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Screening for Diabetes in Odontogenic Infections – A Pilot Study

Anand L, Sealey C

Abstract

Aims: To investigate the value of screening for Type 2 Diabetes Mellitus (T2DM) in adult patients admitted under the Oral and Maxillofacial Surgery (OMFS) unit at Middlemore Hospital with odontogenic infections.
Methods: This pilot study was carried out prospectively, over a six month period, from January to July 2015. All adults admitted under the care of the OMFS unit at Middlemore Hospital with odontogenic infections were screened for HbA1c.
Results: Sixty-six patients were recruited. The New Zealand Guidelines Group (NZGG) criteria were used to determine the diagnosis of diabetes. Of the sixty-six patients, four had previously undiagnosed pre-diabetes and one had previously undiagnosed T2DM. Six patients had known T2DM and, of these, three had poorly controlled glucose levels.
Conclusions: This pilot study demonstrates the value of opportunistic screening for diabetes in patients presenting with odontogenic infections. A larger prospective study is planned. If the results are confirmed, routine screening will be recommended on an on-going basis.

Introduction

Type 2 Diabetes Mellitus (T2DM) in the Counties-Manukau District Health Board (CMDHB) region is a health issue that demands our attention. It continues to increase in prevalence and consumes significant health resources. Reducing the burden of T2DM requires a concerted effort from health professionals across a range of services.

The CMDHB catchment area is multiethnic with a high proportion of Maori, Pacific Island and Asian peoples.[1] Census information has shown a significant proportion of the CMDHB population live in socio-economic deprivation.[2] Poor oral health is prevalent in Maori and Pacific people and those who live in more deprived areas.[3,4]

Maori, Pacific and Asian populations have higher rates of diabetes, as do those who live in socioeconomically deprived areas.[5] The prevalence of diabetes is higher in Auckland than elsewhere in New Zealand, and higher in the CMDHB catchment than in other parts of Auckland.[4]

There is a well known association between poor diabetic control and infection[6,7]. A significant number of patients admitted to the Oral and Maxillofacial Surgery (OMFS) unit at Middlemore Hospital have odontogenic infections requiring intravenous antibiotics. A proportion of these patients also require surgical drainage.

This prospective pilot study set out to evaluate the benefit of routinely testing HbA1c in all patients admitted to hospital with odontogenic infections. Prevention and early diagnosis of T2DM is the best way of minimizing long-term complications.

Using opportunistic screening we set out to identify new cases of pre-diabetes and T2DM. For patients with a known diagnosis of T2DM, a HbA1c test would allow us to assess current diabetic control.

The cost of HbA1c screening needs to be considered. By undertaking a six month pilot study we aimed to determine the merit of a larger scale study, and ultimately, if routine HbA1c screening for patients presenting to hospital with odontogenic infections was justified.

Method

All adults (defined as > 18 years old), admitted consecutively under the OMFS unit, Middlemore Hospital, with an odontogenic infection, between January 2015 and July 2015, were invited to participate. The department at Middlemore accepts maxillofacial admissions from all the neighbouring hospitals in the Auckland area – Auckland, North Shore, and Waitakere Hospital, as well as from General Practitioners (GP). It also accepts self-referrals.

At the time of admission, all patients were informed about the study, the benefits and risks of testing for T2DM, and what follow-up would be required should they fall into either the pre-diabetic category or have a new diagnosis of T2DM. Consent was obtained and patients were tested for HbA1c at the same time as they had their routine blood tests.

HbA1c values were grouped according to the New Zealand Guidelines Group (NZGG) Diabetes guidelines[8] into the following: Diabetes, Pre-diabetes, and Diabetes unlikely (Table 1).

Patients who had a diagnosis of pre-diabetes or T2DM were counselled regarding their result by either a member of the maxillofacial or medical team, and the patient's GP was informed. The responsibility for follow up testing and further risk assessment was deferred to the patient's GP.

This study was given ethical approval by the Health and Disability Ethics Committee .

The Counties-Manukau DHB Research Committee approved this study.

Results

Sixty-six adult participants were enrolled over the six-month period. Of the sixty participants with no previous diagnosis of T2DM, four were found to be pre-diabetic, and one was found to have T2DM. Of the six patients with existing T2DM, three were found to have suboptimal glucose control.

Our results are presented in Table 2.

Discussion

T2DM is a chronic illness that places a significant burden on our healthcare system. There needs to be an emphasis on prevention and early disease detection.

Pre-diabetes is intermediate stage in the diabetic spectrum – between normal glucose levels and hyperglycaemia. The pre-diabetic diagnosis is significant; diabetic complications such as microvascular disease (including neuropathy and nephropathy) and macrovascular disease (coronary artery disease, stroke, peripheral arterial disease) have been found soon after diagnosis[9,10].

