ORIGINAL RESEARCH

Comparative Evaluation of the Effectiveness of *Triphala* and Chlorhexidine in Full-mouth Disinfection Treatment of Periodontitis in Type 2 Diabetes Patients

Aishwarya Rathod[1], Priyanka Jaiswal[2], Bhairavi Kale[3], Deepika Masurkar[4]

Abstract

Aim: To evaluate and compare the efficacy of *triphala* and chlorhexidine (CHX) in the treatment of stages II and III periodontitis with one-stage complete mouth disinfection in type 2 diabetes mellitus (DM) patients.

Materials and methods: A total of 24 type 2 diabetic subjects with either stage II or stage III periodontitis were randomly divided into test and control groups with 12 patients in each group. For control group, full-mouth disinfection (FMD) was done using CHX and for test group, FMD was done using *triphala*. Clinical parameters were evaluated at baseline and at 6 months which comprised of probing pocket depth (PPD), plaque index (PI), clinical attachment level (CAL), papillary bleeding index (PBI). The primary outcomes considered were a reduction in PPD and a gain in CAL. The data were recorded, tabulated, and statistically analyzed.

Results: The PPD reduction for the test group was 3.38 ± 0.75 mm and for the control group was 3.39 ± 0.76 mm. The CAL gain for the test group was 3.39 ± 0.76 mm and for the control group was 3.18 ± 0.74 mm. Although there was a statistically significant PPD reduction, statistically not significant CAL gain was observed.

Conclusion: Both the groups with the FMD protocol showed beneficial results in terms of PPD reduction and CAL gain but the test group showed slightly better results.

Clinical relevance: Clinically, there is more PPD reduction and CAL gain from baseline to 6 months in the test group compared to the control group. Clinically, the test group has more favorable results compared to the control group.

Keywords: Chlorhexidine, Full-mouth disinfection, Probing pocket depth, Root planing, Scaling, *Triphala*.

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Introduction

Periodontal disease is an inflammatory disorder that has many underlying causes. A bacterial infection, the host's immune reaction to it, a systemic condition, and the patient's habits all contributed to the development of periodontitis.[1] The main causative agents are the periodontopathogenic microorganisms, which have close ties to *Porphyromonas gingivalis*, *Bacteroides forsythus*, and *Aggregatibacter actinomycetemcomitans*.[2] According to, the European Federation of Periodontology (EFP) and the American Academy of Periodontology (AAP) presented a novel classification of periodontal disease during the 2017 European Workshop of Periodontology. It classifies periodontitis into four phases based on the severity of the condition, assigns grades based on the extent of the disease, and considers the patient's tendency for the disease as well as risk factors.[3]

The management of periodontitis is centered around two fundamental ideas: maintaining good oral hygiene to prevent the buildup of supragingival plaque and using subgingival instruments to eradicate periodontopathic bacteria.[4] Over the past 20 years, a number of clinical studies have been carried out to determine whether full-mouth disinfection (FMD) for 24 hours is better than the typical nonsurgical treatment of 4–6 weeks.[5] The motive behind one-stage full-mouth disinfection (OSFMD) is to manage the previously treated periodontal sites from the residual pockets by preventing reinfection of periodontal pathogens and intraoral bacterial reservoirs, such as tonsils, tongue, and mucous membranes that could lead to a disease recurrence.[6] According to a series of studies[7] that were based on these concepts, disinfection with full-mouth scaling and root planing (SRP) in 24 hours reduces the likelihood of bacterial cross-contamination, which gives it an advantage over traditional stepwise care.

The sixth complication of diabetes was identified by the American Diabetes Association in 1997 as periodontal disease. Diabetes affects both the severity of the disease and the chance of getting periodontal disease.[8] Treatment for periodontitis that lowers periodontal inflammation may aid in regaining insulin sensitivity and enhancing glycemic control.[9]

[1–4]Department of Periodontics, Sharad Pawar Dental College and Hospital, Datta Meghe Institute of Higher Education and Research (Deemed to be University), Wardha, Maharashtra, India

Corresponding Author: Aishwarya Rathod, Department of Periodontics, Sharad Pawar Dental College and Hospital, Datta Meghe Institute of Higher Education and Research (Deemed to be University), Wardha, Maharashtra, India, Phone: +91 9834240701, e-mail: aishwaryarathod55@gmail.com

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Chlorhexidine (CHX) is a cationic bisbiguanide and an antimicrobial agent with a strong affinity to bind mucous membrane and skin, low toxicity, and broad antibacterial activity. Furthermore, CHX has a broad-spectrum action enclosing gram-negative and positive bacteria, lipophilic viruses, yeasts, and dermatophytes. Its antimicrobial activity is of membrane-active type that impairs the cytoplasmic membrane. Also, CHX shows low irritability and exhibits substantivity to oral mucosa and tooth surfaces.[10]

