



BRIEF REPORT

# Differences in Dental Care Referral for Diabetic Patients Between General Practitioners and Diabetes Specialists in Japan, Analyzed from NSAID-Study 3

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## ABSTRACT

**Introduction:** Periodontal disease is a common inflammation worldwide and is not only the foremost cause of tooth loss but also a cause of deterioration of glycemic control in patients with diabetes mellitus. In addition, effective

glycemic management improves the control of periodontitis infection. The aim of this study was to clarify whether awareness of the need to refer their patients with diabetes to dentists differs between general practitioners and diabetes specialists. This was achieved by secondary analysis of data from the 2018 Nationwide Survey on Actual Intervention for Type 2 Diabetes Mellitus (T2DM) by Japanese Practitioners (NSAID Study).

**Methods:** Data from 380 general practitioners and 79 diabetes specialists who participated in the NSAID study and responded to the question of whether they referred T2DM patients to the dentist were analyzed in this study.

**Results:** The proportion of general practitioners who referred T2DM patients to dentists was significantly lower than that of diabetes specialists (35.4% vs. 64.1%, respectively).

**Conclusion:** This result suggests that the general practitioners who participated in this study were less cognizant of oral hygiene in patients with diabetes than those who specialized in diabetes. It is also necessary to increase the opportunities for education of physicians who provide diabetic care to promote appropriate dental referrals.

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## PLAIN LANGUAGE SUMMARY

Periodontal disease is a common inflammation worldwide and not only causes tooth loss but also the deterioration of glycemic control in patients with diabetes. In addition, effective glycemic management improves the control of periodontitis infection. Physicians who care for diabetes patients need to be aware of the increased risk and need for improved oral hygiene and to refer their patients to dentists. This study aims to clarify whether awareness of the need to refer their patients with diabetes to dentists differs between general practitioners and diabetes specialists. Responses from 380 general practitioners and 79 diabetes specialists are analyzed in this study. The proportion of general practitioners who refer type 2 diabetes patients to dentists is shown to be significantly lower than that of diabetes specialists. It is necessary to increase the opportunities for education of physicians who provide diabetic care to promote appropriate dental referrals.

**Keywords:** General practitioners; Nationwide survey; Oral health care; Periodontal disease; type 2 diabetes mellitus

### Key Summary Points

#### *Why carry out this study?*

There is a bidirectional relationship between periodontitis and diabetes mellitus

Physicians who care for the patients with diabetes mellitus need to be aware of the need for improved oral hygiene and refer their patients to the dentists

#### *What was learned from the study?*

The proportion of general practitioners who referred patients to dentists was significantly lower than that of diabetes specialists

It is also necessary to increase the opportunity for education of physicians who provide diabetes care to promote appropriate referral to the dentist

## INTRODUCTION

Periodontal disease is a chronic inflammation of periodontal tissues, which is common worldwide and is the foremost cause of tooth loss [1, 2]. Incidence of periodontitis increases with age, and it has been reported in 82% of the elderly population, 73% of adults, and 59% of adolescents [3]. In addition, periodontal disease is associated with not only age, sex, race, smoking, poor oral hygiene, and socioeconomic status but also other systemic illnesses such as diabetes mellitus, cardiovascular disease, adverse pregnancy outcomes, rheumatoid arthritis, chronic obstructive pulmonary disease, chronic kidney disease, and cancer [4].

Many reports have shown a bidirectional relationship between periodontitis and diabetes mellitus [5]. Diabetes mellitus is considered a major risk factor for periodontitis, and periodontitis is thought to increase the risk of developing diabetes mellitus [6]. In addition, a

number of diabetic microvascular complications are associated with increased risk of periodontitis severity in patients with type 2 diabetes mellitus (T2DM) [7]. Moreover, effective glycemic control improves the regulation of periodontal infection in patients with T2DM [8], and treatment of periodontal disease leads to improved glycemic status in some patients with T2DM [9]. Tooth loss affects the dietary therapy of patients with diabetes mellitus, and glycemic control is strongly associated with the number of natural teeth [10]. Therefore, collaboration between physicians who care for patients with diabetes and oral care providers is required to increase awareness among patients with diabetes of their increased risk of oral health problems and to motivate them to maintain good oral hygiene and have regular dental visits. Therefore, physician who care for patients with diabetes and dentists or oral care providers need to understand the importance of their collaboration and refer patients with diabetes to each other. The aim of this study was to clarify whether the awareness of need to refer diabetic patients to dentists is different in general practitioners from that in diabetes specialists, using secondary analysis of data from the 2018 Nationwide Survey on Actual Intervention for T2DM by Japanese Practitioners (NSAID Study) [11].