T2DM, the most common form of diabetes, is characterised by excess glucose in the bloodstream due to insulin resistance. Hyperglycaemia and hyperinsulinaemia causes suppression of neutrophil function (chemotaxis, reactive oxygen generation and phagocytosis), and impaired elimination of bacteria.[11] This places diabetics at an increased risk of infection.[12]

The OMFS department is in a position to establish the diabetic status of patients presenting with odontogenic infections. The goal of this pilot study was to determine

Table 1. Recommended guidelines for diagnosis of diabetes

HbA1c Result	Glucose Equivalent	Diagnosis	Comments
50 mmol/mol, with symptoms	7.0 mmol/L with symptoms	Diabetes	
50mmol/mol, no symptoms	≥ 7.0 mmol/L, no symptoms	Diabetes	A second HbA1c test ≥ 50mmol/mol is required to confirm the diagnosis
41-49 mmol/mol	6.1 – 6.9 mmol/L	Pre-Diabetes	Offer lifestyle advice. Perform cardio-vascular disease (CVD) risk assessment and follow guidlelines for treatment of risk. Repeat tesing of HBA1c every 6-12 months.
40 mmol/mol	6.0mmol/L	Diabetes unlikely	Normal range. Repeat HBA1c at next CVD assessment or when clinically indicated.

Table 2. Demographic and Diabetes Data

	No Diabetes	Pre-Diabetes	New Diagnosis	Existing Diabetes
Age (years)				
18-30	25	0	1	0
30-49	20	2	0	2
50-65	9	0	0	4
>65	1	2	0	0
Total	55	4	1	6
Gender				
Male	25	2	0	3
Female	30	2	1	3
Total	55	4	1	6
Ethnicity				
NZ European	32	3	0	1
Polynesian	10	1	0	1
Maori	4	0	1	2
Indian	4	0	0	0
Asian	2	0	0	1
Other	3	0	0	1
Total	55	4	1	6

if there was value in routinely testing this group of patients. It may identify new cases of pre-diabetes and T2DM. Routine testing also provides an opportunity to review the diabetic control of those patients who are already known to have T2DM. HbA1c is a sensitive and established test for diabetes. The HbA1c test costs approximately $11.40.[13] This pilot study set out to determine if routine HbA1c testing in a larger sample size was justified.

Our pilot study diagnosed four new cases of pre-diabetes and one new case of T2DM, as defined by the NZGG guidelines (Table 1), in a cohort of 66 patients.

The four patients that were found to have pre-diabetes in our study were counselled and offered lifestyle advice. Their GPs were notified.

A number of patients in our study were found to be close to the threshold for pre-diabetes. Two of these, on repeat testing after leaving the hospital, fell into the pre-diabetic category. If these had been included, a total of six patients (10%) of our cohort would have fallen into the pre-diabetic group without prior diagnosis.

There was one new diagnosis of T2DM within our sample, with a follow-up HbA1c test by the patient's GP confirming the diagnosis.

From the six patients with an existing diagnosis of T2DM, only three had adequately controlled glucose levels according to the NZGG guidlelines . Prior to discharge their medication regime was reviewed by the medical team and discussed with the patient's GP.

A number of studies have investigated the association between diabetes and odontogenic infections. Ueta et al [14] conducted a five year retrospective study on the prevalence of diabetes in patients with odontogenic infections. T2DM was detected in five of 21 patients with severe odontogenic infections, and five of 221 patients with mild odontogenic infections. Severe infection was defined as involving multiple maxillofacial regions and requiring at least nine days antibiotic therapy. In patients with T2DM, white cell count (WBC), C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were noted to be higher than in non-diabetics. Neutrophil function was found to be suppressed in the diabetic patients, suggesting a predisposition to severe odontogenic infections. Jang et al [15] evaluated the impact of HbA1c levels in diabetic patients with maxillofacial space infections. This retrospective study found that patients with odontogenic infections who had poorly controlled diabetes, with elevated HbA1c values, displayed more elevated WBC and CRP levels, had a longer hospitalisation stay and had more clinically severe infections than patients who were non-diabetics. Rao et al [16]conducted a four year prospective study comparing maxillofacial space infections in diabetic and non-diabetic patients. Glycaemic control was achieved in the diabetic group. Both groups were managed with empiric antibiotics and surgical drainage where required. Satisfactory resolution of infection occurred in both groups.

Our pilot study confirms that there is a high incidence of undiagnosed pre-diabetes and T2DM within the CMDHB catchment area. Almost 10% of patients presenting with odontogenic infections were previously undiagnosed pre-diabetics. One patient (1.5% of patients presenting with odontogenic infections) had undiagnosed T2DM. The HbA1c test is simple and relatively inexpensive. Screening patients with odontogenic infections for diabetes may result in important early diagnosis, with the potential to improve health outcomes for individuals and for the community. Significant cost savings may result. We propose to extend this study for a further 12 months. If the findings are confirmed, routine HbA1c screening for our patients with odontogenic infections will be implemented.

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Author Information:

Lanit Anand corresponding author- Lanit.anand@hotmail.com
Oral and Maxillofacial Registrar, Oral Health Department, Middlemore Hospital, Auckland, New Zealand

Christopher Sealey
Oral and Maxillofacial Surgeon, Oral Health Department, Middlemore Hospital, Auckland, New Zealand