Since the beginning of time, ayurvedic medicines have been used to treat diseases, including periodontal diseases. In periodontal therapy, ayurvedic oral rinses are used to reduce bleeding and inflammation. The mouth is thought to be a reflection of overall health, so maintaining good dental hygiene is essential for both oral and overall health. Ayurveda is the oldest indigenous medical practice practiced in India.[11] *Triphala*, according to the 20th *shloka* of *Sushruta Samhita*, can be used as a gargling agent in dental problems due to its anti-inflammatory, antibacterial, and antiseptic characteristics. As a result, when used, it provides systemic benefits rather than side effects. *Triphala* has several possible systemic advantages and is highly recognized in Indian folk medicine. Ayurvedic practitioners have recommended it for a variety of systemic ailments due to its broad range of activities. As a result, it may be advantageous for impaired and immobile patients, as well as those who are unable to maintain proper oral hygiene.[12] There is limited study comparing *Triphala* and CHX for FMD, diabetes and periodontitis has two-way relationship.

Therefore, the aim of present study was to evaluate and compare the efficacy of *triphala* and CHX in the treatment of stage II and III periodontitis with one stage FMD in type 2 diabetes mellitus (DM) patients at baseline and after 6 months.

Materials and Methods

In the present study, 24 patients with stages II and III periodontitis were chosen from outpatient section of the department of periodontics. The study protocol was submitted, and approval was obtained by the Datta Meghe Institute of Medical Sciences' (DMIMSs') Ethical Committee at Sawangi (Meghe), Wardha, Maharashtra, India (DMIMS(DU)/IEC/2020-21/267). After approval from the ethical committee, all participants were informed verbally and written consent was taken. The research was carried out from September 2021 to September 2021.

The current study included the individuals under the age of 50 years (25–50 years) with glycated hemoglobin levels of ≥6.5% and fasting plasma glucose levels of ≥126 mg/dL. Individuals who had a minimum of 15 teeth and patients with stage II periodontitis who have at least two interproximal sites with attachment loss (AL) of 3–4 mm and probing depth (PD) of 5 mm. Patient with stage III periodontitis have minimum two interproximal sites with an AL of 5 mm and a PD of 6 mm.

In the present study, the patients excluded were who had received periodontal therapy within the previous 6 months and patients with a known or suspected allergy; patients with any systemic disease affecting periodontal health, excluding DM, those suffering from infectious diseases other than periodontitis; patients who use tobacco, smokers, and chronic alcoholics; patients with impaired immunity; females who were expecting or nursing; patient who had significant complications of DM, including nephropathy, neuropathy, ulcers, gangrene, and amputation.

The chosen individuals were divided into the test group and the control group at random by flipping a coin. Sample size was 24; the test group was treated with *triphala* gel (Himalaya, HiOra-GA gel, Himalaya wellness Company) to 12 patients. whereas the control group was treated with CHX gel (1% HEXIGEL, ICPA Health Product Ltd.) to 12 patients with stages II and stage III periodontitis patients and type 2 diabetes.

Clinical measurements such as plaque index (PI), papillary bleeding index (PBI), clinical attachment level (CAL), and probing pocket depth (PPD) were measured at baseline and after 6 months. All clinical measurements were measured by an examiner pre- and posttherapy.

An FMD procedure described by Quirynen et al.[7] was used to treat all individuals full-mouth scaling and root planing (FMSRP) was accomplished in a single day using hand curettes and an ultrasonic tool. For group I, after 1 week of supragingival scaling, patients were subjected to one stage FMD. Under local anesthesia, FMSRP was performed in 24 hours using curettes and ultrasonic scaler. Mechanical debridement was done by the application of CHX to intraoral niches by with index figure and scraped with tongue cleaner. Immediately following every instrumentation session, the patient were asked to brush the dorsum of the tongue for 1 minute with a 1% CHX gel, the mouth was rinsed two times with a 0.2% CHX mouthwash for 1 minute, and all periodontal pockets were irrigated (thrice within 10 minutes) with a 1% CHX gel, and the patients were prescribed a 0.2% CHX mouthwash for 1 month. For group II, after 1 week of supragingival scaling, patients were subjected to FMD. Under local anesthesia, FMSRP were performed within 24 hours using curettes and ultrasonic scaler. Mechanical debridement was done by the administration of *triphala* gel to the intraoral niches. Immediately following each instrumentation session, the patients brushed the dorsum of the tongue for 1 min with a *triphala* gel, the mouth was rinsed 2 times with *triphala* mouthwash (Himalaya, Himalaya wellness company, Bengaluru, Karnataka, India) for 1 minute, and all pockets were irrigated (thrice within 10 minutes) with a *triphala* gel, and the patients were prescribed mouthwash for 1 month.

