

Effects of Nonsurgical Periodontal Therapy on Glycemic Control in Diabetic Patients under Systemic Administration of Antidiabetic Ayurvedic Drug

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ABSTRACT

Aim: This study aimed to monitor the metabolic response of nonsurgical periodontal therapy in type-2 diabetic patients with chronic periodontitis under systemic administration of antidiabetic ayurvedic drug.

Materials and methods: About 90 newly diagnosed mild-to-moderate forms of type-2 diabetes mellitus (DM) subjects with generalized chronic periodontitis were selected according to the inclusion and exclusion criteria and were randomly divided into group A and group B with 45 patients in each group. Clinical parameters, including plaque index, probing pocket depth, clinical attachment level, and glycemic status, were assessed at baseline. Following initial periodontal clinical examination, the drug Nishamalaki (NA) 2 gm twice daily for 3 months was prescribed after food by an Ayurvedic physician to all the patients enrolled in group A and group B, and scaling and root planing were completed only for group B patients. Patients were recalled for review, and all the parameters were reassessed at the end of the 1st, 2nd, and 3rd months following interventions.

Results: Regarding clinical and metabolic parameters at baseline, no statistically significant differences were displayed between the two groups. However, at the 3-months follow-up period, the patients in group B demonstrated significantly better clinical and metabolic outcomes than patients in group A.

Conclusion: Periodontal therapy improved glycemic control in patients with type-2 DM in both groups; however, the reduction in FBS values reached statistical significance only in the group receiving scaling and root planing alone.

Clinical significance: Nonsurgical periodontal therapy may have a beneficial effect on the periodontal clinical and glycemic levels in type-2 diabetic patients with chronic periodontitis.

Keywords: Chronic periodontitis, Diabetes, Pocket depth, Scaling and root planing.

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INTRODUCTION

Periodontitis is a chronic inflammatory disease caused by pathogens in the surrounding periodontal tissues, that results in the periodontal pocket formation, clinical attachment loss, and alveolar bone resorption, and ultimately leads to tooth loss.¹ While it is the bacterial infection that triggers the destructive process, it is the presence of risk factors and the host's immune response to the bacterial challenge that is responsible for the molecular processes leading to periodontal tissue destruction.²

Diabetes mellitus (DM) and chronic periodontitis (CP) are chronic diseases that have long been considered to be biologically linked. In fact, diabetes is one of the primary risk factors for periodontitis.^{3,4} Diabetes mellitus is a clinically and genetically heterogeneous group of metabolic disorders manifested by abnormally high levels of glucose in the blood. Periodontitis is one of the complications of diabetes. There is strong evidence that diabetes is a risk factor for gingivitis and periodontitis, and the level of glycemic control appears to be an important determinant in this relationship.^{5,6} Patients with diabetes mellitus who have poor glycemic control are more likely to develop severe periodontitis and are at higher risk for the advancement of periodontal disease over time.^{7,8} Diabetes results in changes in the function of immune cells, including neutrophils, monocytes, and macrophages. Neutrophil adherence, chemotaxis, and phagocytosis are often impaired; enabling bacteria to persist in the periodontal pocket and to significantly increase periodontal destruction.⁹

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Evidence supports the concept that periodontal diseases can contribute to poorer glycemic control in people with diabetes and that treating periodontal infections could have a beneficial effect on glycemic control in either type-1 or type-2 DM.¹⁰ Studies have proved that nonsurgical periodontal treatment in type-2 diabetic patients is effective in improving metabolic control.¹¹ Periodontal nonsurgical treatment is important in periodontal patients affected by diabetes because, in addition to the negligible side effects, it leads to the reduction of one potential factor impairing glycemic control, while preserving dental and periodontal health.

Management of diabetes without any side effects is still a challenge in the medical field, as presently available drugs for diabetes have one or more adverse effects. In view of these

adverse effects and limitations of intensive treatment of hyperglycemia in preventing diabetic complications, which is linked to oxidative stress, it has been proposed that simultaneous targeting of hyperglycemia and oxidative stress could be more effective than intensive treatment of hyperglycemia alone in the management of DM.

