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

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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 Word 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 $x\pm s$, 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).

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 \((P<0.01, \text{Table 2})\).

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

<table>
<thead>
<tr>
<th>Education level</th>
<th>Know about symptoms</th>
<th>Know about risk factors</th>
<th>Will focus on oral health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior high school or below (N=117)</td>
<td>1.15±1.26</td>
<td>0.77±1.18</td>
<td>1.88±0.70</td>
</tr>
<tr>
<td>Bachelor's degree (N=54)</td>
<td>2.13±1.08</td>
<td>1.48±1.285</td>
<td>1.65±0.519</td>
</tr>
<tr>
<td>Master's degree or above (N=3)</td>
<td>3.33±2.89</td>
<td>4.67±4.041</td>
<td>2</td>
</tr>
<tr>
<td>(P)</td>
<td>0.000**</td>
<td>0.000**</td>
<td>0.000**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Know about symptoms</th>
<th>Know about risk factors</th>
<th>Will focus on oral health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 20 (N=7)</td>
<td>2.57±1.397</td>
<td>1.14±1.345</td>
<td>1</td>
</tr>
<tr>
<td>20-40 (N=15)</td>
<td>2.07±0.594</td>
<td>1.60±1.183</td>
<td>1.67±0.488</td>
</tr>
<tr>
<td>40-60 (N=78)</td>
<td>1.63±1.326</td>
<td>1.07±1.179</td>
<td>1.361±0.634</td>
</tr>
<tr>
<td>Over 60 (N=80)</td>
<td>1.18±1.348</td>
<td>0.94±1.610</td>
<td>1.2±0.769</td>
</tr>
<tr>
<td>(P)</td>
<td>0.004**</td>
<td>0.040*</td>
<td>0.048*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>History of diabetes (Years)</th>
<th>Know about symptoms</th>
<th>Know about risk factors</th>
<th>Will focus on oral health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 1 (N=23)</td>
<td>1.48±1.00</td>
<td>0.87±0.97</td>
<td>1.83±0.72</td>
</tr>
<tr>
<td>1-5 (N=53)</td>
<td>1.85±1.26</td>
<td>1.21±1.20</td>
<td>1.64±0.59</td>
</tr>
<tr>
<td>5-10 (N=48)</td>
<td>1.46±1.51</td>
<td>1.25±1.64</td>
<td>1.67±0.69</td>
</tr>
<tr>
<td>Over 10 (N=50)</td>
<td>1.16±1.30</td>
<td>0.80±1.53</td>
<td>1.74±0.78</td>
</tr>
<tr>
<td>(P)</td>
<td>0.072</td>
<td>0.040*</td>
<td>0.781</td>
</tr>
</tbody>
</table>

Note: *\(P<0.05\) **\(P<0.01\).

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

<table>
<thead>
<tr>
<th>Education</th>
<th>Know about symptoms</th>
<th>Know about risk factors</th>
<th>Will strengthen oral health education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor degree or below (N=33)</td>
<td>4.00±1.225</td>
<td>2.94±1.478</td>
<td>0.94±0.242</td>
</tr>
<tr>
<td>Master degree or above (N=14)</td>
<td>5.21±0.426</td>
<td>4.07±1.492</td>
<td>0.93±0.267</td>
</tr>
<tr>
<td>(P)</td>
<td>0.028*</td>
<td>0.891</td>
<td>0.000**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work seniority</th>
<th>Know about symptoms</th>
<th>Know about risk factors</th>
<th>Will strengthen oral health education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5 years (N=31)</td>
<td>4.23±1.203</td>
<td>3.29±1.716</td>
<td>1</td>
</tr>
<tr>
<td>5-10 years (N=13)</td>
<td>4.54±1.266</td>
<td>3.31±1.377</td>
<td>0.85±0.375</td>
</tr>
<tr>
<td>More than 15 years (N=3)</td>
<td>5.00±0.000</td>
<td>3.00±0.000</td>
<td>0.67±0.577</td>
</tr>
<tr>
<td>(P)</td>
<td>0.997</td>
<td>0.025*</td>
<td>0.289</td>
</tr>
</tbody>
</table>

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 doctors on annual comprehensive periodontal evaluation. With career time increasing, the concern to periodontitis decreased and the difference was statistically significant \((P<0.05, \text{Table 3})\). 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 \((P<0.05, \text{Table 2})\).

### 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.

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Conflicts of Interest

The authors declare no conflict of interest.

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References


