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Type 2 diabetes and risk for periodontal disease: a role for dental health awareness

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Abstract

Background: Several studies have found correlations between diabetes and an increased prevalence of periodontitis.

Objective: To analyse, in a group of subjects with type 2 diabetes (T2D), (i) the association between medical characteristics and severe periodontal disease and (ii) dental care habits and knowledge of oral health.

Methods: One hundred and ninety-one subjects with T2D were examined. Based on assessment of marginal bone height in panoramic radiographs, two periodontal subgroups were identified: one periodontally diseased (PD+) and one periodontally healthy (PD −) group. All subjects completed a questionnaire about their medical and oral health.

Results: Twenty per cent of the subjects were classified as PD+. This was verified by clinical parameters. PD+ individuals had higher haemoglobin A1c (HbA1c) levels ($p = 0.033$) and higher prevalences of cardiovascular complications ($p = 0.012$). They were also less likely to be of Scandinavian origin ($p = 0.028$) and more likely to smoke ($p < 0.001$) than the PD- group.

The PD+ group rated their oral health as poor ($p < 0.0001$) and believed that T2D had an influence on their oral status ($p < 0.0001$).

Conclusion: The best predictor for severe periodontal disease in subjects with T2D is smoking followed by HbA1c levels. T2D subjects should be informed about the increased risk for periodontal disease when suffering from T2D.

Key words: dental care habits; diabetes mellitus; periodontal disease; risk factor; smoking

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Type 2 diabetes (T2D) is a disorder characterized by chronic hyperglycaemia caused by impaired insulin secretion and action. In Sweden, about 3–4% of the population suffers from diabetes, and 90% of these from T2D (Andersson et al. 1991, Berger et al. 1998).

The pathogenesis and severity of periodontal disease differ between individuals (Loe et al. 1986). In Western countries, it has been estimated that approximately 35% of an adult population will develop periodontal disease (Hugoson et al. 1998, Albandar et al. 1999) whereas 10–15% will develop severe periodontitis (Brown et al. 1990, Hugoson et al. 1998, Albandar et al. 1999). Subjects with diabetes have a greater prevalence and severity of periodontal disease compared with subjects without diabetes (Hugoson et al. 1989, Emrich et al. 1991, Grossi & Genco 1998, Taylor et al. 1998, Soskolne & Klinger 2001). Hyperglycaemia has been ascribed a key role in the pathogenesis of periodontal disease (Tervonen & Knuuttila 1986), and individuals with poorly controlled diabetes have been found to be more susceptible to oral infections including periodontitis (Cianciola et al. 1982, Moore et al. 2000).

Good oral health is strongly dependent on attitudes and personal behaviour such as oral self-care (habits at home, regular dental visits) (Frandsen 1985). Spangler & Konen (1994) reported that patients with T2D and adequate oral hygiene were more prone to visit their dentist annually than T2D patients with poor oral hygiene. In a study by Moore et al. (2000) 55% of T1D were satisfied with their oral health situation.

The aim of this study was to analyse, in a group of subjects with T2D, (i) the association between medical characteristics and severe periodontal disease and (ii) dental care habits and knowledge of oral health.

Materials and Methods

Study subjects

During 2003–2004, 429 patients with T2D who were listed in a local diabetes registry (Diabetes Scania) and attending the Out-Patient Clinic at the Department

of Endocrinology, University Hospital Malmö, Malmö, Sweden, were asked if they wished to be referred to the Department of Periodontology, Centre for Oral Health Sciences, Malmö University, for a periodontal and radiographic examination. The majority of the registered patients came from the city of Malmö, and they accounted for about 25% of all diabetic patients in the region most of them listed at the department of Endocrinology, Malmö. At annual follow-ups, the assessment of metabolic control, signs of retinopathy, nephropaty, neuropathy, and macrovascular disease were recorded. For a more detailed description of the study population see Lindholm et al. (2001). Of the 429 patients contacted, 191 patients (44.5%) agreed to participate in the study. Ten patients were deceased, eight had moved, nine were edentulous, and 211 did not want to participate or were unable to attend for health reasons.

