

# Cognitive Survey on Periodontitis and Cardiovascular Disease Among Medical Staffs and Cardiovascular Patients in Hainan

Zhu Ling Guo<sup>1,2</sup>, Tao Han<sup>1</sup>, Chen Xie<sup>1</sup>, Xiang Guo<sup>1,2</sup>, Si Yu Tao<sup>1,2</sup>, Wan Yun Lin<sup>1,2</sup>, Sunchuri Diwas<sup>3</sup>, Hong Xia Pang<sup>2</sup>, Xu Zheng<sup>1,2,\*</sup>

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

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

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

## Email address:

524118902@qq.com (Xu Zheng)

\*Corresponding author

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**Abstract:** Objective: Periodontitis is linked to increased prevalence of cardiovascular disease and it is significant to have a comprehensive cognition on the mutual influence for combined treatment. The present investigation aimed to promote oral health instruction to patients with periodontitis and/or cardiovascular disease and the medical staffs from the department of cardiology and stomatology. Materials and Methods: A total of 120 Cardiologist and dentists and 120 patients with cardiovascular diseases were randomly investigated in Hainan public hospitals. The subjects' cognition of the correlation between cardiovascular disease and periodontitis were examined through questionnaires. Results: The public represented by patients with cardiovascular disease in Haikou City has a lack of cognition of the two-way relationship between periodontitis and cardiovascular disease. 32.1% of medical staff and 72.2% of patients did not know that "periodontitis is a cause of cardiovascular disease", and 83.5% of patients did not know that "periodontitis is a complication of cardiovascular disease". 96.3% of dental medical staff and 87.9% of cardiovascular medical staff expressed the willingness to popularize the correlation between the two diseases to patients. Conclusion: The public in Hainan has insufficient understanding of the correlation between periodontitis and cardiovascular diseases. Clinicians should strengthen the education on the bidirectional relationship between periodontitis and cardiovascular disease.

**Keywords:** Periodontitis, Cardiovascular Disease, Cardiologist

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## 1. Introduction

Periodontitis is an inflammation induced by bacterial pathogens. Periodontitis is globally prevalent the major cause of tooth loss in adults. It is characterized by gingival recession and alveolar bone loss [1]. Periodontal disease is a common oral disease caused by microorganisms, which has adverse effects on systemic health [2, 3]. In addition, cardiovascular diseases (CVD) are also widespread in China. The epidemic of CVD had been increasingly severe in the past several years and the epidemic of CVD has an increasing

trend among young people [4, 5]. CVD is the leading cause of death and premature death in China, accounting for 40% of deaths [6]. Around the world, gingivitis, also called periodontal disease, affects 50%-90% of the population. Research shows that periodontitis is more common in developing countries than in developed countries [7]. In recent research, there is now increasing evidence that periodontitis have a negative impact on cardiovascular-related diseases, especially valvular heart disease [8, 9]. This study improved the public awareness of the two-way relationship between periodontitis and cardiovascular disease. It also strengthened the awareness of oral health by

investigating the cognition of cardiovascular disease and periodontitis among medical staff in the department of cardiology and stomatology and patients with cardiovascular disease in Haikou city.

## 2. Materials and Methods

### 2.1. Subjects of Survey

A total of 240 subjects involving 120 medical staff in the Department of Cardiology and Department of Stomatology and 120 patients with cardiovascular diseases were randomly selected from Hainan provincial public hospitals. 191 valid questionnaires were collected, and the data were analyzed from 112 medical staff and 79 patients with cardiovascular disease. 54 medical staff were from the Department of Stomatology and 58 medical staff were from the Department of Cardiology. 33 of them had more than 5-years working experience. There were 36 male patients, 43 female patients, and 47 of them had high school education or below, accounting for 59.5%.

Inclusion criteria of subjects: (1) Subjects do not have Cognitive dysfunction. (2) Subjects agreed to participate in this survey.

### 2.2. Methods of Survey

The questionnaire on the correlation between periodontitis and cardiovascular disease with good reliability and validity was based on the 4th national oral health epidemiological survey questionnaire and the 5th edition of the oral health survey released by the WHO questionnaire, and designed by adjusting it according to the local conditions. During July 2021, with informed consent and full understanding of the questionnaire, subjects finished the questionnaire accompanied by professional trained investigators.

The contents of the questionnaire were divided into the following parts: Part I: Basic information of the subjects (patients: gender, age, education level, income; Medical staff: department, working-age, education); Part II: Cognitive

survey of periodontitis. This section includes symptoms, effects and preventive measures of periodontitis, of which the full score is 7 points, 4 points and 4 points, respectively.

Based on the scores of subjects, the cognition of periodontitis was analyzed; Part III: Correlation between periodontitis and cardiovascular disease awareness survey, the content including "periodontitis is one of the causes of cardiovascular disease", "treating periodontitis can reduce the possibility of cardiovascular disease", "periodontitis is a complication of cardiovascular disease". The options were set to "yes", "no" and "not clear", selecting the correct option scored 1 point, whereas no any points for incorrect option. The higher score represented the higher understanding of the correlation these two diseases.

