Original Article

Comparison of glycated albumin levels before and after periodontal treatment in type 2 diabetes patients with periodontitis

Bhuvana Karthikeyan*, Suresh Babu Kondaveeti**, I.Anand Shaker***, Thayappan R****.

*Final year BDS student, Adhiparasakthi College of Dental Sciences, Melmaruvathur, 603319, Tamilnadu.
**Assistant Professor, ***Associate Professor, Department of Biochemistry, Melmaruvathur Adhiparasakthi Institute of Medical Sciences, Melmaruvathur, 603319, Tamilnadu.
****Professor & Head, Department of Periodontics, Adhiparasakthi College of Dental Sciences, Melmaruvathur, 603319, Tamilnadu.

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ABSTRACT

Background: Periodontal disease is closely related to type 2 diabetes and is an important complication of diabetes.

Aim: This study aimed to investigate the effect of periodontal treatment on levels of blood glucose (Glu) and glycated albumin (GA) among patients with type 2 diabetes and periodontal disease.

Methods: A total of 150 patients with type 2 diabetes and periodontal disease were selected and divided into two groups according to their GA levels. Group A was a well-controlled diabetic group and group B was uncontrolled. Their probing depth (PD), attachment loss (AL), the value of glucose and GA were analyzed before periodontal treatment and every two weeks in two months interval after.

Results: There was a significant difference in periodontal condition between groups A and B (P <0.01). The periodontal condition for both groups was significantly (P <0.01) improved after periodontal therapy. The effect of treatment in group A was more pronounced than group B, and the difference was significant (P <0.01). After the periodontal treatment, Glu and GA were reduced significantly in both groups (P <0.05).

Conclusion: Periodontal condition is related to the control of glucose level among patients with type 2 diabetes and periodontal disease. Periodontal treatment can effectively reduce the level of glucose and GA as well as it improves the periodontal condition in type-2 diabetes patients with periodontal disease.

Keywords: periodontal disease, type 2 diabetes, glycated albumin

INTRODUCTION

The longer plaque and tartar are on teeth, the more harmful they become. The bacteria cause inflammation of the gums that is called “gingivitis.” In gingivitis, the gums become red, swollen and can bleed easily. Gingivitis is a mild form of gum disease that can usually be reversed with daily brushing and flossing, and regular cleaning by a dentist or dental hygienist. This form of gum disease does not include any loss of bone and tissue that hold teeth in place. When gingivitis is not treated, it can advance to “periodontitis” (which means inflammation around the tooth.) [1]. In periodontitis, gums pull away from the teeth and form spaces (called “pockets”) that become infected. The body’s immune system fights the bacteria as the plaque spreads and grows below the gum line. Bacterial toxins and the body’s natural response to infection start to break down the bone and connective tissue that hold teeth in place. If not treated, the bones, gums, and tissue that support the teeth are destroyed. The teeth may eventually become loose and have to be removed. Periodontal disease is closely related to type 2 diabetes and is an important complication of diabetes [2,3]. People with diabetes usually have a high prevalence of periodontal disease, which is characterized by severe lesions and rapid progress. For those patients with periodontal disease and type 2

diabetes, they always suffered from a decreased oral health condition due to the decline of whole body function. When they become older, the decline of periodontal tissue regeneration [4] will cause worse damage to their periodontal tissue. Glucose has an aldehyde group with strong reduction at its end, this group can combine non enzymatically with various kinds of proteins [5] and produce glycated proteins such as glycated haemoglobin and glycated albumin [6,7]. Few Studies showed that non-surgical periodontal treatment can reduce the level of glycosylated haemoglobin in these patients [8,9,10], But HbA_1c can be an index of average blood glucose level up to 3 months, while Glycated albumin can be act as short term glycemic index up to 3-4 weeks which will be more convenient for monitoring and controlling of progression of disease. From the selected 150 elderly patients with type 2 diabetes and periodontitis, we try to investigate the effect of non-surgical periodontal therapy on glycosylated albumin levels and its impact mechanism from the clinical point of view.

MATERIAL & METHODS

A total of 150 elderly patients with type 2 diabetes and periodontitis were selected from the diabetic OPD, Melmaruvathur Adhiparasakthi Institute of medical Sciences and Research Hospital and periodontology department, Adhiparasakthi Dental College and Hospitals. The study was carried out after the approval from the institutional ethical committee (Regd.No.MAPIMS/1058/PO/AC/10/CPCSEA) Among 150 patients 82 patients are males and 68 patients are females, ranging in age from 55 to 78 years. The patients were divided into two groups according to level of Glycated albumin: a good diabetic control group (GA ≤16%) as group A (75 cases, mean age of (55.9±5.9) years) and a poorly controlled diabetic group (GA>16%) as group B (75 patients, mean age of (67.9±6.6) years) and estimating the parameters once in a month for a total of two months interval for better follow up and management of the periodontitis. Both groups received non-surgical periodontal treatment and all patients understood the purpose of this study and agreed to participate and informed consent was obtained from all the subjects.

