

---

# A Cognitive Survey on Diabetes and Periodontitis Among Endocrinologists and Diabetic Patients in Hainan Island

Xu Zheng<sup>1,2</sup>, Chen Xie<sup>1</sup>, Fu Tao Li<sup>3</sup>, Rao Fu<sup>1</sup>, Yu Zhi Wu<sup>1</sup>, Yu Kun Shan<sup>1</sup>, Ren Jie Zhao<sup>1</sup>,  
Jing Tong Li<sup>1</sup>, Qi Huang Xie<sup>1</sup>, Zhu Ling Guo<sup>1,2,\*</sup>

<sup>1</sup>School of Dentistry, Hainan Medical University, Hainan, China

<sup>2</sup>Department of Dentistry, The First Affiliated Hospital of Hainan Medical University, Hainan, China

<sup>3</sup>School of International Education, Hainan Medical University, Hainan, China

## Email address:

604569033@qq.com (Zhu Ling Guo)

\*Corresponding author

## To cite this article:

Xu Zheng, Chen Xie, Fu Tao Li, Rao Fu, Yu Zhi Wu, Yu Kun Shan, Ren Jie Zhao, Jing Tong Li, Qi Huang Xie, Zhu Ling Guo. A Cognitive Survey on Diabetes and Periodontitis Among Endocrinologists and Diabetic Patients in Hainan Island. *International Journal of Diabetes and Endocrinology*. Vol. 5, No. 2, 2020, pp. 18-22. doi: 10.11648/j.ijde.20200502.11

**Received:** April 12, 2020; **Accepted:** April 20, 2020; **Published:** May 15, 2020

---

**Abstract:** Objective: Periodontitis was linked to increased prevalence of diabetes and it is decisive to have a comprehensive cognition on the mutual influence for combined treatment. This study serves to provide accurate guidance data to endocrinologists and diabetic patients on periodontitis and diabetes. Materials and Methods: 50 endocrinologists and 200 diabetic patients were investigated in national public hospitals. Oral health habits, the cognition of diabetes and periodontitis were examined through questionnaires. Results: The cognitive level of diabetic patients on periodontitis and the correlation between periodontitis and diabetes was low. Only 48.6% patients agreed with "Periodontitis may affect normal blood glucose level". 86.2% patients were not clear that "Treatment of periodontitis is beneficial to the prevention of diabetes". 93.6% endocrinologists stressed that they were concerned about their patients' oral health, while only 23.6% patients received suggestions from their doctor on annual comprehensive periodontal evaluation. Conclusion: The cognition of the relationship between periodontitis and diabetes is deficient in public, represented by endocrinologists and diabetic patients in Hainan. Clinicians should strengthen the education on the bidirectional relationship between periodontitis and diabetes into their routine treatment and management.

**Keywords:** Diabetes, Periodontitis, Endocrinologist

---

## 1. Introduction

There are around 425 million diabetics worldwide, of which China accounts 1/4 [1]. Studies have shown that 8-10% of Chinese diabetics suffer from periodontal diseases [2]. In the USA, nearly 50% adults suffer from diabetes and about 47% of them have been affected by periodontitis [3, 4]. Studies have shown that there is a two-way relationship between diabetes and periodontitis [5-7]. Diabetic patients are more susceptible to periodontitis than healthy people, the metabolic control level and duration may have an effect on the risk for periodontitis [8]. Periodontitis is positively correlated with the severity of diabetes. The levels of HbA1c and serum creatinine are significantly related to the severity of

periodontitis and diabetic retinopathy [9, 10]. The public's cognition to diabetes and periodontitis has not been effectively improved for a long time [11]. This study serves to provide accurate guidance data to endocrinologists and diabetic patients on periodontitis and diabetes.

## 2. Materials and Methods

### 2.1. Research Materials

The study included 50 endocrinologists and 200 diabetic patients selected by random sampling in national public hospitals in Hainan island. The total number of valid questionnaires was 221, data was analyzed for 174 diabetic patients and 47 endocrinologists. Inclusion criteria: 1)

Diabetics and endocrinologists 2) Without cognitive dysfunction 3) Agreed to participate in the survey activities.

