

## Diabetes Mellitus and Periodontal Disease: A Pilot Investigation Into Patient Awareness Of Glycated Haemoglobin Levels And Periodontal Screening Scores And Their Associated Risk Factors In General Dental Practice

Research Article

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### Abstract

The two-way inter-relationship between diabetes mellitus and periodontitis, with each disease affecting the other and vice versa, is well established, although the cause is still under investigation and may be related to chronic infection.

People living with diabetes are at 3 to 4 times higher risk of developing periodontitis than non-diabetics, rising to 10 times if they smoke. When periodontitis is controlled, there is an improvement in glycaemic control. However, doctors and dentists may not be sharing their screening results with each other and with their patients despite recent calls for better inter-professional working.

Dentists and their teams should review their medical history forms to include a question about their patients' glycated haemoglobin level, as this is a risk factor for the progression of both medical and dental complications associated with diabetes mellitus.

The present pilot study investigated patients' knowledge of their glycated haemoglobin levels, if known, and reviewed their dental status using Basic Periodontal Examination scores, the UK equivalent of CPITN.

**Keywords:** Diabetes; Periodontitis; Risk Assessment; Medical History.

### Introduction

The relationship between diabetes mellitus (DM) and periodontitis (PD) is well established as a bidirectional interaction [1]. The diseases are linked, although the pathophysiological mechanism of the relationship is still under investigation [2]. There is a common pathogenesis. This is caused by the chronic effects of hyperglycaemia involving an enhanced inflammatory response at both local and systemic levels [3]. Toxic products from gram-negative organisms in mature plaque stimulate an inflammatory response in the periodontium. It is the severity of the hyperglycaemia that affects the periodontium most [4].

People with DM have a three to four times greater risk of developing PD than non-diabetics, rising to ten times greater for

smokers [5].

In the UK in 2022, The National Institute for Clinical Excellence (NICE) recommended medical practitioners to advise their patients with diabetes mellitus that they are at greater risk of developing periodontitis than non-diabetics and that successful periodontal maintenance improves glycaemic control [6, 7].

There have been calls for better interprofessional education and collaboration between doctors and dentists to provide more seamless healthcare for these patients [8, 9]. Both parties must know their screening results and how risks can be quantified. These risks have been associated with HbA1c glycated haemoglobin levels for medical risks (Table 1) and a Basic Periodontal Examination (BPE), the UK version of the Community Periodontal Index

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of Treatment Needs (CPITN)[10] scores for dental risks (Table 2) using a traffic light method of risk analysis [11, 12].

If more seamless care is to be achieved, dentists will need to ask for HbA1c levels from diabetic care teams, have additional information on their medical history forms and share their BPE results with these teams. A form has been developed for this purpose and for patients to keep and show their respective health care professionals [11].

**Material and Methods**

A pro forma (Table 3) was developed to ask patients if they knew their HbA1c score, when they last had their annual medical check, and whether they were type 1 or type 2 diabetics to check against their medical risk, as determined from Table 1. Their last two successive CPITN scores were recorded, and the highest sextant score was taken and then compared. If there was no change the periodontal status was considered to be stable, an increase in score deterioration, or a decrease in the score improvement using the criteria detailed in Table 2.

Individual oral hygiene performance and plaque control were not reviewed.

**Results**

Twenty-five successive patients of SJG attending a general dental practice in Cirencester were recruited into the study, 14 males and 11 females, and placed into age categories 20-40, 40-60, and over 60. No patients were in the 20-40 year-old group. Two 40-60 year-old males were type 1 diabetics. For females, there was one patient in each of the 40-60 and over 60 year-old age groups (Table 4).

Responders recorded their HbA1c levels using either percentage or mmol.mol scores. Four male and three female patients were unaware of their HbA1c levels. Ten patients, five male and five female, had scores below the ideal (green) 6.5 per cent. Two males and two females were in the amber group, and two males and one female patient were in the highest risk (red) category with HbA1c levels greater than 8.5 per cent (Table 5). Three patients had not had recent annual medical reviews.

When BPE risks were assessed, none of the study group of pa-

**Table 1. HbA1c levels and medical risks.**

<b>percentage</b>	<b>&lt; 6.5</b>	<b>6.5 – 8.5</b>	<b>8.5&gt;</b>
mmol/mol	< 48	48 – 69	69 >
mmol/L	< 7.8	7.8 – 10.9	10.9 >
<b>Risk factor</b>	Low, green	Moderate, amber	High, red

**Table 2. Periodontal risk factor.**

<b>Highest sextant score</b>	<b>0 or 1</b>	<b>2 or 3</b>	<b>4 or 4*</b>
Risk factor	Low, green	Moderate, amber	High, red

**Table 3. Market Square Dental Practice.**

As one of our diabetic patients, we are updating the information we hold confidentially for you. Could you please complete this form for us.