Inclusion criteria were as follows

1. Patients were diagnosed with type 2 diabetes for more than one year according to the 2008 WHO established DM diagnostic criteria, and with no other serious complications of diabetes [11].
2. Two groups have the same total remaining number of teeth, 15 ≤remaining teeth ≤20.
3. At least six sites of attachment loss (AL) ≥4 mm, probing depth (PD) ≥4 mm.
4. Patients had no periodontal treatment for at least six months.
5. Had no significant changes in their diabetes medications.
6. Had no other serious systemic disease.
7. Do not smoke.
8. Had no significant changes for their diet and movement before and after treatment.
9. Had not taken antibiotic treatment for at least three months.

Experimental methods

Periodontal examination

Patients were checked by the periodontology O.P department APDCH hospitals with the FP32-Florida pressure sensitive probe to get the PD, AL of six representative teeth (16, 11, 24, 36, 41, 44) prior to an non-surgical periodontal treatment and four months afterwards. If missing tooth (16, 11, 24, 36, 41, 44), the measurements were performed on the neighboring teeth. The data from six sites of each tooth were averaged and calibrated by the clinical parameters to a consistent rate of 96%.

Determination of blood glucose level

The fasting glucose level (G_0) and 2-hour postprandial blood glucose (G_2) 3 weeks before and one month after the treatment were determined by Hitachi-7600 automatic biochemical analyzer (Hitachi Ltd., Japan).

GA determination

To get the GA levels three weeks before and one month after the treatment, Serum GA levels were determined with an improved bromocresolpurple method using Lucica™ glycated albumin-L assay kit (Asahi Kasei Pharma, Japan).

Body mass index (BMI) determination

BMI was calculated with the equation: body weight/height (kg/m^2).

Periodontal treatment

Periodontal treatment was: 1. Teaching the patients how to take control of dental plaque and maintain good oral health; 2. Periodontal and subgingival scaling, root planning and removal of infected tissue, occlusal adjustment (done by two experienced doctors sub-quadrant in 4 days), and removal of extremely loose teeth that cannot be retained; 3. Placing anti-

inflammatory drugs, such as iodine glycerine or Periocline into periodontal pocket; 4. Periodic return visit, re-treatment, finishing the treatment within one month and re-examining month after treatment.

Statistical analysis

Data were shown as mean ± standard deviation (SD) and analyzed with Student's *t*-test using SPSS11.0 software (SPSS Inc., USA). *P* <0.05 was considered as statistically significant.

RESULTS

Table 1.Comparision of all parameters of the two patient groups before treatment

Parameters	Group A (75 cases)	Group B (75 cases)
Age(years)	55.9±5.9	67.9±6.6
BMI(kg/m^2)	25.65±1.98	27.42±3.25
Fasting plasma glucose(G_0)	117±2.92	204±4.63
2hrs postprandial glucose(G_2)	156.78±2.45	332.25±4.34
GA (%)	15.2±0.54	22.5±2.44
Probe depth(PD in mm)	3.81±0.54	7.45±0.54
Allinement loose(AL in mm)	4.95±0.65	7.25±0.56

Table 2.Comparision of PD and AL of the two patient groups before and after treatment

Groups	Probe depth(PD in mm)				Alignment loose(AL in mm)			
	Before treatment	After 1st month treatment	After 2ndmonth treatment	Improvement	Before treatment	After 1st month treatment	After 2ndmonth treatment	Improvement
A	3.81±0.54	2.96±0.35	2.02±0.54	1.79	4.95±0.65	3.65±0.23	2.95±0.34	2.6
B	7.45±0.54	5.79±1.04	4.85±0.56	2.25	7.25±0.56	5.25±0.65	5.95±0.45	1.95

Table 3.Comparision of fasting, post-prandial blood glucose and GA levels along with BMI of the two patient groups in two intervals after treatment.

Groups	After 1st month treatment				After 2ndmonth treatment			
	Fasting plasma glucose(G_0)	Postprandial blood glucose(G_2)	GA levels (%)	BMI (kg/m^2)	Fasting plasma glucose(G_0)	Postprandial blood glucose(G_2)	GA levels (%)	BMI (kg/m^2)
A	132.57±2.43	145±2.57	17±1	25.65±1.98	125.45±1.54	140±1.45	16±1	25.65±1.98
B	158.45±1.54	185±2.65	20±2	27.42±3.25	152.24±2.34	172±2.45	18±1	27.42±3.25

As shown in Table 1, before the non-surgical periodontal treatment, the G_0, G_2 and GA levels as well as PD and AL of group A were significantly (*P* <0.01) lower than the corresponding index of group B, while the indexes of age and weight had no significant difference (*P* >0.05).

Table 2 shows that periodontal clinical parameters of the two groups in overall two months' time decreased significantly (*P* <0.01). After the treatment, the PDs of groups A and B decreased by 1.79 and 2.65 respectively, and the reduction was significant

(*P* <0.01); AL decreased significantly (*P* <0.01) by 2.0 and 2.30 respectively.

