

Role of Periodontal Therapy in the Reduction of HBA1C Levels in Diabetes Mellitus

Samba Siva Reddy¹, Krishna Kripal^{2*}, Dharendra Kumar Singh³ and Ipsitha Jayanthi³

¹Post Graduate Student, Department of Periodontology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India

²Professor, Department of Periodontology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India

³Department of Periodontology, Kalinga Institute of Dental Sciences, Bhubaneswar, Odisha, India

***Corresponding Author:** Krishna Kripal, Professor, Department of Periodontology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India.

Received: March 14, 2017; **Published:** May 22, 2017

Abstract

Different studies clearly indicate that the estimation of glycated hemoglobin can act as an important and reliable parameter to assess the effective periodontal treatment on the level of glycemic control. This HbA1c assay is of prime interest, and it is advantageous over traditional blood glucose monitoring methods. Numerous proteins in the body have the capacity of being glycated. Glycated hemoglobin is formed constantly in erythrocytes and is a product of the non-enzymatic reaction between the hemoglobin protein, which carries oxygen molecules and glucose. As the binding of glucose to hemoglobin is highly stable, hemoglobin remains glycated for the life-span of erythrocyte which is approximately 123 ± 23 days.

Keywords: Diabetes Mellitus; Periodontal Diseases; HbA1c; Periodontitis; Periodontal Therapy

Introduction

Type 1 diabetes mellitus represents approximately 5 to 10% of all diagnostic cases of diabetes mellitus. It is characterized by chronic hyperglycemia caused by autoimmune pancreatic β -cells destruction generally leading to total loss of insulin secretion [1]. Periodontal disease is a chronic inflammation which involves the tissues surrounding the teeth. These surrounding tissues get affected in response to accumulation of bacterial biofilm on the teeth [2]. It has been well established that bacterial pathogens and their products have an essential role in the initiation of the chronic inflammatory process which causes damage to periodontal tissues. The host response appears to play an important role in pathogenesis of periodontitis by accentuating the destructive inflammatory process initiated by the bacterial insult [3].

The complex pathogenesis of this disease is further complicated by the coexistence of systemic diseases, such as diabetes mellitus, which has the potential to aggravate the manifestations of periodontitis [4]. Periodontal disease and diabetes mellitus belong to a pathologic condition in which both diseases could negatively interfere with each other, constituting a bidirectional relationship with diabetes mellitus increasing the risk for periodontitis and periodontal inflammation negatively affecting glycemic control and the progression of vascular complications. Diabetic individuals, both type 1 and type 2, experience a higher incidence of periodontitis and the severity of the disease correlates with the duration of diabetes mellitus and glycemic control reflected by glycated hemoglobin (HbA1c) levels in the blood [5].

Type 1 diabetes mellitus has been recognized as an important modifier of periodontal disease [6,7]. Numerous factors related to diabetes mellitus have been proposed to increase the severity of periodontal disease in diabetic individuals, such as vascular abnormalities, neutrophil dysfunction, non-enzymatic glycosylation, altered collagen metabolism, and altered monocytic response [8]. Conversely, periodontal disease may be a critical factor for worsening glucose intolerance among patients with diabetes mellitus [9] and may increase the risk of diabetic complications. Periodontitis may play role in initiating or propagating insulin resistance by enhancing activation of the overall systemic immune response which is initiated by cytokines [10]. Elevated circulating levels of tumor necrosis factor- α (TNF- α), interleukin-6 (IL-6), and high-sensitivity capsular reactive protein (hs-CRP), which can impair insulin resistance and thereby reduce glycemic control, have been shown in a previous study [11].

This way, the control of periodontal disease is essential for improved systemic health in these individuals. Numerous studies have been published on the effect of periodontal therapy on glycemic control and some of these researchers have found beneficial effect on glycemic control [12-15]. Other studies have demonstrated no significant effect of periodontal therapy on metabolic control [9,16,17].

This HbA1c assay is of interest, as it offers advantages over traditional blood glucose monitoring methods. Numerous proteins in the body have the capability of being glycosylated. Glycosylated hemoglobin is formed continuously in erythrocytes as a product of the non-enzymatic reaction between the hemoglobin protein, which carries oxygen molecules and glucose. Binding of glucose to hemoglobin is highly stable; thus, hemoglobin remains glycosylated for the life-span of erythrocyte approximately 123 ± 23 days [18].

There are principally three methods of HbA1c examination: Flow cytometry, high performance liquid chromatography, and turbidimetric inhibition immunoassay (TINIA). The method used in this study is by TINIA by COBAS® auto analyzer.

Certain studies have shown that, if scaling and root planing are combined with systemic doxycycline, there is a marked improvement in the periodontal status of the patient, that significantly improves the glycaemic control, as can be monitored by the glycosylated haemoglobin assay (HbA1c) [19]. The reviewed literature also suggest a likelihood of treating with full-mouth ultrasonic debridement in combination with systemic tetracycline to improve the diabetic condition [20,21]. An meta-analysis study also demonstrated glycaemic control improved after periodontal therapy $P = 0.03$ [22].