Due to their efficiency, lack of negative side effects and affordable price, herbal medications are frequently given. India has a long history of treating diabetes with a variety of strong herbs and herbal remedies. Nishamalaki (NA) drug is a unique ayurvedic formulation comprising of two herbal products turmeric and gooseberry.¹² Nishamalaki is offered as tablets and powder. The medication is made by combining an equal amount of dried turmeric rhizome powder with dried gooseberry fruit powder (Amla). Gooseberry interferes with the absorption of glucose and delays glucose entry in the blood, thereby preventing sudden spikes in glucose levels in the blood. Turmeric improves the functions of β -cells of pancreas. Nishamalaki can be used with any allopathic medication because it contains kitchen ingredients. It is recommended to keep a minimum 3-hour separation between NA and any allopathic or homeopathic medications for safety reasons.

However, till date, only limited clinical trials exist to assess the effect of nonsurgical periodontal therapy on periodontal and glycemic status in type-2 DM patients with chronic periodontitis under ayurvedic treatment.

Thus, in this study, an attempt was made to assess the effectiveness of scaling and root planing on the glycemic and periodontal status in type-2 diabetes patients with chronic periodontitis under systemic administration of the drug NA.

MATERIALS AND METHODS

The research protocol was approved by the Institutional Human Ethical Committee before the initiation of the study. This study was carried out from December 2019 to March 2020 in Kandamkulathy Super Speciality Ayurveda Hospital, Kerala, and the fasting blood sugar level was assessed for patients, who were reporting for the treatment of DM. About 90 newly diagnosed mild-to-moderate forms of type-2 DM¹³ subjects with generalized chronic periodontitis with mild-to-moderate forms were selected according to the inclusion and exclusion criteria and were randomly divided into group A and group B of 45 patients in each group. All the subjects were informed about the study, and written informed consent was obtained prior to the initiation of the study.

Patients with fasting blood sugar levels greater than 126 mg/dL and having clinical attachment loss between 1 and 4 mm¹⁴ were included in the study. Female patients and patients with other forms of systemic illness (other than type-2 DM) were excluded.

Clinical parameters, including plaque index, probing pocket depth, clinical attachment level, and glycemic status, were assessed at baseline. Following initial periodontal clinical examination, the drug NA 2 gm twice daily for 3 months was prescribed after food by an Ayurvedic physician to all the patients enrolled in group A and group B, and scaling and root planing were completed only for group B patients. The patients were allowed to take other allopathic drugs advised by their physician with a minimum of 3 hours gap after or before taking NA. Patients were recalled for review, and all the parameters were reassessed at the end of the 1st, 2nd and 3rd months following interventions.

All patients were supplied with nonmedicated toothpaste and medium toothbrushes and instructed to brush twice daily using a

Table 1: Mean and SD of distribution of age by groupwise

| Group | No | Mean | Standard deviation | p-value |
|---------|----|-------|--------------------|---------|
| Group A | 45 | 41.74 | 4.53 | 0.777 |
| Group B | 45 | 41.98 | 3.44 | |

Table 2: Intergroup comparison at baseline

| | | N | Mean | Standard deviation | p-value |
|--------------|---------|----|---------|--------------------|---------|
| Baseline PI | Group A | 45 | 2.595 | 0.396 | 0.786 |
| | Group B | 45 | 2.617 | 0.375 | |
| Baseline PPD | Group A | 45 | 5.000 | 0.738 | 0.771 |
| | Group B | 45 | 5.044 | 0.705 | |
| Baseline CAL | Group A | 45 | 3.666 | 0.603 | 0.724 |
| | Group B | 45 | 3.711 | 0.588 | |
| Baseline FBS | Group A | 45 | 132.822 | 2.249 | 0.749 |
| | Group B | 45 | 132.666 | 2.354 | |

modified bass brushing technique. Measures were taken to ensure that all the patients were taking the NA drug regularly, as confined to the group.

Statistical Analysis

The results obtained were recorded in a proforma, tabulated, and subjected to statistical analysis, performed using SPSS Version 22 Software, IBM Statistics, USA. A p -value < 0.05 was considered as significant. t -test: Baseline parameters were compared using independent t -test.

Repeated analysis of variance (R-ANOVA) followed by multiple comparisons using Bonferroni test was used to assess the effectiveness of the drug NA in group A and adjunctive use of scaling and root planing along with the drug in group B in terms of changes in glycemic status and clinical and biochemical parameters.