Interview Questionnaire

All individuals were interviewed at the time of the clinical examination using a questionnaire with closed questions. The participants were asked about dental care habits, oral hygiene habits, education levels, and smoking habits. All subjects were classified according to their smoking habits:

1. Non-smokers: subjects who had never smoked or had formerly smoked.
2. Smokers: subjects who smoked.

Periodontal examination

All individuals underwent a periodontal examination by one examiner. In total three different examiners (H.J., K.S., and S.C.) were involved in the investigation, and all had been calibrated for reproducibility before the study. The following variables were analysed in the present study:

Number of teeth. A root remnant was considered as a missing tooth.

Probing pocket depth (PPD). Only sites with probing depth $\geqslant 4$ mm were registered. Measurements were made at four sites for all teeth: mesiobuccal, midbuccal, distobuccal, and midlingual. Probing was performed with a calibrated periodontal probe (UNC-15, Hu-Friedy, Chicago, IL, USA) to the nearest mm (diameter of the probe tip was 0.5 mm, 1-mm increments).

Bleeding on probing (BoP). Full-mouth BoP was registered in conjunction with PPD. If bleeding arose on probing, the examined site was considered inflamed (Muhlemann & Son 1971).

Oral hygiene. After disclosure with erythrosine pellets (Rondell Red™, Astra Tech, Mölndal, Sweden), the percentage of surfaces with visible plaque was recorded on four surfaces (PlI %) of all teeth as described previously (Ainamo & Bay 1975).

Radiographic examination

Panoramic radiography was performed with the Scanora® (Soredex, Helsinki, Finland) multimodal radiography system using the screen/film combination Lanex medium/T-mat G (Eastman Kodak Co., Rochester, NY, USA). The Scanora® dental panoramic program 003 was used with voltage settings of 66 or 70 kV at 10, 13, 16, or 20 mA and exposure times of 15, 19, or 23 s. The vertical angulation of the tube was a constant -5°. The films were processed in an automatic processor (Curix HT-33OU, AGFA, Mortsel, Belgium) with a developing time of 2 min. The magnification factor in the resulting radiographs was 1.7 as referred to by the operating instructions for the X-ray equipment.

Marginal bone level was assessed by one independent observer (C.L.). In order to calculate intra-observer agreement the observer (C.L.) performed the assessments of the marginal bone level in panoramic radiographs twice, in 90 radiographs. The radiographs were randomly chosen by another author (H.J.) to represent an even distribution of patients who had been classified with different amounts of remaining marginal bone. The overall agreement between the two assessments was 85.5% and the κvalue (χ) was 0.79. A ruler originally constructed for measurements before implant treatment with corrections for the magnification factor was used. A classification into three different classes according to the amount of marginal bone loss around each remaining tooth was made:

- 0 = no loss of supporting bone tissue [periodontally healthy (PD −) group],
- 1 = horizontal loss of supporting bone tissue $\geqslant 1/3$ of the root length in $< 30\%$ sites,
- 2 = horizontal loss of supporting bone tissue $\geqslant 1/3$ of the root length in $\geqslant 30\%$ of the sites [periodontally diseased (PD+) group].

If the mesial or distal surface of a tooth was assessed as having a bone loss, the tooth as a whole was assessed as having a loss of supporting bone tissue.

Statistical analyses

For descriptive analyses, mean values and standard deviations were calculated based on the subject as the unit. Statistical analyses of differences between the PD − and the PD+ subgroups were performed on the entire sample with the use of Fisher's exact test; categorical variables; and the non-parametric test, the Wilcoxon rank-sum test for continuous variables. A linear regression model with periodontal disease as dependent variable was used for identifying factors associated with periodontal disease. Two-sided p-values < 0.05 were considered statistically significant. All analyses were made using the statistical software SAS (version 8.2 for WIN_PRO, SAS Institute Inc., Cary, NC, USA).

Ethical requirements

The Medical Ethics Committee of Lund University, Lund, Sweden, approved the study in accordance with the Helsinki Declaration. All patients gave their signed, informed consent before inclusion in the project.

Results

The prevalence of severe periodontitis, according to the radiographic criteria, was almost 20% in this group of T2D patients. Patient characteristics are described in Tables 1 and 2: age; gender; duration of diabetes; body mass index (BMI); haemoglobin A1c (HbA1c); blood pressure; medication; complications such as retinopathy, nephropathy, neuropathy, myocardial infarct, or stroke; education level; civil status; ethnicity; and smoking habits.