Conclusion

The following conclusions can be drawn:

1. The HbA1c levels are correlated to the duration of the disease and to the type of treatment provided for type 2 diabetes mellitus.
2. The HbA1c levels are correlated to periodontal health status after treatment in type 2 diabetics.
3. Following nonsurgical periodontal treatment, a decrease in HbA1c is observed, thus indicating improved blood glucose control in type 2 diabetics.
4. Improvement in the HbA1c levels is obtained regardless of the duration of the disease and the treatment provided for type 2 diabetes mellitus.
5. Improvement in the HbA1c levels of type 2 diabetics after periodontal treatment is obtained regardless of the degree of periodontal involvement at baseline.

Bibliography

1. American Diabetes Mellitus Association. "Diagnosis and classification of diabetes mellitus". *Diabetes Mellitus Care* 33.1 (2010): S62-S69.

2. J Kim and S Amar. "Periodontal disease and systemic conditions: a bidirectional relationship". *Odontology* 94.1 (2006): 10-21.
3. AR Kamer., *et al.* "Inflammation and Alzheimer's disease: possible role of periodontal diseases". *Alzheimer's and Dementia* 4.4 (2008): 242-250.
4. A Monea., *et al.* "The influence of diabetes mellitus mellitus on periodontal tissues: a histological study". *Romanian Journal of Morphology and Embryology* 53.3 (2012): 491- 495.
5. E Firatli. "The relationship between clinical periodontal status and insulin-dependent diabetes mellitus. Results after 5 years". *Journal of Periodontology* 68.2 (1997): 136-140.
6. A Meenawat., *et al.* "Periodontal disease and type I diabetes mellitus: associations with glycemic control and complications". *Journal of Indian Society of Periodontology* 17.5 (2013): 597-600.
7. A Poplawska-Kita., *et al.* "Association between type 1 diabetes mellitus and periodontal health". *Advances in Medical Sciences* 59.1 (2014): 126-131.
8. BL Mealey and TW Oates. "Diabetes mellitus and periodontal diseases". *Journal of Periodontology* 77.8 (2006): 1289-1303.
9. F O B Correa., *et al.* "Effect of periodontal treatment on metabolic control systemic inflammation and cytokines in patients with type 2 diabetes mellitus". *Journal of Clinical Periodontology* 37.1 (2010): 53-58.
10. BL Mealey and LF Rose. "Diabetes mellitus and inflammatory periodontal diseases". *Current Opinion in Endocrinology Diabetes Mellitus and Obesity* 15.2 (2008): 135-141.
11. GW Taylor., *et al.* "Severe periodontitis and risk for poor glycemic control in patients with non-insulin dependent diabetes mellitus". *Journal of Periodontology* 67.10 (1996): 1085-1093.
12. Y Iwamoto., *et al.* "The effect of antimicrobial periodontal treatment on circulating tumor necrosis factor-alpha and glycated hemoglobin level in patients with type 2 diabetes mellitus". *Journal of Periodontology* 72.6 (2001): 774-778.
13. M Kiran., *et al.* "The effect of improved periodontal health on metabolic control in type 2 diabetes mellitus". *Journal of Clinical Periodontology* 32.3 (2005): 266-272.
14. L S Miller., *et al.* "The relationship between reduction in periodontal inflammation and diabetes mellitus control: a report of 9 cases". *Journal of Periodontology* 63.10 (1992): 843-848.
15. S Singh., *et al.* "The effect of periodontal therapy on the improvement of glycemic control in patients with type 2 diabetes mellitus: a randomized controlled clinical trial". *International Journal of Diabetes Mellitus in Developing Countries* 28.2 (2008): 38-44.
16. JP Aldridge., *et al.* "Single-blind studies of the effects of improved periodontal health on metabolic control in type 1 diabetes mellitus". *Journal of Clinical Periodontology* 22.4 (1995): 271-275.
17. F Llambes., *et al.* "The effect of periodontal treatment on metabolic control of type 1 diabetes mellitus". *Clinical Oral Investigations* 12.4 (2008): 337-343.
18. Mealey BL and Ocampo GL. "Diabetes mellitus and periodontal disease". *Periodontology 2000* 44 (2007): 127-153.
19. Grossi S., *et al.* "Treatment of periodontal disease in diabetes mellitus reduces glycated hemoglobin". *Journal of Periodontology* 68.8 (1997): 713-719.
20. D'Aiuto F., *et al.* "Short-term effects of intensive periodontal therapy on serum inflammatory markers and cholesterol". *Journal of Dental Research* 84.3 (2005): 269-273.

21. D'Aiuto F, *et al.* "Periodontitis and systemic inflammation: control of the local infection is associated with a reduction in serum inflammatory markers". *Journal of Dental Research* 83 (2004): 156-160.
22. Wijnand J., *et al.* "Effect of Periodontal Treatment on Glycemic Control of Diabetic Patients. A systematic review and meta-analysis". *Diabetes Mellitus Care* 33.2 (2010): 421-427.

Volume 1 Issue S2 May 2017

© All rights are reserved by Krishna Kripal., *et al.*