Name.....

Male/Female    date of birth.....

Are you a Type 1 diabetic or a Type 2 diabetic?

When did you last have your annual doctor's check-up?    Month.....    Year.....

What was your HbA1c % score then?.....

I do not know my score.....

**For office use**

Age band under 20, 20-40, 40-60, over 60

Last BPE scores

Previous BPE scores

Improving, stable, deteriorating

**Table 4. Respondents by age, gender and type of diabetes mellitus.**

	<b>MALE</b>		<b>FEMALE</b>	
<b>AGES</b>	<b>40-60</b>	<b>over 60</b>	<b>40-60</b>	<b>over 60</b>
Type 1	2		1	1
Type 2		12	2	7

**Table 5. Respondents by age, gender and HbA1c levels.**

	MALE		FEMALE	
AGES	40-60	over 60	40-60	over 60
<6.5%		5	3	2
6.5-8.5%	1	2		2
>8.5%	1	1		1
Not known		4		3

**Table 6. Respondents by age, gender and highest sextant score.**

	MALE		FEMALE	
AGES	40-60	over 60	40-60	over 60
0 – 1				
2 – 3	2	8	1	6
4 or 4*		4	2	2

**Table 7. Respondents by age, gender and periodontal stability.**

	MALE		FEMALE	
AGES	40-60	over 60	40-60	over 60
Improving			1	
Stable	1	7	2	5
Deteriorating	1	5		3

**Table 8. A revised periodontal risk assessment protocol.**

Highest sextant score	0 , 1 or 2	2 *or 3	4 or 4*
Risk factor	Low, green	Moderate, amber	High, red

tients had a low, green risk for periodontal disease with scores of either 0 or 1. The majority, ten males and seven females had scores of 2-3, amber risk, and four males and four females scored 4 or 4\*, red risk (Table 6).

Only one female patient in the 40-60 age group had an improving periodontal status. The majority, eight males and seven females, were stable, and six males and three females had deteriorating (red) periodontal status (Table 7).

This study identified one male 40-60 year-old Type 1 diabetic with the highest (red) HbA1c risk and a deteriorating periodontal status. One over-60-year-old female was similarly identified as at most significant risk, and she is now deceased.

**Discussion**

HbA1c levels have been variously described using percentages and mmol/mol (Table 1). The latest recommended scoring system is mmol/L. While percentages are perhaps the easiest for patients to understand, there is an urgent need for the medical profession to have a single, standardised scoring method to prevent confusion and to create a clearer picture for their dental colleagues.

Doctors and their teams need to ensure that their patients living with diabetes have and understand the significance of their gly-cated haemoglobin levels. In this study, two male and one female

patient were in the highest (red) risk group. As both medical and dental risks have increased, it is suggested that controlling periodontal disease in these individuals will be harder until their medical treatment improves.

Three patients had not been attending for the recommended regular annual medical reviews. They were advised that this is an important part of their care and an area where medical and dental collaboration should improve patient outcomes [8, 9]. Dentists are encouraged to take more detailed medical histories for their diabetic patients as part of this process [13].

Most patients, seventeen, had CPITN scores of 2-3 (amber risk) and were considered stable. However, this category may give a false impression about the actual periodontal status. Score 2 is ascribed to calculus, whether supra- or sub-gingival, and score 3 to periodontal pockets of up to 5.5mm in depth. It has been proposed that score 2 is too generalised to evaluate the significance of calculus properly [11]. For example, a small quantity of supra-gingival calculus around the lingual surfaces of lower incisor teeth with score 2 and place a patient in a higher risk group than the true clinical presentation would merit. Therefore, score 2 is too wide a band and should be changed to 2, supra-gingival and 2\* subgingival calculus. The risk categories would then change to 0, 1, 2 (green, low risk), 2\*, and 3 (amber risk), a truer reflection of dental health. A revised periodontal risk form is proposed (Table 8) and is downloadable at [www.chooseabrush.com](http://www.chooseabrush.com).

This pilot study also suggests that it is important that people living with diabetes have regular dental care and that this underlying disease is making it harder to achieve periodontal control compared with non-diabetic patients.

## Conclusions

The medical profession urgently needs to standardise the HbA1c score using one method, not three.

Patients who have not been attending for annual checks have been identified.

As dentists ask for more information in medical histories for people living with diabetes mellitus, they will be able to identify those who are at greatest risk, as shown by high (red) HbA1c levels, as they are likely to be less responsive to periodontal improvement.

Dentists need to share their CPITN results with patients as a matter of routine and could use a previously developed pro forma for this purpose.

To better identify periodontal risks and treatment needs, the Category 2 CPITN score should be divided into supra- and subgingival categories.

Better information sharing between medical and dental teams requires a paradigm shift in thinking and action.

## Declaration of Interest

Dr Turner is the designer of the Chooseabrush® method of

plaque control.

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