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Type 2 diabetes mellitus and periodontitis: Are diabetic patients aware about this bidirectional association?

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INTRODUCTION

Periodontitis is a highly prevalent chronic disease involving tooth-supporting tissues that leads to a systemic low-grade chronic inflammatory state, and thus it has been associated with many systemic diseases [1]. Substantial evidence supports the bidirectional relationship between periodontitis and type 2 diabetes mellitus (T2DM). Periodontal inflammation negatively affects glycaemic control and increases the risk for T2DM complications; conversely T2DM enhances the risk for periodontitis initiation and progression [2]. Hence, periodontitis has been recognized as the sixth complication of T2DM.

Considering this close relationship, mutual collaboration between medical and dental practitioners is fundamental for providing a successful prevention and an integrated treatment for both commonly prevalent diseases. Nevertheless, only a minority of diabetic patients regularly have visited a dentist [3,4]. Therefore, the aim of this cross-sectional study was to assess the awareness of such association and the attitude towards oral health among T2DM patients of an Outpatient Centre in Northern Italy.

METHODS

This study included 104 Caucasian adults with T2DM aged 40-80 years, consecutively enrolled from among 343 patients attending the Diabetes Centre of San Giovanni Antica Sede Hospital, Turin (Italy) from March 2018 to July 2019. Inclusion criteria were: at least 8 teeth and diabetes laboratory tests within the previous 6 months. Exclusion criteria were: periodontal therapy in the past 6 months, intake of drugs known to affect gingival tissues, and diagnosis of systemic diseases (i.e. HIV, liver/kidney failure excluding diabetic nephropathy, chronic obstructive pulmonary disease). The study protocol was approved by

the Ethics Committee and participants provided written informed consent.

Patients completed a self-administered questionnaire on the awareness of the T2DM-to-periodontitis association, sociodemographic characteristics, lifestyle habits and oral hygiene behaviour. Data on medical history (familiarity, onset, duration, chronic complications, current medications for T2DM), results of laboratory tests performed in the last diabetic visit (HbA1c level, lipid profile, urine analysis, creatinine, hs-CRP) and physical measurements (BMI, WC, systolic and diastolic blood pressure) were collected by two diabetologists. A single dentist conducted a full-mouth periodontal examination.

Periodontal status was established using case definitions for severe and moderate periodontitis agreed upon by the Centres for Disease Control and Prevention/American Academy of Periodontology.

Data were analysed using SPSS software (version 26.0, Chicago, IL, USA). Continuous variables were summarized as means $\pm$ SD and categorical variables as percentages. Awareness of the association between periodontitis and T2DM was the outcome variable. A patient was considered aware of such relationship if he answered "yes" to the following question: "Do you know that there is a link between diabetes and periodontitis and that diabetes exerts negative effects on gingival health and vice versa?" The $\chi2$ test was used to evaluate any association between categorical and outcome variables and the unpaired Student's t-test to assess differences of quantitative variables between aware and unaware groups. A multiple logistic regression model was developed to identify predictors of awareness of T2DM-to-periodontitis association. Data were presented as the adjusted odds ratio (OR) and 95% confidence intervals (CI). $P < 0.05$ was considered statistically significant.

RESULTS

Of the study participants 26% were aware of the association. Inadequate glycaemic control (HbA1c ≥ 7%) was detected in 63.5% of T2DM patients. As shown in the bivariate analysis (Table 1), there was a statistically significant association of the outcome variable with duration of diabetes ($p = 0.026$), familiarity for diabetes ($p = 0.028$) and poor metabolic control ($p = 0.017$). A statistically significant association was also verified for regular use of interdental devices ($p = 0.025$), frequency of toothbrushing ($p = 0.39$), and frequency of dental visits and scaling sessions (both $p < 0.001$). Although 91% of participants had severe or moderate periodontitis, awareness was not related to their periodontal conditions.

Table 2 presents the results of logistic regression analyses adjusted for age and gender. Patients with HbA1c ≥ 8% (OR = 4.312, $p = 0.015$), familiarity for diabetes (OR = 4.171, $p = 0.044$) and suffering from T2DM for at least 10 years (OR = 4.304, $p = 0.032$) were more likely to be aware of the periodontal health complications of their disease. Higher compliance to oral hygiene (OR = 7.287, $p = 0.002$) and regular attendance to dental check-ups (OR = 6.412, $p = 0.004$) increased the odds of being aware.