**2.2. Research Methods**

**2.2.1. Investigation Methods**

According to the oral health surveys: basic methods - 5th edition published by World Health Organization and make appropriate modifications according to local conditions and China's conditions, a written questionnaire suitable for obtaining comprehensive oral health and diabetes was developed. Endocrinologists and diabetic patients were selected by random sampling in national public hospitals during in July 2019. On the premise of informed consent and full understanding of the questionnaire, respondents filled the questionnaire accompanied by separate investigators.

**2.2.2. Questionnaire Content**

The questionnaire consists of four parts. Part A: Basic information (endocrinologist: gender, age, education level, career time; diabetic patient: gender, age, education level, history of diabetes); Part B: Oral health behaviors of both doctors and patients (brushing time, brushing method, oral examination frequency); Part C: This part adopted the marking system to score one point for choosing the correct option and no score for choosing the wrong answer; Part D: This part using T/F questions to analyze the cognition of respondents on relationship between periodontitis and diabetes.

**2.3. Statistical Analysis**

SPSS 23.0 was used for data analysis. Measurement data were expressed as  $\bar{x} \pm s$ , and counting data were expressed as percentage [n (%)]. *t*-test, *Chi-square* test and *Nonparametric* statistics were used for inter-group comparison.  $P < 0.05$  was considered as statistically significant.

**2.4. Ethical considerations**

Ethical agreement was obtained from the ethics committee of the First Affiliated Hospital of the Hainan Medical University in Haikou. Written consent was obtained prior to administration of questionnaires.

**3. Results**

**3.1. Oral Health Behaviors between Endocrinologists and Patients**

5.1% diabetic patients and 6.4% endocrinologists had an oral health examination every six months. 51.7% patients and 66.0% of endocrinologists replaced their toothbrush at proper interval. 24.1% patients and 31.9% of endocrinologists used bass method, 23.0% patients and 40.4% endocrinologists brushed their teeth for more than 3 minutes. Endocrinologists had better oral examination habits, brushing methods and brushing time than patients ( $P < 0.05$ ). Along with the increase of age, the frequency of oral examination gradually decreased in patients ( $P < 0.01$ , Table 1).

*Table 1. Oral health behaviors between endocrinologists and diabetic patients.*

		Endocrinologists (N=47)	Diabetic patients (N=174)	Total
Frequency of oral examination *	Semi-annual (Twice a year)	3	9	12
	Once a year	7	22	29
	Occasionally	27	60	87
	Never	10	83	93
Frequency of toothbrush replacement *	1 month	6	16	22
	1-3 months	31	76	107
	3-6 months	10	69	79
	more than 6 months	0	13	13
Brushing methods	Bass method	15	42	57
	Non-Bass method	32	132	164
	Within 1 minute	0	13	13
Brushing time *	1-3 minutes	28	121	149
	More than 3 minutes	19	40	59
Total		188	696	884

Note: Compared to the patient group, \* $P < 0.05$ .

**3.2. Cognition of Periodontitis Among Endocrinologists and Patients**

**3.2.1. Cognition of Periodontitis Symptoms**

Data showed that elder patients got lower scores than younger patients from this question set ( $P < 0.01$ , Table 2). Patients with higher education level got better cognition on this question than those who with lower education ( $P < 0.01$ ). The cognitive difference caused by education level was statistically significant among endocrinologists ( $P < 0.05$ , Table 3).

**3.2.2. Cognition on Periodontitis Risk Factors**

The doctors' cognition status of risk factors of periodontal disease in the master group was higher than that in the bachelor group, with the mean scores of 4.07 and 2.94 respectively ( $P < 0.05$ ). Endocrinologists with 5-10 year medical working years got the highest score, with significant difference between the groups ( $P < 0.05$ , Table 3). Patients were deficient in the cognition on the risk factors of periodontitis. The score of risk factors of periodontitis was the

lowest in patients with history of diabetes for more than 15 years ( $P<0.01$ ). The score increased with the growth of the educational level of the patients. The average score of the

master group was 4.67, higher than the other two groups. The difference in the education level of patients was statistically significant ( $P<0.01$ , Table 2).