## METHODS

### Study Design and Methods

The NSAID study included 463 practitioners (approximately 15%) from 6580 randomly selected practitioners who were members of the Japanese Medical and Dental Practitioners for the Improvement of Medical Care (JMDPIMC), and it enrolled 8070 T2DM patients aged 33–100 years [10]. Of these, 380 general practitioners and 79 diabetes specialists who responded to the query regarding whether they referred T2DM patients to the dentist were analyzed. In this study, diabetes specialists (SPs) were defined as members of the Japan Diabetes Society (JDS) or diabetes-care physicians who were board-certified by the JDS or the Japan

Endocrine Society. All other physicians were considered general practitioners (GPs). In the NSAID study, data were collected from July 1 to 31, 2018. We asked practitioners for their age, sex, reference to the dentist, and the source of information for diabetes management. Information sources were classified into seven categories: guidelines for diabetes, journals or papers, lectures or meetings, the internet, pharmaceutical companies, other physicians, and own experience. We tallied the results for each answer and defined it as well used, sometimes used, or barely used. Data were entered into a sheet by each practitioner and mailed to the central analytical facility, where the information was anonymized.

### Ethical Considerations

This study was performed in accordance with the Helsinki Declaration of 1964 and its later amendments. It was approved by the ethics committee of the Kanagawa Association of Medical and Dental Practitioners, which includes lawyers and ethical experts, on May 1, 2018. The study approval number was 17007. Informed consent was obtained from all enrolled patients at each clinic, in accordance with the Guidelines for Epidemiological Study of the Ministry of Health, Labour and Welfare of Japan.

### Statistical Analysis

The chi-squared test was used to compare age, sex, and percentage of general practitioners versus diabetes specialists who referred patients with T2DM to the dentist. We translated the answers for information sources into scores (3 for well used, 2 for sometimes used, and 1 for barely used) and compared results for the general practitioners with those for the diabetes specialists using a chi-squared test. In addition, we performed multivariate logistic regression analysis to investigate the association between referrals to the dentist as an objective variable and other factors such as general practitioners or diabetes specialists, age and sex of practitioners, and score of seven information sources

**Table 1** Characteristics of the practitioners who participated in this study and sources of information on diabetes

	General practitioners	Diabetes specialists	<i>p</i>
Number ( <i>n</i> )	380	79	
Sex [male/female, <i>n</i> (%)]	348/32 (91.6%/8.4%)	60/19 (75.9%/24.1%)	< 0.001
Age [median (interquartile range)]	63.00 (56.00, 69.00)	60.00 (54.00, 68.50)	0.288
Scores for information sources [median (interquartile range)]			
Guideline	3.00 (2.00, 3.00)	3.00 (2.00, 3.00)	0.525
Journals, papers	2.00 (1.50, 2.00)	2.00 (2.00, 2.50)	< 0.001
Lecture, meeting	2.00 (1.67, 2.33)	2.00 (1.67, 2.00)	0.979
Internet	2.00 (1.00, 2.00)	2.00 (1.00, 2.00)	0.754
Information from pharmaceutical company	2.00 (2.00, 2.00)	2.00 (2.00, 2.00)	0.078
Opinion from other physicians	2.00 (1.00, 2.00)	2.00 (2.00, 2.00)	0.461
Own experiences	3.00 (2.00, 3.00)	3.00 (2.50, 3.00)	0.001

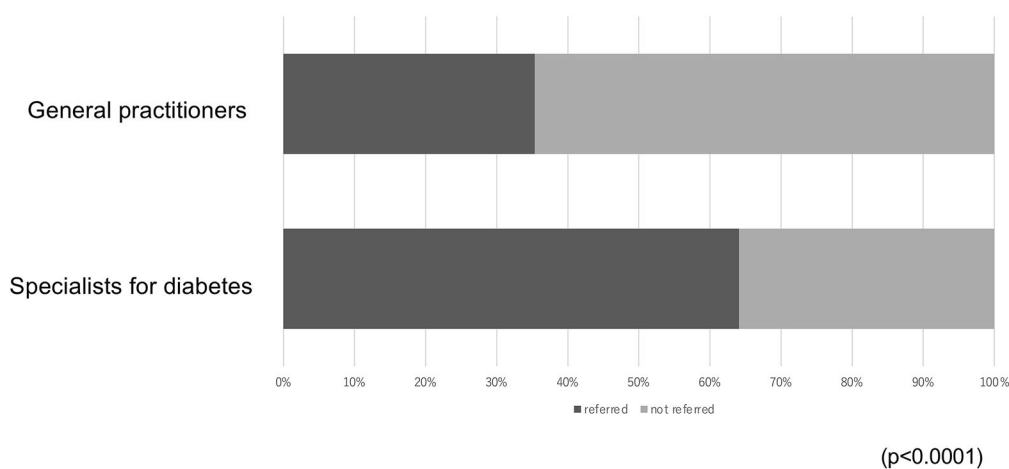
Scores for information sources of: 3; well used, 2; sometimes used, 1; barely used

as explanatory variables. Statistical analyses were performed using SPSS (IBM Corp., Armonk, NY, USA) and JMP version 14.0 (SAS Institute Inc., Cary, NC, USA). Statistical significance was set at  $p < 0.05$ .