Table 3 shows, G_0, G_2 and GA levels of the two groups slight decrease in one month of time and the decrease was most significant after two months (p <0.05) , whereas no significant change was found for BMI (*p* >0.05). The decrease of fasting plasma glucose and GA levels before and after treatment in group A were more pronounced (*p* <0.01).

DISCUSSION

The association between diabetes mellitus and periodontitis has long been discussed with conflicting conclusions. Both of these diseases have a relatively high incidence globally in the general population with a number of common pathways in their pathogenesis. Diabetes mellitus and Periodontitis are polygenic disorders with some degree of immuno-regulatory dysfunction. Numerous reports indicate a higher incidence of periodontitis in diabetics compared to healthy controls. Periodontal disease is a chronic oral infectious disease and considered as the sixth complication of diabetes. Recent study has shown that type 2 diabetes is a chronic inflammatory disease with the feature of insulin resistance [12]. Both diseases are of high incidence and the incidence of diabetes associated with periodontal disease has an upward trend among old people. Extensive studies have shown that the incidence of diabetes and periodontal disease share common risk factors and enhance the risk of each other [13,14]. Excluding smoking, age and BMI factors, our results have shown that PD and AL of the well-controlled group are significantly lower than the corresponding indicators of the poorly-controlled group; periodontal status of both groups was significantly improved after treatment, and the improvement of the well-controlled group is more obvious than the poorly-controlled group. This suggests that the level of blood glucose will have a significant impact on periodontal health status. The main reason for a more severe periodontal disease within the blood glucose poorly-controlled group may be the body reaction and special resistance of the host caused by abnormal glucose metabolism [11]. Remarkably, non-surgical periodontal treatment can improve the periodontal situation of both groups. Moreover, PD and AL were obviously decreased. These results are consistent with related reports [15,16].

Two months after periodontal treatment, the GA of both groups decreased significantly. The mechanism may be due to the close links between inflammatory factors and insulin resistance [17]. By effective periodontal treatment, the pathogenic microorganisms were eliminated in periodontal pockets, which improved the inflammation. As a consequence, the serum concentration of inflammation factor tumor necrosis factor α (TNF-α) was decreased, leading to a reduction of insulin resistance and an increased sensitivity to insulin. Finally, the resulting reduction in GA [18,19,20] level can also influence periodontal tissues, diminishing the occurrence and severity of inflammation [21].

Among those elderly patients with periodontal disease and type 2 diabetes, we have observed a high prevalence of periodontal disease for the older patients and patients with longer course of diabetes [22]. The main reason is the weakening of defence mechanisms in elderly patients, reduced ability to fight against infections, the changing of periodontal tissue with age [23] and lesions of tiny blood vessels resulting from increased blood glucose level. All of these abolish the ability of nutritional metabolism and periodontal tissue healing repair in patients. Therefore, for those elderly patients with periodontal disease and type 2 diabetes, a complex treatment plan should be applied along with the better management. .As blood glucose levels play major role in management of disease we have to get a better reliable short term marker such as GA. There are studies about long term marker such as HbA1C for four months but here the time and management to control diabetes is very important as complications of diabetes are very quick to exist. In addition to the control of metabolic disorders and bacterial infections so as to consolidate the treatment of diabetes and periodontal disease [24].

CONCLUSION

Evidence is emerging to suggest that periodontal disease is associated with increased risk for diabetes complications. Because periodontal diseases are "silent" in nature, most patients do not realize they have such conditions until significant destruction has occurred. Likewise, physicians may not know that their patients have a condition that could alter glycemic control and make diabetes management more difficult. It is important for clinicians to discuss with their diabetic patients the increased risk for periodontal diseases. Treating periodontal infection in people with diabetes is clearly an important component in maintaining oral health. It may also have an important role in establishing and maintaining glycemic control and possibly in delaying the onset or progression of

diabetic complications. Systematic study in diverse populations is warranted to support existing evidence that treating periodontal infections can contribute to glycemic control management and possibly to the reduction of the burden of complications of diabetes mellitus. Awareness, attitudes and orientation of health care providers both dentist and physicians are essential in better health outcomes for the patient. An inter-disciplinary approach in health care is the need of the hour. More research to better understand the level of awareness, about the short term glycemic control marker such as GA and orientations of health-care providers (both dentists and physicians), and even patients themselves, when it comes to diabetes and its relationship with periodontal diseases, is warranted. There is clearly room for improvement in clinical practice, and looking ahead, research towards developing clinical support systems for dentists. {and dental hygienists, physicians, nurses, diabetes educators, dieticians) and also programmes that facilitate the interaction and synergy among all health-care providers involved in the care of diabetic individuals is of essence.

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Corresponding Author:

Suresh Babu Kondaveeti
Assistant Professor,
Department of Biochemistry
MAPIMS, Melmaruvathur.
Tamilnadu
E-mail: sureshbabu_kondaveeti@yahoo.com

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