RESULTS

The study was conducted for a period of 3 months, and included 90 type-2 diabetic patients with mild-to-moderate periodontitis, with the greatest number of participants between 35 years and 50 years, and the mean value of 41.74 in group A and 41.98 in group B (Table 1).

Periodontal Parameters and FBS Levels at Baseline, 1st and 2nd Month

There was no significant difference in PI (p -value = 0.786), PPD (p -value = 0.771), CAL (p -value = 0.724), and FBS (0.749) between the two groups at baseline (Table 2).

After the 1st and 2nd month, there was a gradual decrease in all the clinical and biochemical parameters in group A patients, which is statistically significant (p -value < 0.001), whereas in group B patients, both the clinical and biochemical parameters were increased with p -value < 0.001 (Tables 3 and 4).

Comparison of Periodontal Parameters and FBS Levels after 3 Months

In group B, the PI dropped from 2.61 to 0.977 with a significant p -value < 0.001 , whereas in group A, the PI was increased from 2.59 to 2.62 (Table 5). Similarly, there was a statistically significant

Table 3: Intergroup comparison after 1 month

| | | N | Mean | Standard deviation | p-value |
|-------------------|---------|----|---------|--------------------|---------|
| After 1 month PI | Group A | 45 | 2.624 | 0.388 | 0.437 |
| | Group B | 45 | 2.393 | 1.947 | |
| After 1 month PPD | Group A | 45 | 5.111 | 0.745 | <0.001* |
| | Group B | 45 | 4.977 | 0.753 | |
| After 1 month CAL | Group A | 45 | 3.731 | 0.596 | <0.001* |
| | Group B | 45 | 2.521 | 0.649 | |
| After 1 month FBS | Group A | 45 | 131.111 | 2.376 | 0.004* |
| | Group B | 45 | 129.600 | 2.434 | |

*Statistically significant

Table 4: Intergroup comparison after 2 months

| | | N | Mean | Standard deviation | p-value |
|--------------------|---------|----|---------|--------------------|---------|
| After 2 months PI | Group A | 45 | 2.624 | 0.388 | <0.001* |
| | Group B | 45 | 1.486 | 0.506 | |
| After 2 months PPD | Group A | 45 | 5.511 | 0.745 | <0.001* |
| | Group B | 45 | 4.000 | 0.707 | |
| After 2 months CAL | Group A | 45 | 3.888 | 0.596 | <0.001* |
| | Group B | 45 | 2.101 | 0.617 | |
| After 2 months FBS | Group A | 45 | 128.711 | 1.995 | <0.001* |
| | Group B | 45 | 126.222 | 2.530 | |

*Statistically significant

Table 5: Intergroup comparison after 3 months

| | | N | Mean | Standard deviation | p-value |
|--------------------|---------|----|---------|--------------------|---------|
| After 3 months PI | Group A | 45 | 2.624 | 0.388 | <0.001* |
| | Group B | 45 | 0.977 | 0.461 | |
| After 3 months PPD | Group A | 45 | 5.922 | 0.745 | <0.001* |
| | Group B | 45 | 3.400 | 0.495 | |
| After 3 months CAL | Group A | 45 | 4.001 | 0.596 | <0.001* |
| | Group B | 45 | 1.200 | 0.476 | |
| After 3 months FBS | Group A | 45 | 127.111 | 3.213 | <0.001* |
| | Group B | 45 | 118.555 | 2.776 | |

*Statistically significant

decrease observed from 5.00 to 3.40 and from 3.711 to 1.20 in the PPD and CAL, respectively, after the end of 3rd month (Table 5). In group B patients, there was an improvement in the FBS value, from 132.66 to 118.55 at the end of the 3rd month, which is statistically significant (p -value < 0.001) (Table 5).

The results showed that there was an increase in plaque index, probing pocket depth, and clinical attachment loss from baseline to 3rd month in group A patients when compared with group B patients.