## RESULTS

### Practitioner Characteristics

A total of 459 practitioners (380 general practitioners and 79 diabetes specialists of diabetes) were analyzed in this study. The ratio of females to males was higher in the SP group than in the GP group ( $p < 0.0001$ , Table 1), while age did



**Fig. 1** Proportion of general practitioners and diabetes specialists who referred or did not refer patients to the dentist

not differ significantly between groups ( $p = 0.288$ , Table 1). Among the seven information sources, use of journals or papers and own experience were higher for SPs than for GPs ( $p < 0.0001$  and  $p = 0.001$ , respectively, Table 1), while use of guidelines, lectures or meetings, the internet, pharmaceutical companies, and opinions from other physicians did not differ significantly between the two groups ( $p = 0.979$ ,  $p = 0.754$ ,  $p = 0.078$ , and  $p = 0.461$ , respectively, Table 1).

**Awareness of the Need for Referral to the Dentist**

In response to the question of whether T2DM patients were referred to the dentist, 35.4% of general practitioners and 64.1% of diabetes specialists answered that they were (Fig. 1). The proportion of general practitioners who referred patients with T2DM to dentists was significantly lower than that of diabetes specialists ( $p < 0.0001$ ).

**Association Between Awareness of the Need to Refer Diabetic Patients to the Dentist and Characteristics of Practitioners and Sources of Information**

A multivariate logistic regression analysis showed that the awareness of the need to refer diabetic patients to the dentist was associated with diabetes specialists and use of the internet as a source of information ( $p < 0.0001$  and  $p = 0.012$ , respectively, Table 2).

**DISCUSSION**

This result suggests that the general practitioners who participated in this study had lower awareness of importance of oral hygiene in patients with diabetes than the diabetes specialists. Recently, knowledge of the relationship between diabetes mellitus and oral health, including periodontal disease, has become widespread among diabetes specialists. However, this knowledge has not been sufficiently imparted to general practitioners. In this study, multivariate logistic analysis suggested an association between awareness of the need to refer patients to the dentist and use of the Internet.

**Table 2** Association between referral to the dentists and characteristics of practitioners and information sources

Variables	Adjusted odds ratio	95% confidence interval		<i>p</i>
General physicians	0.323	0.180	0.580	< 0.001
Age	0.996	0.972	1.019	0.717
Female sex	1.934	0.986	3.794	0.055
Information sources				
Guideline	1.284	0.884	1.864	0.190
Journals, papers	0.874	0.567	1.347	0.541
Lecture, meeting	1.353	0.852	2.147	0.200
Internet	1.472	1.089	1.990	0.012
Information from pharmaceutical company	0.777	0.536	1.126	0.183
Opinion from other physicians	1.183	0.853	1.640	0.315
Own experiences	1.268	0.886	1.813	0.194

This may indicate that the internet is a valuable tool for education on the importance of good oral hygiene in diabetic patients. Not only lack of awareness regarding diabetic oral health but also time constraints and absence of networks with dentists may become barriers to referral [12].

## CONCLUSION

We had already described that the limitations of this study include the sample size and nature of the participants, while we randomly selected approximately 15% of the JMDPIMC members for study eligibility, and 6.9% participated in this study. The ratio of specialists to general practitioners in this study was 16.8% [11]. Even though this ratio is close to the ratio of certified diabetologists to general practitioners in Japan, it may not even be representative of the whole GP and diabetes specialist world in Japan. Furthermore, we did not collect precise information about the patients, such as duration of diabetes and complications, because the method of data collection was administration of a questionnaire among the busy practitioners as reported previously [11]. Questionnaires represent a simple yet easily biased method to investigate such a problem. In addition, this survey assessed the awareness of physicians regarding the referral of their diabetic patients to the dentist and not the prevalence of patients who visited to the dentist. Therefore, our findings may be very limited. These were the limitations of the present study.

In conclusion, the proportion of general practitioners who referred T2DM patients to dentists was lower than that of diabetes specialists in this study. Furthermore, it is necessary to increase opportunities for the education of physicians who provide diabetes care to promote appropriate referrals to dentists. Diabetes care and oral health care providers should encourage their patients to improve their oral hygiene. This may lead to improvements in the health of patients with diabetes and periodontal disease.

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**Authorship Contributions.** K.A. designed the study, analyzed results, and wrote the manuscript. Y.M., S.O., S.S., S.Y., K.H. and H.M. collected the data, and edited the manuscript. T.N. oversaw research and wrote the manuscript.

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**Compliance with Ethics Guidelines.** This study was performed in accordance with the Helsinki Declaration of 1964 and its later amendments. The present study was approved

by the ethics committee of the Kanagawa Association of Medical and Dental Practitioners, which includes lawyers and ethical experts, on May 1, 2018. The study approval number was 17007. Informed consent was obtained from all enrolled patients at each clinic, in accordance with the *Guidelines for Epidemiological Study* of the Ministry of Health, Labour and Welfare of Japan.

**Data Availability.** The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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