Compared with periodontally healthy individuals (PD −), individuals with severe periodontitis (PD+) had significantly higher HbA1c levels (7.1% *versus* 6.5%; $p = 0.033$), they had higher

Table 1. Clinical characteristics of patients with (PD+) and without (PD –) periodontal disease; mean values ± standard deviations

	n	Total sample	*n*	PD – group	*n*	PD+ group	*p*-value
N (females/males)		191 (83/108)		63 (26/37)		37 (16/21)	
Age (years)		55.0 ± 4.7		54.1 ± 5.1		55.6 ± 4.1	NS
Duration of diabetes	179	10.1 ± 6.5	60	9.2 ± 5.1	36	11.4 ± 8.8	NS
BMI (kg/m^2)	158	30.6 ± 5.1	52	30.2 ± 5.6	32	30.5 ± 4.6	NS
HbA1c (%)	180	6.7 ± 1.3	60	6.5 ± 1.2	36	7.1 ± 1.2	0.033
Systolic BP (mmHg)	160	139.6 ± 16.6	52	137.2 ± 14.4	33	140.8 ± 20.3	NS
Diastolic BP (mmHg)	159	80.7 ± 10.0	52	81.0 ± 9.2	33	81.8 ± 11.9	NS
Treated with diet only (%)	177	11	59	12	35	3	NS
Treated with oral antidiabetic agents (%)	177	81	59	80	35	94	NS
Treated with insulin (%)	177	49	59	47	35	57	NS
Retinopathy (%)	169	25	56	23	34	29	NS
Nephropathy (%)							
Microalbuminuri	169	22	56	28	34	17	NS
Macroalbuminuri		14		9		17	
Neuropathy (%)	121	47	40	48	23	48	NS
Myocardial infarct or stroke (%)	157	14	50	4	32	25	0.012

BMI, body mass index; BP, blood pressure; NS, not significant; HbA1c, haemoglobin A1c; PD+, periodontally diseased; PD –, periodontally healthy.

Table 2. Characteristics (%) of individuals with (PD+) and without (PD –) periodontal disease

		n	Total sample	*n*	PD – group	*n*	PD+ group	*p*-value
Education level	Compulsory school	191	34	63	30	37	35	
	Upper secondary school		44		37		43	NS
	Higher education		9		14		16	
	University degree		8		13		3	
	Other		4		6		3	
Civil status	Married	191	53	63	59	37	46	
	Separated		5		3		14	NS
	Cohabitant		12		8		14	
	Single		29		30		27	
Ethnicity	Scandinavian	180	64	60	73	36	50	0.0278
	Non-scandinavian		36		27		50	
Smoking	Non-smoker	189	62	62	79	37	43	
	Smoker		38		21		57	<0.001

NS, not significant; PD+, periodontally diseased; PD –, periodontally healthy.

prevalences of cardiovascular complications such as myocardial infarction or stroke (25% *versus* 4%; $p = 0.012$), they were less likely to be of Scandinavian origin (50% *versus* 73%; $p = 0.028$), and they were more likely to smoke (57% *versus* 21%; $p < 0.001$). There were no significant differences between the PD – and PD+ groups in age; gender; duration of diabetes; BMI; blood pressure; medication; complications such as retinopathy, nephropathy, and neuropathy; education level; and civil status.

In the entire sample, 70% had visited a dentist during the last year (Table 3); differences between the PD – (71%) and PD+ (65%) groups were non-significant. Seventy per cent of the entire sample claimed that the reason for visiting a dentist was a routine check-up; differences between the PD – (85%) and the PD+ (58%) groups were non-significant.

The self-reported frequency of cleaning the teeth was high. Approximately 92% of all patients brushed their teeth at least once a day and 51% cleaned approximally >3 times/week (e.g., tooth picks, proximal brushes, flossing, or any combination of these). Differences in tooth brushing and approximal cleaning between the groups were non-significant.

Oral health perceptions are presented in Table 3. Overall, 42% of the patients rated their overall oral health as good compared with 24% in the PD+ group and 51% in the PD – group. This difference was significant ($p < 0.001$).

Of the entire sample, 49% reported that they received dental care as often as they wanted compared with 35% in the PD+ group and 54% in the PD – group, but this difference was non-significant. The main reason for not visiting a dentist was reported to be the cost of dental care, followed by fear and anxiety, both in the entire sample as well as in the PD – and PD+ groups with non-significant differences between the two groups.