**Table 2.** Cognition on periodontitis among diabetic patients.

	Know about symptoms	Know about risk factors	Will focus on oral health
Education level			
Senior high school or below (N=117)	1.15±1.26	0.77±1.18	1.88±0.70
Bachelor's degree (N=54)	2.13±1.08	1.48±1.285	1.65±0.519
Master's degree or above (N=3)	3.33±2.89	4.67±4.041	2
<i>P</i>	0.000**	0.000**	0.000**
Age (Years)			
Below 20 (N=7)	2.57±1.397	1.14±1.345	1
20-40 (N=15)	2.07±0.594	1.60±1.183	1.67±0.488
40-60 (N=78)	1.63±1.326	1.07±1.179	1.361±0.634
Over 60 (N=80)	1.18±1.348	0.94±1.610	1.2±0.769
<i>P</i>	0.004**	0.040*	0.048*
History of diabetes (Years)			
Below 1 (N=23)	1.48±1.00	0.87±0.97	1.83±0.72
1-5 (N=53)	1.85±1.26	1.21±1.20	1.64±0.59
5-10 (N=48)	1.46±1.51	1.25±1.64	1.67±0.69
Over 10 (N=50)	1.16±1.30	0.80±1.53	1.74±0.78
<i>P</i>	0.072	0.040*	0.781

Note: \* $P<0.05$  \*\* $P<0.01$ .

**Table 3.** Cognition on periodontitis among endocrinologists.

	Know about symptoms	Know about risk factors	Will strengthen oral health education
Education			
Bachelor degree or below (N=33)	4.00±1.225	2.94±1.478	0.94±0.242
Master degree or above (N=14)	5.21±0.426	4.07±1.492	0.93±0.267
<i>P</i>	0.028*	0.891	0.000**
Work seniority			
1-5 years (N=31)	4.23±1.203	3.29±1.716	1
5-10 years (N=13)	4.54±1.266	3.31±1.377	0.85±0.375
More than 15 years (N=3)	5.00±0.000	3.00±0.000	0.67±0.577
<i>P</i>	0.997	0.025*	0.289

Note: \* $P<0.05$  \*\* $P<0.01$ .

### 3.3. Cognition of the Relationship Between Diabetes and Periodontitis among Endocrinologists and Patients

Only 22.4% of the patients agreed that "Periodontitis may affect blood glucose" and "Controlling blood glucose can reduce the risk of periodontitis", 12.1% of the patients agreed that "Periodontitis treatment is effective to prevent diabetes". 83% of endocrinologists agreed that "Controlling blood sugar level can reduce the risk of periodontitis". 93.6% endocrinologists stressed that they were concerned about their patients' oral health, while only 23.6% patients received suggestions from their doctor on annual comprehensive periodontal evaluation. With career time increasing, the concern to periodontitis decreased and the difference was statistically significant ( $P<0.05$ , Table 3). 86.8% patients would actively pay attention to periodontal health when notified by their doctors, especially in the higher education level and young age group ( $P<0.05$ , Table 2).

## 4. Discussion

Diabetes and periodontal disease are influenced by multiple factors [12-14]. The mechanism of the interaction has not been fully investigated. The relevant research fields mainly focus on periodontal diseases, such as inflammatory cell function changes, accumulation of advanced glycation end products and impairment healing disorders [15-16]. Some scholars believe that diabetes further lead to the deterioration of periodontal disease by affecting the subgingival microenvironment while periodontal disease influences the development of diabetes through increasing insulin resistance [17-18]. Others believe that oxidative stress and cytokines may be the key factors for the occurrence and development of these two diseases [19-20].

Public are lack of the basic knowledge about the frequency of oral examination, frequency of toothbrush replacement, brushing method and brushing time. Therefore, we

hypothesized that bad oral habits of diabetics and endocrinologists were largely related to the insufficient promotion of oral health knowledge. The cognition level of periodontitis in diabetic patients is closely related to age and education level ( $P<0.05$ ). Furthermore, endocrinologists' cognition of periodontitis is involved with the education level ( $P<0.05$ ). After a brief knowledge of the relationship between diabetes and periodontitis, up to 86.8% of patients indicated that they would pay attention to periodontal health proactively. Based on the data above, we infer the reasons why they lacked the cognition of periodontitis. Periodontal disease progresses slowly which leads to indifferent attitude of patients to the asymptomatic manifestation [1, 21]. Even though some patients have received relevant health education, they are still limited by the high cost of oral examination, the difficulty in seeking dental treatment. Most diabetic patients have poor oral health status in China, and 78% of them are short of the correct cognition of oral health knowledge. Patients are limited by individual age, education level, economic situation and other factors, while doctors are restricted by updating in existing knowledge and the experience of clinical cases, which are the objective factors that cannot be ignored when we consider what affects the cognition of doctors and patients. Finally, health education departments are not sufficiently supportive, both endocrinologists and patients are not aware of the prevention of oral diseases, which requires us to further improve the corresponding mechanism.