DISCUSSION

Both T2DM and periodontitis are highly prevalent inter-related chronic diseases with high costs for the public health-care system. Current study was undertaken to estimate the extent of awareness about periodontitis in T2DM patients in a diabetic centre in Northern Italy. Although most of the participants suffered from periodontitis and had inadequate metabolic control, only a quarter of them were aware of the negative effects of T2DM on periodontal health and vice versa. Uncontrolled diabetes with poor glycaemic control is an established risk factor for severe periodontitis. On the other hand, the treatment of periodontitis improves glycaemic control [5]. This low awareness can be due to failure of the information from medical and dental practitioners and to the lack of interaction between them [3,4]. Awareness appears to be related to a longer duration of T2DM, familiarity for T2DM and frequency of dental visits suggesting that patients who attend more often medical or dental offices may have had more opportunities to receive information. Furthermore, patients with longer disease may be more concerned about their medical condition.

In conclusions, the present study brings into the focus the poor awareness of the T2DM-to-periodontitis relationship among diabetics. They should be informed that effective home oral care, professional hygiene and routine dental visits not only have a positive impact on improving oral health but must also be considered an important aspect of their comprehensive health care. The screening of periodontitis should be incorporated in an interdisciplinary approach for prevention, early detection and treatment of diabetes-related complications. The treatment of periodontitis decreases on average Hb1Ac levels by 0.40% corresponding to the reduction achieved by adding a second drug into the pharmacological regime [5]. Provided that this improvement in glycaemic control could be sustained, it would result into a reduction of T2DM complications and an improved quality of life.

REFERENCES

1. Kurgan S, Kantarci A (2018) Molecular basis for immunohistochemical and inflammatory changes during progression of gingivitis to periodontitis. Periodontol 2000 76: 51–67. https://doi.org/ 10.1111/prd.12146.

2. Sanz M, Ceriello A, Buysschaert M et al. (2018) Scientific evidence on the links between periodontal diseases and diabetes: Consensus report and guidelines of the joint workshop on periodontal diseases and diabetes by the International Diabetes Federation and the European Federation of Periodontology. J Clin Periodontol 45: 138–149. https://doi.org/ 10.1111/jcpe.12808

3. Al-Khabbaz AK, Al-Shammari KF, Al-Saleh NA (2011) Knowledge about the association between periodontal diseases and diabetes mellitus: contrasting dentists and physicians. J Periodontol 82: 360– 366. https://doi.org/ 10.1902/jop.2010.100372.

4. Siddiqi A, Zafar S, Sharma A, Quaranta A (2019) Diabetic patients' knowledge of the bidirectional link: are dental health care professionals effectively conveying the message? Australian Dent J 64: 312–326. https://doi.org/ 10.1111/adj.12721

5. Madianos PN, Koromantzos PA (2018) An update of the evidence on the potential impact of periodontal therapy on diabetes outcomes. J Clin Periodontol 45:188–195. https://doi.org/10.1111/jcpe.12836

Table 1. Sociodemographic and clinical characteristics of T2DM patients [mean ± SD (range) or n (%)] according to the awareness of the relationship between diabetes and periodontitis.