The mean values of the variables describing the clinical periodontal conditions are presented in Tables 4 and 5. The statistical analysis based on the entire sample (Table 4) revealed significant differences between the PD – and PD+ groups in the number of remaining teeth (26.0 *versus* 20.4), percentage with a PPD of 4–5 mm (11.3 *versus* 29.7), percentage with a PPD ⩾6 mm (1.0 *versus* 10.8), percentage with BoP (31.8 *versus* 54.0), and percentage with PlI (56.2 *versus* 69.7).

Table 5 lists the periodontal conditions of non-smokers and smokers in the PD – and PD+ groups. In all parameters, differences between non-smokers in these two groups were significant. Differences between the smokers in the PD – and PD+ groups in number of teeth, percentage with a PPD of 4–5 mm, percentage with a PPD ⩾6 mm, and percentage with BoP were significant. For percentage PlI, however, differences between smokers in the PD – (52.2%) and smokers in the PD+ (63.3 %) groups were not significant. No significant differences were observed between non-smokers and smokers in the PD – group as well in the PD+ group.

The responses to three questions about oral health knowledge are presented in Table 6. The majority of the patients in the PD – and the PD+ groups (79% *versus* 91%, respectively) reported that their dentist knew that they had diabetes. This difference was non-

Table 3. Oral health behaviours and perceptions for patients with (PD+) and without (PD-) periodontal disease (in %)

		n	Total sample	*n*	PD − group	*n*	PD+ group	*p*-value
Visited the dentist in the last year		191	70	63	71	37	65	NS
Reason for last visit	Check-up	191	70	63	85	37	58	
	Emergency treatment		9		4		8	
	Restoration		16		9		17	
	Periodontal therapy		5		2		17	
Tooth brushing frequency	Less than once/day	191	8	63	8	37	8	
	Once/day		20		25		14	NS
	Twice/day		57		53		73	
	Greater than twice/day		15		14		5	
Use of approximal cleaning >3 times/week		191	51	63	54	37	51	NS
Rating of overall oral health of the teeth,	Very good	189	6	63	11	37	0	
gingivae, and oral cavity	Good		36		40		24	<0.0001
	Fair		33		32		22	
	Poor		16		16		22	
	Very poor		9		2		30	
Do you feel that you get dental care as often as you should?	Yes	191	49	63	54	37	35	NS
If no, what is the reason you do not visit	Fear or anxiety	191	21	63	14	37	25	
the dentist more often?	Costs too much		75		76		79	
	Have no time		10		7		8	
	Get tired of doctors' appointments		2		4		0	
	Do not like my dentist		1		0		0	
	Other		6		7		0	

NS, not significant; PD+, periodontally diseased; PD − , periodontally healthy.

Table 4. All individuals ($n = 191$)

	PD − group ($n = 63$)		PD+ group ($n = 37$)		*p*-value
	mean	SD	mean	SD	
Number of teeth	26.0	4.0	20.4	6.4	<0.0001
%PPD 4–5 mm	11.3	11.2	29.7	17.1	<0.0001
% PPD⩾6 mm	1.0	2.0	10.8	10.6	<0.0001
%BoP	31.8	17.8	54.0	27.2	<0.0001
%PII	56.2	22.8	69.7	29.5	0.0083

Mean values and standard deviations (SD) for patients with (PD+) and without (PD −) periodontal disease. PPD, probing pocket depth; BoP, bleeding on probing; PII, plaque index.

significant. On the other hand, 66% of the patients in the PD+ group recognized that their diabetes might affect their oral health compared with 18% of the PD − group. This difference was significant ($p < 0.0001$). Only 13% in the PD − group and 29% in the PD+ group claimed that they had been informed by a health care professional that they should perform adequate oral hygiene and obtain routine dental care because of their T2D. This difference was non-significant.

Table 7 presents the linear regression analysis model aimed to find predictors of severe periodontal disease. Smoking seems to be the most important variable in estimating severe periodontal disease ($p = 0.0016$). The Hba1c level is important as well ($p = 0.0034$), and maybe the subjects own opinion of their overall oral health, the teeth, gingivae, and oral cavity as well, but not statistically significant ($p = 0.0566$).

Discussion

The key findings of the present study were that patients with T2D and periodontitis (PD+) had worse glycaemic control, as indicated by higher concentrations of HbA1c and more cardiovascular complications. In addition, more of the PD+ than the PD − patients were smokers.