The result of correlation between periodontitis and diabetes in the endocrinologist group was higher than that in the patient group, with statistically significant ( $P<0.05$ ). All the participants agree the T/F question "Dental plaque, dental calculus can cause periodontal disease". As shortage of health education are also inevitable reasons, endocrinologists' awareness of connecting periodontitis and diabetes needs to be further strengthened. We hypothesize that it is difficult to link diabetes and periodontitis together in daily life for both are two different diseases with various courses, symptoms and location of onset [22]. Furthermore, our research showed 93.6% of endocrinologists indicate they would pay attention and recommend patients to maintain oral health. However, only 23.6% patients indicate that they have been suggested to have an oral health examination. The contradiction between endocrinologists and patients on this issue, may be relevant to job burnout. Investigations have shown that general practitioner, family doctors, oncologist, pediatrician, interventional radiologists and nurses suffered from different levels of job burnout [23-26]. Thus, it is suggested endocrinologists and dentist should maintain the passion for lifelong learning on their professional and related systemic diseases. Nowadays endocrinologists and diabetic patients are still insufficient on the correlation between periodontitis and diabetes in China. Diabetic patients with higher education level have a strong awareness to oral health when notified by their doctors. Therefore, it is very imperative to strengthen the education of oral health knowledge to the public.

## 5. Conclusion

The cognition of the relationship between periodontitis and diabetes is deficient in public, represented by endocrinologists and diabetic patients in Hainan. Clinicians should strengthen the education on the bidirectional relationship between periodontitis and diabetes into their routine treatment and management.

## Funding

This research was funded by Scientific Research Fund of Hainan Provincial Education Department (Hnky2020ZD-19), Young Talents' Science and Technology Innovation Project of Hainan Association for Science and Technology (QCXM201817), Medical Education Research Project of Medical Education Branch of Chinese Medical Association (2018B-N12003), Health Science Research Project of Hainan Province (19A200062), Course Construction Project of Hainan Medical University (HYJW201834), Education Science Research Project of Hainan Medical University (HYZX201704), Marxism Theory Discipline Research Project of Hainan Medical University (QMYKYLX201807), Research Project of Hainan Provincial Humanities Medical Research Base (QRYZH201811 (YB)).

## Conflicts of Interest

The authors declare no conflict of interest.

## Acknowledgements

We thank all the participants for their cooperation. We also wish to thank the local health workers, officials in the different hospitals of Hainan Province for their help and support.

## References

- [1] Akram TK, Hisham MD. Diabetes: The epidemic of the century [J]. *World Journal of Diabetes*, 2015, 6 (6): 850-867.
- [2] Guo XH, Ke MH. Study on the relationship between cognitive level of periodontal health care and blood glucose metabolism of diabetic patients [J]. *Chin J Med Guide*, 2016, 18 (01): 36-37.
- [3] Benjamin P. November Is American Diabetes Month [J]. *Diabetes Foreca*. 2019.
- [4] Eke PI, Dye BA, Wei L, et al. Update on Prevalence of Periodontitis in Adults in the United States: NHANES 2009 to 2012 [J]. *Journal of periodontology*, 2015, 86 (5): 611-622.
- [5] Abhijit N Gurav. Management of diabolical diabetes and periodontitis nexus: Are we doing enough [J]. *World Journal of Diabetes*, 2016, 7 (04): 50-66.
- [6] Furuta M, Fukai K, Aida J, et al. Periodontal status and self-reported systemic health of periodontal patients regularly visiting dental clinics in the 8020 Promotion Foundation Study of Japanese Dental Patients [J]. *Journal of oral science*, 2019, 61 (2): 238-245.