DISCUSSION

In this study, there was an increase in the mean plaque score, mean probing pocket depth, and mean clinical attachment level

($p < 0.001$) from baseline to 3rd month in group A, while there was a reduction in the mean plaque score, probing pocket depth, and clinical attachment level ($p < 0.001$) in group B patients. The present results were in accordance with Buzinin et al.,¹⁵ who found an improvement in all the clinical parameters, including plaque score, PPD, and CAL following nonsurgical periodontal therapy. Similarly, Sinha et al.¹⁶ also observed an improvement in clinical parameters after scaling and root planing in type-2 diabetic patients with moderate generalized chronic periodontitis and hence is effective in conditioning the periodontal pockets.

In order to diagnose diabetes as per ICMR guidelines, FBS is suggested as the most common test with the cutoff point of FBS ≥ 126 mg/dL.¹⁷ In this study, 8-hour FBS ≥ 126 mg/dL was diagnosed as diabetes, which is in accordance with Khan et al.,¹⁸ who also found an elevated FBS level in suspected cases of type-2 DM. Chahkandi et al.,¹⁹ in their cross-sectional study, also observed an impaired fasting glucose in adolescents. A significant reduction in FBS values in both the groups of the study, with a more pronounced reduction in group B patients, who underwent SRP along with the antidiabetic drug was observed.

The above findings were in accordance with the study by Bedarkar,²⁰ who found a significant reduction in fasting and postprandial blood sugar levels in the NA drug-treated group along with reduction in signs and symptoms of the disease. Kashinath et al.²¹ also found similar results, where drug NA was administered to diabetic patients and found 8.6% and 15.7% reduction in FBS after 1 and 2 months, respectively. Punchihewa et al.,²² who evaluated the immediate effect of NA drug in the management of blood glucose levels in type-2 DM, reported that the NA drug did not effectively reduce the blood-glucose level, which is in contrast to the present study.

Nishamalaki drug is a unique ayurvedic formulation, prepared in a 1:1 ratio of gooseberry and turmeric, and is available in powder and tablet forms. Studies have shown that gooseberry reduces the blood-glucose levels by suppressing gluconeogenesis and glycogenolysis.²³ The extract of gooseberry also rises the β -cell size and number proving its antidiabetic activity through the upregulation of β -cell actions that decreases glucose intolerance and enhances insulin secretion.²⁴ Furthermore, it has strong antioxidant action, which reduces and prevents the damage to pancreas due to oxidative stress. Turmeric inhibits the reactive oxygen species production, playing a fundamental role, particularly for diseases related to oxidative stress and diabetes.

Various other studies^{25,26} reported that scaling and root planing or SRP plus adjuvant treatment could improve glycemic control in patients with T2DM and CP, which is in accordance with our present results, where there is reduction in FBS in group B patients.

This study suggests that periodontal therapy along with the antidiabetic drug improves glycemic control. However, these results may be influenced by dietary factors, which were not monitored during this investigation. In this regard, it is important to highlight the fact that treating periodontal disease while addressing modifiable risk factors like diabetes control and diet will enhance the quality of patient care. This can possibly lead to more successful outcomes in our treatment of patients with periodontal disease.

The hypothesis that metabolic control of DM could be improved by the successful treatment of periodontitis along with the use of systemic drugs was confirmed by this study. The clinical and biochemical parameters were significant at baseline which indicates that the treatment outcome was highly influenced by the baseline

values. At this juncture, we would like to emphasize that all the confounding variables associated with the study, the initial baseline mean value was found to be higher in both groups, which could also be a key contributing factor for marked response in diabetic patients with chronic periodontitis.

Thus, in our current study, significant improvements were seen with both the groups, but SRP along with the NA drug provided profound changes in all clinical and biochemical parameters than subjects treated with the antidiabetic drug alone, thus clinically establishing its pivotal role as an effective therapy in treating diabetes mellitus subjects with chronic periodontitis.

CONCLUSION

The results obtained appeared to demonstrate a strong, statistically significant association between the clinical improvement in the periodontal condition and improved metabolic control of diabetes. Moreover, adjunctive scaling and root planing along with NA drug, having both antidiabetic and antioxidant properties improves the periodontal and metabolic parameters when compared with drug alone. These results can also be a starting point for further research on the efficiency of different antioxidant agents for prevention and treatment of periodontal disease in diabetic patients. The interpretation and result of the study are significant as they will guide not only the dentists for proper control and care of diabetic patients but also help in awareness of the public to consult a dentist well in time for better control of these chronic diseases.

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