The prevalence of severe periodontitis in the entire group was somewhat higher compared with in a general population, as described by Brown et al. (1990) and Hugoson et al. (1998), who found prevalences of 8% and 13%, respectively. Our results, however, are similar to those of Hugoson et al. (1989), who found a prevalence of 18–23% periodontitis in a population of subjects with T1D, with an age range of 20–70 years. Thorstensson & Hugoson (1993) reported a prevalence of 28.5% in T1D patients with an age range of 40–69 years. T1D is beginning to occur in younger individuals (Laakso & Pyörälä 1985), and this could be an explanation for the difference between our study and the study of Thorstensson & Hugoson (1993).

In our study, we found no statistical difference between the PD+ and PD − groups in age, gender, education level, civil status, and duration of diabetes. This contrasts with the findings of Paulander et al. (2004) who found differences between patients with and without periodontitis concerning gender and education level. The difference between our study and the study of Paulander et al. could be due to the different populations investigated, because Paulander et al. (2004) described a general population which cannot be compared with our group of T2D subjects. In our study, however, significantly higher levels of HbA1c were observed in PD+ than in PD − subjects. This agrees with the results of (Tervonen & Knuutila (1986) and Tsai et al. (2002). Interestingly, Bridges et al. (1996) found no correlation between glycaemic control and periodontal status, although an asso-

Table 5. Comparison of periodontal variables between non-smoking and smoking individuals according to periodontal health

Variable	PD− group ($n = 62$)		PD+ group ($n = 37$)		*p*-value			
	Non ($n = 49$)	S ($n = 13$)	Non ($n = 16$)	S ($n = 21$)	Non *versus* S in PD− group	Non *versus* S in PD+ group	Non in PD− group *versus* Non in PD+ group	S in PD− group *versus* S in PD+ group
Number of teeth	26.2 ± 4.0	25.5 ± 4.0	21.3 ± 7.1	19.7 ± 5.9	NS	NS	0.0085	0.0080
%PPD 4–5 mm	11.1 ± 11.6	12.0 ± 10.5	31.0 ± 16.2	28.8 ± 18.1	NS	NS	0.0001	0.0047
%PPD ⩾ 6 mm	1.08 ± 2.2	0.8 ± 1.2	10.8 ± 8.4	10.8 ± 12.2	NS	NS	<0.0001	0.0065
%BoP	33.6 ± 17.7	25.2 ± 18.1	62.8 ± 26.1	47.3 ± 26.7	NS	NS	0.0002	0.0199
%PlI	58.0 ± 23.0	52.2 ± 21.2	78.0 ± 27.0	63.3 ± 30.3	NS	NS	0.0056	NS

Mean values and standard deviations (SD) for patients with (PD+) and without (PD −) periodontal disease. Non, non-smoking; S, smoking; PPD, probing pocket depth; BoP, bleeding on probing; PlI, plaque index; NS, not significant.

Table 6. Diabetic subjects response to three oral health knowledge questions in %

Question	Response	*n*	Total sample	*n*	PD − group	*n*	PD+ group	*p*-value
Does your dentist know that you have diabetes?	Yes	186	82	62	79	34	91	
	No		11		13		3	NS
	Not sure		7		8		6	
Do you believe that your oral health would be better if you did not have diabetes?	Yes	186	32	61	18	35	66	
	No		27		44		11	<0.0001
	Not sure		41		38		23	
Have you ever been told that you should be extra careful to brush, floss, and see a dentist or dental hygienist often because you have diabetes?	Yes	183	28	61	13	34	29	
	No		68		85		65	NS
	Not sure		4		2		6	

NS, not significant.

Table 7. Regression analysis with the classification of periodontal disease as dependent variable

Variable	Parameter estimate	*p*-value
Smoking	0.3361	0.0016
HbA1c	0.0769	0.0034
Rating of overall oral health of the teeth, gingivae, and oral cavity	0.1413	0.0566
Does your dentist know that you have diabetes?	−0.1371	0.1604
Education	−0.0969	0.1944
Age	0.0218	0.2031
Do you believe that your oral health would be better if you did not have diabetes?	−0.1016	0.2277
BMI	−0.0104	0.4709
Duration	−0.0083	0.5626
Have you ever been told that you should be extra careful to brush, floss, and see a dentist or dental hygienist often because you have diabetes?	0.0479	0.7163

BMI, body mass index; HbA1c, haemoglobin A1c.

ciation was found between periodontal disease and diabetes.

