

STUDY OF SALIVARY PH IN PATIENTS WITH THE PREVALENCE OF PERIODONTITIS WITH OR WITHOUT DIABETES MELLITUS

UMA MAHESWARI TN¹, SRI NEERAJA P¹

¹Department of Oral Medicine and Radiology, Saveetha Dental College and Hospitals, Chennai, Tamil Nadu, India.

Email: prabhurajs20@gmail.com

Received: 05 May 2016, Revised and Accepted: 14 May 2016

ABSTRACT

Objective: To assess the relationship between salivary pH and periodontitis in subjects with and without diabetes mellitus. The relationship between diabetes mellitus and salivary pH has been assessed. The relationship between periodontitis and salivary pH has been assessed. But the relationship between diabetes mellitus, periodontitis and salivary pH among adults has received less attention.

Methods: A total of sixty subjects were evaluated in the study with no history of diabetes mellitus and periodontitis, with periodontitis but no history of diabetes mellitus, with periodontitis and diabetes mellitus twenty in each group. pH strips were used to measure the salivary pH.

Results: The results show that a decreased salivary pH was seen in subjects having periodontitis with diabetes as compared to subjects having periodontitis without diabetes.

Conclusion: Thus diabetes mellitus have a direct effect on salivary pH, reducing it from normal levels.

Keywords: Periodontitis, Diabetes mellitus, Salivary pH.

INTRODUCTION

Diabetes mellitus is characterized by increased glucose level. This hyperglycemic state affects multiple systems which is due to impaired insulin secretion [1]. There are many oral manifestations seen in diabetic patients such as xerostomia caused due to polyuria, gingivitis, periodontitis, multiple periodontal abscess, dental caries, infections of tongue, and oral mucosa-like chronic atrophic candidiasis and in few cases with burning mouth syndrome [2-4]. Diabetes mellitus has also been related to increased carriage of pathogens in saliva [5,6].

Some studies have demonstrated increased periodontal incidence in diabetics while others have shown decreased periodontal rate [7-9]. However, the relationship between the two is not clearly understood. With this problem in mind, the relation between salivary pH and periodontitis in non-diabetics and diabetics was evaluated. The relationship between diabetes mellitus and salivary pH has been assessed, the relationship between periodontitis and salivary pH has been assessed. Even the relationship between dental caries and salivary pH has been assessed. This article evaluates the relationship between diabetes mellitus, periodontitis and salivary pH among adults. Awareness of the implications of diabetes mellitus on the oral cavity helps to improve oral hygiene.

METHODS

The study was approved by the Saveetha Dental College and Hospitals at Chennai, Tamil Nadu (India), for performing activities involving human subjects.

Sample collection

A total of 60 subjects were evaluated in the study with their informed consent and were categorized into groups.

Group I: About 20 subjects with no history of diabetes mellitus and periodontitis.

Group II: About 20 subjects with periodontitis but no history of diabetes mellitus.

Group III: About 20 subjects with periodontitis and diabetes mellitus.

Patients were asked to check randomized blood sugar level to categorize according to the respective groups. Salivary samples were collected from each subject. Unstimulated saliva was collected in a disposable cup, and immediately following that pH strips were used to measure the salivary pH.

The periodontal status of all the patients assessed using Russell's index.

RESULTS

Mean of the salivary pH scores was taken individually for each group; and the data for all the values were analyzed using one-way ANOVA with Tukey HSD *post-hoc* test.

The salivary pH values of subjects in Group I ranged from 8.6 to 5.9 with a mean of 7.7 ± 0.20 . Similarly, salivary pH values of subjects in Group II ranged from 6.5 to 4.5 with a mean of 5.8 ± 0.30 , and salivary pH values of subjects in Group III ranged from 3.8 to 5.2 with a mean of 4.3 ± 0.08 (Table 1).

Mean salivary pH value was 5.8 for Group II and 7.7 for cases in Group I. The difference in mean pH value between Group I, Group II, and Group III was highly significant ($p=0.0005$) (Table 2).