### 2.3. Statistical Method

SPSS 24.0 was used for data analysis. The variables data were expressed as ( $\bar{X} \pm s$ ), and the counting data were expressed as N (%). t-test, nonparametric rank sum test, and Chi-squared test were used for data analysis within and between groups.  $P < 0.05$  indicated that the difference was statistically significant.

## 3. Results

### 3.1. Investigation of Patients' Cognition of Periodontitis

Patients had low awareness of periodontitis, and the average scores of periodontitis symptoms, effects and preventive measures were 1.63 points (7 points), 0.71 points (4 points), and 1.39 points (4 points), respectively. With the increase of patients' age, the cognition of periodontitis was decreased, and the understanding of periodontitis symptoms was significantly different ( $P < 0.05$ ). With the increase of education level, patients' cognition of periodontitis showed an increasing trend, and education level had a significant impact on the symptoms and prevention of periodontitis ( $P < 0.05$ ). (Table 1)

Table 1. Comparison of the patient's cognition of periodontitis ( $\bar{X} \pm s$ ).

		Awareness of the symptoms of periodontitis	Awareness of the effects of periodontitis	Awareness of the prevention of periodontitis
Age	N			
0~	3	2.67±0.577	1.33±0.577	2.00±1.000
20~	20	1.80±1.508	0.65±0.671	1.70±1.081
40~	37	1.84±1.608	0.73±0.902	1.43±1.259
60~	19	0.84±1.214	0.63±0.831	0.89±0.737
<i>P</i>		0.030*	0.433	0.100
Education				
Junior High and below	24	1.00±1.103	0.50±0.78	0.83±0.816
Senior high	23	1.48±1.504	0.61±0.722	1.26±1.176
Junior college or Bachelor	30	2.23±1.633	0.93±0.907	1.93±1.018
Postgraduate or above	2	1.50±2.121	1.00±0.000	1.50±2.121
<i>P</i>		0.040*	0.157	0.003**

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

### 3.2. Investigation on the Cognition of Periodontitis and Cardiovascular Disease Among Medical Staff and Patients

According to the survey, patients' cognition of the correlation between periodontitis and cardiovascular disease needs to be improved. More than 70% of the patients did not know that "periodontitis is a cause and complication of cardiovascular disease", and only 26.6% of the patients

agreed that "treatment of periodontitis can reduce the risk of cardiovascular disease". Differences in gender, age, and education level had no significant impact on the cognitive status of patients ( $P>0.05$ ). Medical staff in Cardiology and Stomatology department had better cognition of the correlation between those two diseases, and the cognitive difference between medical staff and patients was highly significant ( $P<0.01$ ). (Table 2)

**Table 2.** Statistical status of cognition of periodontitis and cardiovascular disease between medical staff and patients [N (%)].

	periodontitis is a cause of cardiovascular disease	treatment of periodontitis can reduce the risk of cardiovascular disease	periodontitis is a complication of cardiovascular disease
Medical Staff (N=112)	76 (67.9)	90 (80.3)	67 (59.8)
Cardiovascular Patients (N=79)	22 (27.8)	21 (26.6)	13 (16.5)
P	0.000**	0.000**	0.000**

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

### 3.3. Investigation on Cognition of Factors Related to Cardiovascular Disease Caused by Periodontitis Among Medical Staff

Medical staff have a good understanding of the related factors of cardiovascular diseases caused by periodontitis. In this part, the correct options were a bacterial factor, systemic inflammatory response factor, and systemic immune response factor, and the rate of medical staff marking the correct options were 82.1%, 73.2%, and 52.7% respectively. (Table 3)

**Table 3.** Statistics on cognition of factors related to cardiovascular disease caused by periodontitis.

	Bacteria	Systemic Inflammatory Response	Systemic immune Response	Virus	Psychological Factor	Unknown
Frequency	92	82	59	42	34	2
Percentage (%)	82.1	73.2	52.7	37.5	30.4	1.8

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

### 3.4. Investigation on Working Behavior of Medical Staff in Cardiovascular Department and Stomatology Department

In this part, 28.6% of the medical staff did not pay attention to whether the patients had both periodontitis and cardiovascular disease. (Table 4) The medical staff of the stomatology department were more positive in promoting the correlation between periodontitis and cardiovascular diseases

to patients than those in the department of cardiology. 96.3% of medical staff in stomatology indicated that they are willing to publicize to patients and the correlation of two diseases. 87.9% of cardiovascular medical staff indicated that they are willing to publicize to patients and the correlation of two diseases. The difference between the two departments has no significant effect on promoting the education of the correlation between the two diseases ( $P>0.05$ ). (Table 5)

**Table 4.** Medical staff in cardiovascular department and stomatology department pay attention to the probability of cardiovascular diseases and periodontitis simultaneously.