For each clinical parameter, the mean and standard deviations [mean ± standard deviation (SD)] were determined. A common statistical method was used to statistically analyze the mean values. The CAL, PI, PBI, and PPD at baseline and after six months were compared. The difference was considered significant if the probability value (p) was below 0.05 and nonsignificant if it was above 0.05. Data, within-group prior and after treatment were compared using the paired t-test and unpaired –t-test was used to compare among the groups.

Results

Twenty-four patients completed the study with mean age of 39.53 ± 2.54 years (11 females and 13 males). There were no adverse reactions and discomfort noted in any of the group. The primary outcome was reduction in PPD and gain in CAL, while all other clinical measurements were taken as secondary outcomes. Tables 1 and 2 give the mean results for the clinical assessments of PPD and CAL at baseline and 6-months posttherapy.

In test group, PPD at baseline was 5.63 ± 0.84 mm; after 6 months, it was reduced to 2.25 ± 0.52 mm having statistically significant value ($p < 0.05$) (Table 1). Also, CAL at baseline was 6.46 ± 1.06 mm; it was reduced to 3.07 ± 0.91 mm which was statistically

Table 1: Comparison of clinical parameter values between baseline and 6 months after treatment for test group (mean ± SD; in mm)

Parameter	*Baseline*	*6 months*	*Difference*	*p-value*
PPD	5.63 ± 0.84	2.25 ± 0.52	3.38 ± 0.32	<0.001
REC	0.81 ± 0.76	0.81 ± 0.76	0	1
CAL	6.46 ± 1.06	3.07 ± 0.91	3.39 ± 0.76	<0.001

Table 2: Comparison of clinical parameter values between baseline and 6 months after treatment for control group (mean ± SD; in mm)

Parameter	*Baseline*	*6 months*	*Difference*	*p-value*
PPD	5.21 ± 0.80	2.08 ± 0.46	3.13 ± 0.72	<0.001
REC	0.73 ± 0.73	0.73 ± 0.73	0	1
CAL	6 ± 0.88	2.81 ± 0.85	3.18 ± 0.74	<0.001

Table 3: Comparison of clinical parameters between test group and control group at 6 months after treatment (mean ± SD; in mm)

Parameter	*Test*	*Control*	*Difference*	*p-value*
PPD	3.38 ± 0.75	3.13 ± 0.72	0.25 ± 0.81	0.02
REC	0	0	0	1
CAL	3.39 ± 0.76	3.18 ± 0.74	0.21 ± 0.88	0.06

Table 4: Plaque index and PBI scores at baseline and at 6 months posttreatment for test group

Parameter	*Baseline*	*6 months*	*Difference*	*p-value*
PI	0.75 ± 0.13	0.54 ± 0.11	0.20 ± 0.21	0.005
PBI	0.53 ± 0.13	0.58 ± 0.07	0.05 ± 0.13	0.23

significant ($p < 0.05$) (Table 1). Recession (REC) at baseline was 0.81 ± 0.76 mm and at 6 months it was 0.81 ± 0.76 mm. Furthermore, there is no change in gingival REC after 6 months.

In control group, PPD at baseline was 5.21 ± 0.80 mm; after 6 months, it was reduced to 2.08 ± 0.46 mm which is statistically significant ($p < 0.05$) (Table 2). Also, CAL at baseline was 6 ± 0.88 mm and it was reduced to 2.81 ± 0.85 mm having statistically significant value ($p < 0.05$) (Table 2). Furthermore, REC at baseline was 0.73 ± 0.73 mm and at 6 months it was 0.73 ± 0.73 mm. There is no change in REC at 6 months.

Using a student' unpaired *t*-test, the mean PPD reduction at 6 months for the test group was 3.38 ± 0.75 mm, whereas it was 3.13 ± 0.72 mm for the control group. After comparing the two groups, we found that there was a statistically significant mean PPD reduction of 0.25 ± 0.81 mm ($p < 0.05$). At 6 months, when comparison was made between the mean gain in CAL using student's unpaired *t*-test between test group was 3.39 ± 0.76 mm and for control group it was 3.18 ± 0.74 mm. There was statistically not significant gain in CAL ($p > 0.05$) (Table 3).

In test group, PI score at baseline was 0.75 ± 0.13 and after 6 month it was reduced to 0.54 ± 0.11, there was statistically significant decrease in PI ($p < 0.05$). Furthermore, PBI score at baseline was 0.53 ± 0.13, and after 6 months, it was 0.58 ± 0.07 which is statistically not significant ($p > 0.05$) (Table 4).

In control group, PI score at baseline was 0.69 ± 0.09, and after 6 months, it was 0.52 ± 0.06, there was statistically significant decrease in PI ($p < 0.05$). The PBI score at baseline was 0.6 ± 0.18 and after 6 months, it was 0.6 ± 0.13 which is statistically not significant ($p > 0.05$) (Table 5).