Variable	Awareness of association T2DM and periodontitis		P Value	Total
	No (n= 77)	**Yes (n = 27)**		
Gender			0.704	
Female	31 (72.1)	12 (27.9)		43 (41.3)
Male	46 (75.4)	15 (24.6)		61 (58.7)
Age group (years)	65.5 ± 10.6	64.9 ± 8.5	0.807	65.3 ± 10.1
Education level			0.914	
≤ 8 years	38 (74.5)	13 (25.5)		51 (49.0)
> 8 years	39 (73.6)	14 (26.4)		53 (51.0)
Smoking status			0.076	
Non-smoker	70 (76.9)	21 (23.1)		91 (87.5)
Smoker	7 (53.8)	6 (46.2)		13 (12.5)
BMI (kg/m^2)	29.1 ± 5.2	28.9 ± 6.4	0.889	29.1 ± 5.5
BMI			0.865	
Normal	19 (70.4)	8 (29.6)		27 (26.0)
Overweight	20 (74.1)	7 (25.9)		27 (26.0)
Obese	38 (76.0)	12 (24.0)		50 (48.0)
WC (cm)	101.7 ± 15.1	98.6 ± 11.9	0.339	100.9 ± 14.3
Duration of T2DM			0.026	
< 10 years	39 (84.8)	7 (15.2)		46 (44.2)
≥ 10 years	38 (65.5)	20 (34.5)		58 (55.8)
Chronic T2DM complications			0.226	
No	33 (80.5)	8 (19.5)		41 (39.4)
Yes	44 (69.8)	19 (30.2)		63 (60.6)
Familiarity for T2DM			0.028	
No	29 (87.9)	4 (12.1)		33 (31.7)
Yes	48 (67.6)	23 (32.4)		61 (68.3)
HbA1c (%)	7.2 ± 1.1	7.8 ± 1.4	0.056	7.4 ± 1.2
Glycaemic control			0.183	
Good (HbA1c < 7%, < 53 mmol/mol)	31 (81.6)	7 (18.4)		38 (36.5)
Inadequate (HbA1c ≥ 7%, ≥ 53 mmol/mol)	46 (69.7)	20 (30.3)		66 (63.5)
Poor glycaemic control			0.017	
No (HbA1c < 8%)	61 (80.3)	15 (19.7)		76 (73.1)
Yes (HbA1c ≥ 8%)	16 (57.1)	12 (42.9)		28 (26.9)
Type of toothbrushing			0.537	
Manual	64 (75.3)	21 (24.7)		85 (81.7)
Electric	13 (68.4)	6 (31.6)		19 (18.3)
Frequency of toothbrushing			0.039	
0 – 1 time/day	16 (94.1)	1 (5.9)		17 (16.4)
2 – 3 times/day	61 (70.1)	26 (29.9)		87 (83.6)
Daily use of interdental device			0.025	
No	63 (80.8)	15 (19.2)		78 (75.0)
Yes	14 (53.8)	12 (46.2)		26 (25.0)
Last dental visit			< 0.001	
< 1 year	33 (60.0)	22 (40.0)		55 (52.9)
≥ 1 year	44 (89.8)	5 (10.2)		49 (47.1)
Frequency of professional dental hygiene			< 0.001	
Every 6 months	11 (42.3)	15 (57.7)		26 (25.0)
Every 6 – 12 months	26 (74.3)	9 (25.7)		35 (33.7)
More than 12 months	40 (93.0)	3 (7.0)		43 (41.3)
Periodontitis			0.461	
No	7 (77.8)	2 (22.2)		9 (8.7)
Moderate	23 (82.1)	5 (17.9)		28 (26.9)
Severe	47 (70.1)	20 (29.9)		67 (64.4)

Table 2. Multivariable regression for predictors of awareness of the relationship between diabetes and periodontitis adjusted for age and gender.

Model and variables	Awareness (dichotomous)		
	OR	**95% IC**	**P value**
Severely compromised glycaemic control (yes vs. no)	4.312	1.336 to 13.919	0.015
Duration of diabetes (at least 10 years vs. less than 10 years)	4.304	1.132 to 16.361	0.032
Family history of T2DM (yes vs. no)	4.171	1.004 to 17.329	0.049
Use of interdental devices (yes vs. no)	7.287	2.030 to 26.159	0.002
Last dental visit (less than 1 year vs. at least 1 year)	6.412	1.794 to 22.910	0.004

OR: odds ratio; 95% IC: 95% interval confidence. R^2 = 0.493

Author contributions

M.A., G.G. and F.R. designed the study. M.A., M.D. and G.G. coordinated the study, reviewed and edited the manuscript. S.E.O.M. and S.B. contributed to data acquisition. F.R. and S.P. analysed data and participated in writing and editing the manuscript. All authors approved the final version. M.A. is the guarantor of this work.

Compliance with ethical standards

Conflict of interest: The authors declare that there is no conflict of interest.

Ethical standard statement: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Ethics Committee of AOU Città della Salute e della Scienza of Turin (No. 0027219).

Informed consent: All subjects signed an informed consent to participation.

Data availability statement: The data will be shared on reasonable request to the corresponding author.