The mean pH value, 4.3 for Group III was significantly less than that of Group I and Group II (Graph 1).

Sample size: 20 in each group (Groups I, II, and III).

Therefore, in the present study, salivary pH was determined in non-diabetics and diabetics; and the possible difference in the occurrence of periodontitis was evaluated [10,11]. Unstimulated saliva of subjects was collected for monitoring salivary pH. The collected data were analyzed with SPSS 16.0 version. To describe the data descriptive statistics, mean and standard deviation were used. In the multivariate analysis, one-way ANOVA with Tukey HSD *post-hoc* test was used.

Table 1: Mean and standard deviation of salivary pH in Groups I, II, and III

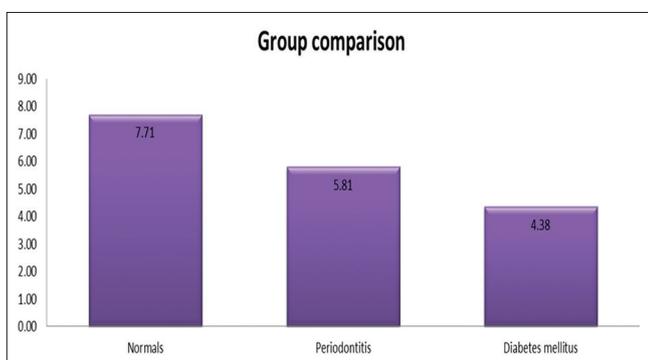
Subjects	Sample size	Mean	SD	Standard error	95% confidence interval for mean		Minimum	Maximum
					Lower bound	Upper bound		
Normal (Group I)	20	7.7143	0.71224	0.15542	7.3901	8.0385	5.90	8.60
Periodontitis (Group II)	20	5.8050	0.53062	0.11865	5.5567	6.0533	4.50	6.50
Diabetes mellitus (Group III)	20	4.3750	0.38781	0.08672	4.1935	4.5565	3.80	5.20
Total	60	5.9934	1.49241	0.19108	5.6112	6.3757	3.80	8.60

SD: Standard deviation

Table 2: Tukey test to determine the difference in salivary pH between the groups

Groups	Mean difference	Standard error	Significant	95% confidence interval	
				Lower bound	Upper bound
Normal					
Periodontitis	1.90929*	0.17575	0.000	1.4865	2.3320
Diabetes mellitus	3.33929*	0.17575	0.000	2.9165	3.7620
Periodontitis					
Normal	-1.90929*	0.17575	0.000	-2.3320	-1.4865
Diabetes mellitus	1.43000*	0.17788	0.000	1.0021	1.8579
Diabetes mellitus					
Normal	-3.33929*	0.17575	0.000	-3.7620	-2.9165
Periodontitis	-1.43000*	0.17788	0.000	-1.8579	-1.0021

*The mean difference is significant at the 0.05 level



Graph 1: Mean salivary pH in Group I, Group II, and Group III

Thus salivary pH value was significantly at much lower level for diabetic patients. Therefore, as per the results, salivary pH value became acidic as disease state progressed from non-diabetics to diabetics.

DISCUSSION

Diabetes has emerged as a common and widespread health care problem in the world, which affects multiple organ systems. Its effects are seen in some of the organs. Even the oral cavity show changes related to the disease and oral infections may adversely affect metabolic control of the diabetic state. The close relationship between the oral health and diabetes suggests a need for assessment of oral clinical parameters in such patients.

The present study demonstrated that when the patients with diabetics were compared with the patients without diabetes, diabetic patients had decreased salivary pH values. This causes changes in the metabolic processes due to increased glucose levels, resulting in a more acidic environment and thus associated with periodontitis. The effect could be secondary to decreased salivary flow rates and pH value that leads a series of plaque risk factors especially if the disease is inadequately controlled and uncontrolled [12,13].

