



## Recent States and Prevention for Chronic Periodontitis and Diabetes in Actual Practice

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### Abstract

Chronic periodontitis and type 2 diabetes mellitus (T2DM) have been recently prevalent and crucial diseases. Both diseases show mutual vicious cycle as influencing each other. A systematic review revealed that T2DM cases with periodontitis have elevated odds ratio for retinopathy (2.8-8.7), neuropathy (3.2-6.6), nephropathy (1.9-8.5), cardiovascular complications (1.3-17.7) and mortality (2.3-8.5) compared to those without periodontitis. Adequate therapy for chronic periodontitis a few months would bring 0.27-0.48% decrease in HbA1c by meta-analyses. For patients with both diseases, low carbohydrate diet (LCD) seems to be effective associated with reduced HbA1c, body weight, Advanced Glycation End Products (AGEs) and inflammatory process.

**Keywords:** Chronic periodontitis; Type 2 diabetes mellitus (T2DM); Low carbohydrate diet (LCD); International Diabetes Federation (IDF); European Federation of Periodontology (EFP)

### Commentary Article

In usual medical practice, type 2 diabetes mellitus (T2DM) and chronic periodontitis have been recently prevalent and crucial diseases worldwide [1]. These diseases are common in the departments of internal medicine and dentistry [2]. According to previous reports, both of these diseases may cause various complications as mutual vicious cycle [3]. A systematic review was conducted concerning the association of chronic periodontitis PD and diabetic complications [4]. It included 14 studies and analyzed diabetic macro- and microvascular complications and death with periodontitis. Compared to diabetes without periodontitis, higher risks were found in diabetic cases with periodontitis. The odds ratio revealed 2.8-8.7 in retinopathy, 3.2-6.6 in neuropathy, 1.9-8.5 in nephropathy, 1.3-17.7 in cardiovascular complications and 2.3-8.5 in mortality.

Regarding the problems of diabetes and periodontitis, dentists conducted clinical research of chairside screening for undiagnosed diabetes mellitus (UDM) for 7343 cases [5]. UDM was defined as no past diabetic history, or not fasting glucose >126 mg/dL, postprandial glucose > 200mg/dL. Periodontitis was

defined for positive medical history. As a result, the ratio of UCD was 5.6%, while obesity and edentulous (no teeth, toothless jaw) showed 12.6% and obesity and periodontitis showed 12.2%. In recent study, meta-analysis was reported concerning the association among nephropathy, retinopathy and periodontitis [1]. T2DM patients were included from 8 articles, in which 1207 cases with microvascular complications, and 1734 cases with periodontitis as well. As a result, odds ratio (OR) was 1.96 for periodontitis with microvascular complications. From subgroup analysis, the relationship existed among nephropathy, retinopathy and periodontitis for Asian race (OR 2.33) and North American populations (OR 1.42).

For current therapy of T2DM and chronic periodontitis, authors and colleagues have continued adequate medical practice with internal medicine and dentistry departments for years [2,6]. The guideline for T2DM is based on American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD), and others [7]. On the other hand, the guideline for T2DM and periodontitis is based on International Diabetes Federation (IDF) and European Federation of Periodontology (EFP) [8,9].

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As to the basic therapy for diabetes, nutritional treatment would be important [10]. The standard method was formerly Calorie Restriction (CR), but recent tendency was changed. Low Carbohydrate Diet (LCD) was started in the medical regions by Drs. Atkins and Bernstein [11]. After that, LCD has been well-known in North American and European areas. For recent decade, clinical benefit of LCD has been prevalent to medical staffs and patients, which are also beneficial for glucose, lipid profile and arteriosclerotic cardiovascular disease (ASCVD) [12].

Our medical team have treated many patients with diabetes, obesity and chronic periodontitis [13,14]. Our group has initiated LCD at first in Japan, and developed LCD movement medically and socially through the activity of Japan LCD Promotion Association (JLCDPA) [15]. For practical use, three types of LCD have been recommended, which are super-LCD, standard-LCD, petite-LCD methods including carbohydrate 12%, 26%, 40%, respectively [16]. As any food includes a certain percentage of carbohydrate, and then minimum intake of carbohydrate becomes 12%. LCD has been applied to lots of cases with significant results. About 2900 cases showed 10% < weight reduction for 25%, and 5% < weight reduction for 59% [17]. Furthermore, LCD has brought hyperketonemia, which has been effective for not only protection of hyperglycemia, obesity, hyperlipidemia, but also reduction of Advanced Glycation End Products (AGEs) [18], inflammatory process and oxidation by reactive oxygen species (ROS) [19].

Among our clinical practice, a case with diabetes and chronic periapical periodontitis showed impressive course. He was 57-year-old man who suffered from impaired mastication and limited number of teeth [20]. By dental treatment and LCD for 3 months, general status was relieved satisfactory, in which weight decreased 100 kg to 90 kg and HbA1c improved 7.8% to 5.4%. Due to the standard guideline from EFP and IDF, the treatment for chronic periodontitis reveals clinical efficacy for diabetic patients [8]. By proper therapy for a few months, the reduction of HbA1c was reported to be about 0.27-0.48% by meta-analyses [21].

In the light of basic science, periodontal microbiome studies showed that the association between altered periodontal microbiome and changed glucose metabolism may be present [22]. Associated to this process, elevated glucose values will enhance the expression of pathogen receptors leading to stimulate response of the host. Hyperglycemia may also enhance pro-inflammatory response for the pathway of AGEs [22]. As periodontal pathogens product some cytokines for acute phase proteins, the insulin action and sensitivity may be impaired [23]. Discussion on the clinical efficacy has been continued concerning treatment of chronic periodontal disease only and/or combined therapy of periodontitis and diabetes. A recent study presented the comparison of HbA1c changes for patients with both diseases.

They were treated and followed by the treatment of full-mouth scaling associated with scaling root planing (SRP) for three months. The results showed that periodontal treatment had brought decreased inflammatory markers, indicating clinical efficacy of decreased HbA1c levels [23].

A recent study showed the correlation between glucose control and chronic periodontitis for T2DM patients [24]. The subjects included 182 cases with chronic periodontitis. As the protocol, several biomarkers were included such as fasting plasma glucose, HbA1c, remaining tooth number, probing depth (PD), bleeding on probing (BoP), clinical attachment level (CAL), and others. As a result, two groups (HbA1c is  $\geq 7\%$  vs HbA1c  $< 7\%$ ) revealed the significant difference as mean PD (3.78 vs. 3.42 mm,  $p < 0.01$ ), mean CAL (4.5 vs. 4.1 mm,  $p = 0.02$ ), mean remaining teeth (18.5 vs 20.4,  $p < 0.01$ ). Consequently, extension of chronic periodontitis was found more prevalent in T2DM cases with poor glycemic variability than those with good control [24].

## Conclusion

In conclusion, periodontal therapy can reduce HbA1c value. Diabetic patients have to check oral status and receive adequate periodontal treatment. Especially, when diabetic patient is hospitalized, to manage dental examination is required, because it is not included for the routine check [25]. Thus, physicians and medical staffs always have to keep dental evaluation in mind for diabetic patients.

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## Conflicts of Interest

The authors declare no conflict of interest.

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