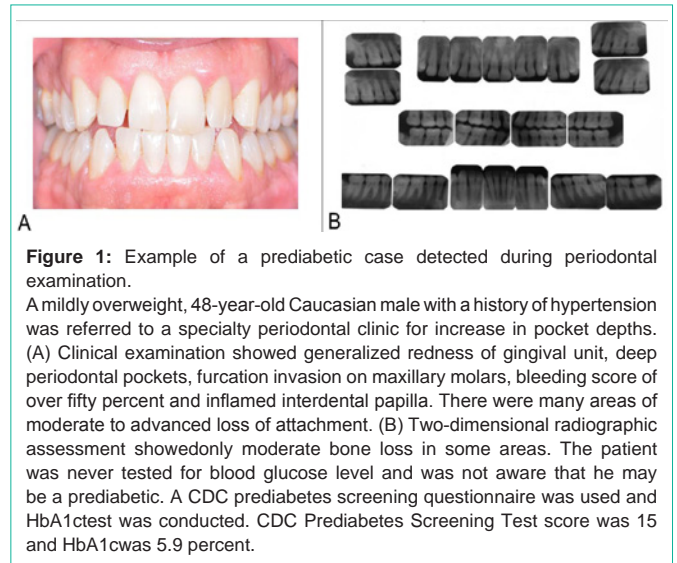
CDC Diabetes Prevention Recognition At-Risk Weight Chart

Height	Weight (Pounds)	Height	Weight (Pounds)
4’10”	129	5’7”	172
4’11”	133	5’8”	177
5’0”	138	5’9”	182
5’1”	143	5’10”	188
5’2”	147	5’11”	193
5’3”	152	6’0”	199
5’4”	157	6’1”	204
5’5”	162	6’2”	210
5’6”	167	6’3”	216
		6’4”	221

biomarkers to detect undiagnosed diabetic and prediabetic patients.

It is now realized that random glucose testing does not provide a reliable indicator of a sustained hyperglycemic condition [27]. On the other hand, the HbA1c test reflects a two- to three-month history of blood glucose levels. Although other intensive testing may be required to arrive at a definitive diagnosis and treatment regimen, the HbA1c test presents a practical chairside screening opportunity [28]. The HbA1c test result is reported as a percentage. The higher a person’s blood glucose levels, the more hemoglobin they will have with sugar attached, resulting in a higher HbA1c percentage. A normal HbA1c level is below 5.7 percent, while HbA1c of 5.7 to 6.4 percent indicates prediabetes. HbA1c above 6.0 percent is considered high risk of developing diabetes, and a level of 6.5 percent or above means a person has diabetes [27]. PTS Diagnostics (Indianapolis IN, USA; Roxon Medi-Tech, Etobicoke, ON, Canada) markets the “A1CNow®+Multi-test A1C System” [29]. This instrument can provide results of the HbA1c test within five minutes. This point-of-care test would allow dental practitioners to conveniently screen patients for prediabetes and diabetes, and provide information that will help direct them to pertinent resources for further investigation.

There is a complex relationship between diabetes and periodontitis [30]. Diabetes is well established as a risk factor for periodontitis.



Conversely, periodontal inflammation may exacerbate diabetes and its complications. However, with regard to periodontal therapy, there is only weak evidence that non-surgical treatment and reduction of inflammation in diabetic patients results in moderate reduction of blood glucose [31]. More randomized controlled trials are required to validate this.

The CDC has provided a screening tool, which allows nurses, podiatrists, and dentists to collaborate with their medical colleagues in identifying individuals at high-risk of prediabetes (Table 1) [32]. The CDC screening test is a simple and quick self-assessment questionnaire that patients can use to determine their risk of prediabetes. A score of nine or higher indicates a high risk for prediabetes. In the 2007-2008 National Health and Nutrition Examination Survey [33], the CDC screening test correctly identified 27 to 50% of U.S. adults (aged 18 years and older) with a score of 9 or higher as true cases of prediabetes. This identification was based on HbA1c, fasting blood glucose, or two-hour oral glucose tolerance confirmatory diagnostic tests [5]. Despite urging by the CDC for collaboration in identifying individuals at high-risk for developing diabetes, there still remains a gap in communication among health care providers. This lack of communication results in large numbers of individuals with undetected prediabetes, many of whom may eventually progress to more serious disease [4]. One example of identification of a prediabetic case in a periodontal practice is described in Figure 1.

The financial burden of medical care for diabetic patients is enormous. Cost of care for complications of diabetes is in the hundreds of billions of dollars worldwide [2]. In Canada, it is estimated that the prevalence and direct costs for diabetes care will go up by more than 40 percent over the next ten years [3]. Similar data are also available for the United States of America [34]. Considering the detrimental impact of diabetes on individual patients and the healthcare system, as well as the association between periodontitis and blood glucose levels, it is recommended that all periodontal and general dental practices implement risk assessment questionnaires, as well as chairside HbA1c tests. Diabetes screening done in dental offices will benefit the patient and healthcare system with early

diagnosis and effective management of the disease. In addition, appropriate screening and subsequent diagnosis will provide proof of concept regarding the link between periodontitis and type 2 diabetes. Data from such screening programs can also inform healthcare policy makers of the importance of oral health care professionals in identifying life-threatening diseases. As well, delivery of appropriate oral health care to diabetic patients is an urgent concern, since a recent Canadian report described serious gaps, with only 51 percent of identified diabetics having dental insurance and access to proper dental care [3].

Concluding Remarks

In view of the above discussion, we make following recommendations:

1. All periodontal patients (not already being managed for prediabetes or diabetes) should be asked to complete the CDC questionnaire.
2. Patients with scores of nine or higher on the CDC questionnaire should be offered a chairside HbA1c test.
3. Once sufficient pilot data have been collected and analyzed, policy makers and third party medical and dental insurance companies should be informed of the findings.

Benefits of performing such assessments in clinical practice include:

1. Identified prediabetic patients can be referred for preventive counseling to avoid serious complications and reduce healthcare costs.
2. The impact of periodontal treatment on glycemic control can be assessed in randomized controlled studies.

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