	Unawareness	Awareness					Total
		5-9	10-19	20-39	40-59	60-	
Frequency	32	20	16	19	15	10	112
Percentage (%)	28.6	17.9	14.3	17.0	13.4	8.8	100

**Table 5.** Statistics of mission behavior and intention of medical staff [N (%)].

	Patients have been popularized about the relevance of the two diseases	Willing to popularize the correlation between the two diseases to patients.
Stomatology medical staff (N=54)	30 (55.6)	52 (96.3)
Cardiovascular department medical staff (N=58)	23 (39.7)	51 (87.9)

## 4. Discussion

More evidence proved that periodontitis and systemic diseases had some association, including cardiovascular

disease, gastrointestinal and colorectal cancer, diabetes and insulin resistance, cognitive impairment and Alzheimer's disease, as well as respiratory tract infection and adverse pregnancy outcomes [10-12]. The current epidemiology had defined that periodontal disease and cardiovascular disease

have a moderate association and the mechanism of this link had not been clarified [13, 14]. Severe heart failure (HF) can increase the burden of periodontal disease [15]. Some scholars found that common periodontal pathogens can be tested in atherosclerosis specimens [8, 16]. It was found that the NF- $\kappa$ B-BMAL1-NF- $\kappa$ B signaling loop can promote *P. gingivalis* to accelerate atherosclerosis [9]. The mortality of CVD and all-cause mortality have links with the IgG antibodies level of specific periodontal microbes [17]. Therefore, the therapy of periodontal diseases may reduce the overall inflammation and the pathogens to prevent the occurrence of cardiovascular diseases [18]. Conversely, other scholars found very low quality evidence that was insufficient to support whether periodontal therapy can prevent CVD in patients with chronic periodontitis and have no evidence in primary prevention of CVD [19, 20]. In the joint workshop of 2012, the European Federation of Periodontology (EFP) and the American Academy of Periodontology suggested that people should maintain their dental health to prevent the potential CVD and ask for help from their dentist [21].

To further understand Haikou people's awareness of the relationship between periodontal disease and cardiovascular disease, we interviewed medical staff and patients and investigated the publicization of medical staff. Patients had poor cognition of periodontitis, and there was no relationship in gender ( $P > 0.05$ ). Patients' cognition of periodontitis symptoms and prevention measures are related to age ( $P < 0.05$ ) and education ( $P < 0.05$ ) respectively. It was found that the older the patients, the worse their cognition of the symptoms of periodontal disease, and the higher their educational level, the better their understanding of the symptoms and prevention measures of periodontal disease. The initial symptoms of gingivitis are bleeding gums, which patients tend to ignore and do not take appropriate treatment. In addition, the middle and the old-aged people do not have enough awareness to keep dental healthy and are prone to cardiovascular diseases [22]. The very old individuals even cannot accept and tolerate any dental treatment [23]. Therefore, it is particularly important to strengthen oral health propaganda, strengthen the popularization of periodontal health knowledge, and adopt diversified propaganda methods to improve patients' awareness of periodontal disease, especially the elderly.

Medical staff can well understand the correlation of periodontitis and cardiovascular disease (CVD), 80.3% of the medical staff agree with "the possibility of treating periodontitis can reduce cardiovascular disease", compared with medical staff, patients who usually do not know the two-way relationship of periodontitis and cardiovascular disease, only 16.5% of the patients agree with "periodontitis as a complication of cardiovascular disease," 26.6% agreed that "treatment of periodontitis can reduce the possibility of cardiovascular disease", and there was a significant difference between medical staff and patients in the correlation of the two diseases ( $P < 0.01$ ). This result is caused by occupational factors of both doctors and patients.

Compared with non-medical workers, medical staff have a higher sensitivity to medical knowledge and more positive learning intention.

According to the survey, 28.6% of medical staff were not focused on "whether patients with cardiovascular disease and periodontitis" at the same time, 52.7% of medical staff did not publicize to patients the correlation of two kinds of diseases, while 91.9% said, "they are willing to publicize to patients and the correlation of two diseases". This may be caused by professional burnout [24]. The professional burnout can reduce workability, lack patience with patients, and neglect the publicization of disease-related knowledge. In addition, it may also be related to the limited cognitive ability of some patients. In this survey, 24% of the patients were over 60 years old, and 30.4% only had a junior high school education or below, so the medical staff could only give corresponding suggestions within the scope of understanding of patients.

## 5. Conclusion

The public has deficient knowledge of the correlation between periodontitis and cardiovascular disease in Hainan island, represented by Cardiologists and cardiovascular disease patients in Hainan. Clinicians should strengthen the education on the bidirectional relationship between periodontitis and cardiovascular disease into their routine treatment and management, so as to improve the comprehensive treatment effect of cardiovascular diseases and periodontitis.

## Conflicts of Interest

All the authors do not have any possible conflicts of interest.

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