In the present study, cardiovascular complications such as myocardial infarct or stroke were found in significantly higher proportions in PD+ compared with PD − subjects. This agrees with the findings of Thorstensson et al. (1996). Both periodontal disease and cardiovascular disease (CVD) have several risk factors in common such as smoking, stress and diabetes (Beck 1998). Two hypotheses have been proposed regarding the etiological association between periodontal disease and CVD. One hypothesis may be the chronic infection and another systemic inflammatory mediators. The result from the present study confirms an association between periodontal disease, CVD, and T2D, but it is not clear whether it is a causal association.

Our results also confirm previous findings of a relationship between smoking and periodontal disease (Bergstrom & Eliasson 1987, Holm 1994). The findings of Orbak et al. (2002) and Syrjala et al. (2003) agree with those of the present study. Orbak et al. (2002) studied the influence of smoking and T2D on periodontal disease. They found that periodontitis was more severe in subjects with T2D compared with non-diabetics. They also reported the periodontal condition to be more pronounced in smokers compared with non-smokers in this group of subjects.

Syrjala et al. (2003) reported that patients with T1D and poor metabolic control together with smoking were extremely prone to attachment loss. Interestingly, Thorstensson et al. (1996), did not observe any association between smoking and periodontal disease in T1D subjects.

Overall, 32% of the subjects in our study thought that their diabetes had some influence on their oral health status – 66% in the PD+ and 18% in the PD − group. The response of the PD − group is similar to the findings of Sandberg et al. (2001) and Moore et al. (2000). The information about dental care given to the PD+ and PD − groups was similar, which is in accordance with Moore et al. (2000). Our results showed that 65% in the PD+ group had visited a dentist within the last year *versus* 71% in the PD − group. These frequencies are similar to those reported by Thorstensson et al. (1989) and Moore et al. (2000).

In our study, 92% of all patients in the PD − and PD+ groups reported a tooth brushing frequency of greater than once a day. This is similar to the finding of

Sandberg et al. (2001), who reported a daily tooth brushing frequency of 91.3%. The same pattern can be seen with the frequency of using approximal cleaning aids. In our study, 51% of the patients reported that they used approximal cleaning aids regularly and in the study by Sandberg et al. (2001), 52% claimed to be active users of approximal cleaning aids.

Forty-two per cent in the present study were satisfied with their teeth and mouths. This agrees with Moore et al. (2000) who reported that almost 55% were satisfied. On the other hand, our result differs from the observation of Sandberg et al. (2001), who reported that approximately 83% of their patients were satisfied. This could be due to differences in ages, 55 *versus* 67 years, or because the subjects in our study belonged to an urban population and those in the study of Sandberg et al. to a rural population.

In the present investigation, PD+ subjects had fewer numbers of remaining teeth and a higher proportion were smokers. This agrees with Paulander et al. (2004), who reported an association between severe periodontal disease and a reduced number of teeth on the one hand and cigarette consumption on the other.

In the present study, 91% of the PD+ individuals reported that their dentists knew about their diabetes compared with 79% in the PD− group. This is in accordance with Moore et al. (2000), where the corresponding figure was 89% in subjects with T1D. Interestingly, Sandberg et al. (2001) studied 102 T2D individuals and only 52% reported that their dentist knew about their diabetes.

The two subgroups were selected on the basis of the radiographic examination. Pitiphat et al. (2004) concluded that in epidemiological studies, valid assessments of the stage of periodontal disease can be determined from pre-existing radiographs. Clinical examinations confirmed the radiographic findings.

In conclusion, the best predictor for severe periodontal disease in subjects with T2D is smoking followed by HbA1c levels. Therefore, many of the risk factors for periodontitis in patients with T2D are preventable. T2D subjects should be informed about the increased risk for periodontal disease when suffering from T2D and that smoking is a strong risk factor for both T2D and periodontal disease. Finally, diabetic patients seem to lack sufficient knowledge about oral health complications.

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Clinical Relevance

Scientific rationale for study: A relationship between periodontitis and diabetes has been reported.

Principal findings: Twenty per cent of the patients with T2D were classified as periodontally diseased (PD+). These individuals had a higher Haemoglobin A1c (HbA1c) level and a higher prevalence of cardiovascular complications and were more likely to smoke compared with periodontally healthy (PD−) T2D subjects.

Practical implications: Subjects with T2D should be informed about the risk of periodontitis and smokers with T2D about the increased risk of periodontal problems. Individuals with T2D should be offered an individualised dental recall programme to prevent periodontal disease.