- [7] Preshaw PM, Bissett SM. Periodontitis and diabetes [J]. *British dental journal*, 2019, 227 (7): 577-584.
- [8] Fernando L, Santiago AH, Raúl C. Relationship between diabetes and periodontal infection [J]. *World Journal of Diabetes*, 2015, 6 (07): 927-935.
- [9] Borilova LP, Kavrikova D, Tomandlova M, et al. Differences in Interleukin-8 Plasma Levels between Diabetic Patients and Healthy Individuals Independently on Their Periodontal Status [J]. *International journal of molecular sciences*, 2018, 19 (10): 3214.
- [10] José LHP, Albert GA, David HG. Efectos de la diabetes sobre las enfermedades periodontales [J]. *Avances en Diabetología*, 2013, 29 (5): 151-159.
- [11] Munirah Y, Tin MH, Siti MA, et al. Chronic periodontitis patients: their knowledge and its correlation with oral health related quality of life [J]. *Materials Today: Proceedings*, 2019, 16: 2302-2308.
- [12] Shanmukappa SM, Nadig P, Puttannavar R, et al. Knowledge, Attitude, and Awareness among Diabetic Patients in Davangere about the Association between Diabetes and Periodontal Disease [J]. *Journal of International Society of Preventive & Community Dentistry*, 2017, 7 (6): 381-388.
- [13] Wu YY, Xiao E, Graves DT. Diabetes related bone metabolism and periodontal disease [J]. *International Journal of Oral Science*, 2015, 7 (02): 63-72.
- [14] Khumaedi AI, Purnamasari D, Wijaya IP, et al. The relationship of diabetes, periodontitis and cardiovascular disease [J]. *Diabetes & metabolic syndrome*, 2019, 13 (2): 1675-1678.
- [15] Guo ZL, Gan SL, Cao CY, et al. Advanced glycosylated end products restrain the osteogenic differentiation of the periodontal ligament stem cell [J]. *Journal of dental sciences*, 2019, 14 (2): 146-151.
- [16] Veena HR, Natesh S, Patil SR. Association between Diabetic Retinopathy and Chronic Periodontitis-A Cross-Sectional Study [J]. *Medical sciences*, 2018, 6 (4): 104.
- [17] Liccardo D, Cannavo A, Spagnuolo G, et al. Periodontal Disease: A Risk Factor for Diabetes and Cardiovascular Disease [J]. *International journal of molecular sciences*, 2019, 20 (6): 1414.
- [18] Jayakumar SV, Sadasivan A, Koshi E, et al. Effect of Non-Surgical Periodontal Therapy on Plasma Levels of IL-17 in Chronic Periodontitis Patients with Well Controlled Type-II Diabetes Mellitus-A Clinical Study [J]. *Dentistry journal*, 2018, 6 (2): 19.
- [19] Tsuchida S, Satoh M, Takiwaki M, et al. Ubiquitination in Periodontal Disease: A Review [J]. *International journal of molecular sciences*, 2017, 18 (7): 1476.
- [20] Tomoko KO, Ru J, Yu C, et al. Periodontal Disease-Induced Atherosclerosis and Oxidative Stress [J]. *Antioxidants*, 2015, 4 (3): 577-90.
- [21] Shipra G, Shaveta S, Ashish Jain, et al. Evaluation of oral health knowledge, attitude, and practices among diabetics in a Northern Union Territory of India [J]. *Indian Journal of Dental Sciences*, 2017, 9 (3): 148-152.
- [22] Weinspach K, Staufienbiel I, Sonja MN, et al. Level of information about the relationship between diabetes and periodontitis--results from a nationwide diabetes information program [J]. *European journal of medical research*, 2013, 18: 6.
- [23] Samborska SA, Sablik Z. Professional burnout among family doctors and games in patient - doctor relationship [J]. *Polski merkuriusz lekarski: organ Polskiego Towarzystwa Lekarskiego*, 2013, 34 (203): 305-8.
- [24] Paiva CE, Martins BP, Paiva BSR. Doctor, are you healthy? A cross-sectional investigation of oncologist burnout, depression, and anxiety and an investigation of their associated factors [J]. *BMC cancer*, 2018, 18 (1): 1044.
- [25] Jacob JB, Anthony N. Hage, Ravi N. Srinivasa, et al. Burnout among Interventional Radiologists [J]. *Journal of Vascular and Interventional Radiology*, 2020, 31 (4): 607-613.
- [26] Shahzad MN, Ahmed MA, Akram B. Nurses in double trouble: Antecedents of job burnout in nursing profession [J]. *Pakistan journal of medical sciences*, 2019, 35 (4): 934-939.