As per one study comparing the salivary flow rate, pH and its buffering capacity between subjects with type 2 DM and control inferred that, the

control level of hyperglycemia was not sufficient to improve the salivary flow rate or the salivary glucose concentration [14]. Another study on type 1 DM supported the view that, assessment of salivary flow rate and buffer capacity is required when assisting diabetic children [15,16]. Many other studies were done comparing the incidence of dental caries in diabetic patients along with lower levels of pH.

Since diabetics showed decrease in salivary pH, the present study emphasizes that diabetes may have a direct effect on salivary pH reducing it from normal levels irrespective of diet thus influencing the oral environment.

CONCLUSION

Since the insidious nature of diabetes mellitus allow prolonged periods of hyperglycemia to begin exerting negative effects on various organ systems including oral cavity. Adequate measures to prevent periodontitis in patients at an early stage are necessary. Understanding the effects of diabetes mellitus on the oral health is, therefore, must for the dental professionals.

REFERENCES

1. Definition and Diagnosis of Diabetes Mellitus and Intermediate Hyperglycemia: Report of a WHO/IDF Consultation. Geneva: World Health Organization Press; 2006.
2. Kumar V, Abbas AK, Fausto N. Robbins and Cotran Pathologic Basis of Disease. 7th ed. Noida: Thoma Press Ltd.; 2004. p. 1189.
3. Greenberg MS, Glick M. Oral Medicine: Diagnosis and Treatment. 10th ed. New Delhi: Harcourt Private Limited; 2003. p. 563.
4. Reddy CV, Maurya M. A comparative study to assess the oral health status and treatment needs of diabetics and non-diabetic population attending some of the hospitals in Mysore City. JIAPHD 2008;12:1-14.
5. Khovidhunkit SO, Suwantuntula T, Thaweboon S, Mittrattanakul S, Chomkhakhai U, Khovidhunkit W. Xerostomia, hyposalivation, and oral microbiota in Type 2 diabetic patients: A preliminary study. J Med Assoc Thai 2009;92(9):1220-8.
6. Newman MG, Takei H, Carranza FA, Klokkevold PR. Clinical Periodontology. 10th ed. Philadelphia, PA: Saunders, Elsevier; 2003. p. 113-1.
7. Southerland JH, Taylor GW, Offenbacher S. Diabetes and periodontal infection: Making the connection. Diabetes 2005;23(4):171-8.
8. Tenovou J, Alanen P, Larjava H, Viikari J, Lehtonen OP. Oral health

- of patients with insulin-dependent diabetes mellitus. Scand J Dent Res 1986;94(4):338-46.
9. Preshaw PM, Alba AL, Herrera D, Jepsen S, Konstantinidis A, Makrilakis K, *et al.* Periodontitis and diabetes: A two-way relationship. Diabetologia 2012;55(1):21-31.
 10. Soskolne WA, Klinger A. The relationship between periodontal diseases and diabetes: An overview. Ann Periodontol 2001;6:91-8.
 11. Yalda B, Offenbacher S, Collins JG. Diabetes as a modifier of periodontal disease expression. Periodontol 2000 1994;6:37-49.
 12. Brian L. Mealey, and Thomas W. Oates, Diabetes Mellitus and Periodontal Diseases. J Periodontol 2006;77:1289-303.
 13. Matthews DC. The relationship between diabetes and periodontal disease. J Can Dent Assoc 2002;68(3):161-4.
 14. Bernardi MJ, Reis A, Loguercio AD, Kehrig R, Leite MF, Nicolau J. Study of the buffering capacity, pH and salivary flow rate in Type 2 well-controlled and poorly controlled diabetic patients. Oral Health Prev Dent 2007;5(1):73-8.
 15. Moreira AR, Passos IA, Sampaio FC, Soares MS, Oliveira RJ. Flow rate, pH and calcium concentration of saliva of children and adolescents with Type I diabetes mellitus. Braz J Med Biol Res 2009;42(8):707-11.
 16. Karjalainen KM, Knuutila ML, Käär ML. Salivary factors in children and adolescents with insulin-dependent diabetes mellitus. Pediatr Dent 1996;18(4):306-11.