Table 5: Plaque index and PBI scores at baseline and at 6 months posttreatment for control group

Parameter	*Baseline*	*6 months*	*Difference*	*p-value*
PI	0.69 ± 0.09	0.52 ± 0.06	0.16 ± 0.09	<0.001
PBI	0.6 ± 0.18	0.6 ± 0.13	0	1

At baseline to 6 months, there is statistically significant PPD reduction and CAL gain. In comparison between test group and control group, there is statistically significant PPD reduction and statistically insignificant CAL gain.

Discussion

There are now various periodontitis treatment strategies available. Most practitioners feel that individual with DM may have a poorer response to periodontal treatments than systemically well individual. Those with diabetes who have a greater risk of infection and possible cross-contamination may benefit significantly from FMD, which involves long-term oral CHX application and short-term SRP.[13] In literature, there is no other study comparing CHX and *triphala* in FMD of type 2 DM patients having stages II and III periodontitis. There is need to evaluate *triphala* in non-surgical periodontal therapy for effective result without any harm to patients.

One of the most widely utilized formulations in conventional ayurveda medicine is *triphala*. *Triphala* has potent antiplaque properties. The herbal extract efficiently prevented the development of biofilm, and because it displayed stronger antioxidant activity than commercial toothpastes, it may have protected the gum cells from free radicals. *Triphala* is, therefore, a potent antiplaque agent. Because *triphala* has antibacterial, antiseptic, and anti-inflammatory properties, it can be used as a gargling agent in dental diseases.[14,15]

Triphala means three (tri) fruits (phala), which is traditional ayurvedic herbal formulation. The synergy of three "fruits" *Amalaki–Emblica officinalis*, *Bibhitaki–Terminalia belerica*, *Haritaki–Terminalia chebula* in equal proportions provide the classical combination of *Triphala*.[15] *Triphala* is used as a mouthwash, antimicrobial, and antioxidant in the treatment of oral and periodontal diseases. It is used in anticollagenase activity.[16] Naiktari et al.[17] compared the efficacy of *triphala* mouthwash with 0.2% CHX in hospitalized periodontal disease patients. Authors concluded that the *triphala* mouthwash is an effective antiplaque agent like 0.2% CHX. It is significantly useful in reducing plaque accumulation and gingival inflammation, thereby controlling periodontal diseases in every patient. It is also cost effective, easily available, and well tolerable with no reported side effects.

It is suggested that CHX can be used in the FMD protocol to inhibit microorganisms from supragingival plaque and non-dental niches from reinfecting pockets that have already received treatment.[7] In their study, Almeida et al.[18] compared the clinical effects of FMD treatment for mild to moderate periodontitis in type 2 DM and non-diabetic patients. The study's results to a follow-up of up to 6 months showed that the diabetic group's CAL gain was 3.79 ± 2.01 mm while the diabetic group's PPD reduction was 2.56 ± 0.67 mm. In the non-diabetic group, PPD decreased by 2.50 ± 0.50 mm while CAL increased by 2.22 ± 1.25 mm was in accordance with present study. In randomized controlled clinical

trial, Santos et al.[19] examined the clinical outcomes of using CHX during a FMD in participants with poorly managed type 2 diabetes who had generalized chronic periodontitis. Also, PPD reduction was 2.9 ± 0.4 mm and gain in CAL 3.6 ± 0.77 mm in FMD group and in control group PPD reduction was 2.9 ± 0.5 mm; gain in CAL was 3.8 ± 0.81 mm. It was in accordance with the present study. Using clinical periodontal parameters, Nassar et al.[20] assessed the efficacy of two therapy modalities for individuals with DM and periodontal disease to reduce their blood sugar levels. As a result, in group I (conventional periodontal treatment with SRP plus mechanical control), the PPD reduction was 2.3 ± 0.3 mm and gain in CAL was 2.7 ± 0.4 mm. In group II (FMD plus mechanical control), the PPD reduction was 1.9 ± 0.3 mm and gain in CAL was 2.5 ± 0.8 mm. It was in contrast with the present study. Because the OSFMD periodontal treatment improved all parameters only for three months, most likely as a result of the quick treatment and the use of CHX, which may have accelerated the potential for a reduction in periodontopathogenic bacteria.

The key advantage of the present study is that it is the first study to examine the efficacy of an FMD protocol for the treatment of stages II and III periodontitis in type 2 DM participants for up to 6 months posttherapy between CHX and *triphala*. The limitations of current study is that gingival REC was not reduced. Assessment of salivary levels of red complex bacterial species is also necessary.

Conclusion

At 6 months after therapy, FMD with *triphala* was found to have a greater PPD reduction and CAL gain than FMD with CHX, but the difference was statistically significant for PPD reduction but not for CAL gain when compared between the two groups. Hence authors concluded that *triphala* can be successfully used in the treatment of FMD.

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