



## Comparative Evaluation of Turmeric and Chlorhexidine Gluconate Mouthwash in Prevention of Plaque Formation and Gingivitis: A Clinical and Microbiological Study

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### ABSTRACT

**Aim:** To compare the efficacy of turmeric mouthwash and chlorhexidine gluconate mouthwash in prevention of gingivitis and plaque formation.

**Materials and methods:** A total of 100 randomly selected subjects visiting the Department of Periodontology at Bharati Vidyapeeth Deemed University, Dental College and Hospital, were considered for the study. The gingival index (GI) by Loe and Silness was recorded which was followed by Turesky-Gilmore-Glickman modification of Quigley Hein plaque index (TQHP) at 0, 14 and 21 days. Individuals who gave an informed consent, subjects in the age group of 25 to 35 years with having fair and poor gingival index scores and a score >1 for plaque index, were included in the study.

**Results:** Results showed statistically significant reduction ( $p < 0.05$ ) in mean plaque index (PI) with chlorhexidine gluconate mouthwash when compared with turmeric mouthwash. No significant difference in mean gingival index (GI) was seen when chlorhexidine mouthwash was compared with turmeric mouthwash. Significant reduction in total microbial count ( $p < 0.05$ ) was observed in both the groups. No significant difference was observed in total microbial count when chlorhexidine mouthwash was compared with turmeric mouthwash.

**Conclusion:** From the above observations, it can be concluded that chlorhexidine gluconate as well as turmeric mouthwash can be effectively used as an adjunct to mechanical plaque control methods in prevention of plaque and gingivitis. Chlorhexidine gluconate has been found to be more effective when antiplaque property was considered.

**Clinical significance:** From this study, it could be stated that turmeric is definitely a good adjunct to mechanical plaque control. Further studies are required on turmeric based mouthwash to establish it as a low cost plaque control measure.

**Keywords:** Turmeric mouthwash, Chlorhexidine mouthwash, Gingival index, Quigley Hein plaque index.

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### INTRODUCTION

Gingival and periodontal diseases are affecting the majority of population across the world. Several types of accretions occurring on the teeth are related to periodontal disease in one way or the other. Among these, dental plaque has posed a real challenge. Dental plaque has been proved by extensive research of Harold Loe (1965)<sup>1</sup> to be paramount factor in initiation and progression of gingival and periodontal diseases. A direct relationship has been demonstrated between plaque levels and the severity of gingivitis.<sup>1</sup>

Since bacterial plaque is the principle causative factor in gingival and periodontal diseases, the most rational methodology toward the prevention of periodontal diseases would be regular effective removal of plaque by personal oral hygiene protocol. Procedures for plaque control include mechanical and chemical means. Mechanical methods have proved to be very time-consuming and their effectiveness would depend on skills and technique of the individual, carrying out these procedures. The fact that most people experience difficulty in maintaining adequate levels of plaque control, particularly at interproximal sites, necessitates the use of chemicals for control of plaque as an adjunct to mechanical plaque control procedures.<sup>1</sup>

A number of chemical agents have been advocated such as fluorides, bisbiguanides, essential oils, quaternary ammonium compounds, sanguinarine and triclosan, which are either available as a toothpaste/dentifrice or in the form of a mouthwash. Among these, chlorhexidine gluconate (CHX) is regarded as gold standard in dentistry for the

prevention of dental plaque.<sup>1</sup> CHX mouthwash though very effective also has certain side effects like brown discoloration of the teeth, oral mucosal erosion and bitter taste.<sup>2,3</sup> Hence, a need was felt of an alternative medicine that could provide a product already enmeshed within the traditional Indian setup and is also safe and economical.

Turmeric, more commonly known as 'Haldi', possesses anti-inflammatory, antioxidant and antimicrobial properties, along with its hepatoprotective, immunostimulant, antiseptic, antimutagenic and many more properties.<sup>4</sup> Due to these reasons, it was felt that promotion of turmeric in dental terrain may prove beneficial.

## MATERIALS AND METHODS

The study was conducted in Department of Periodontology, Bharati Vidyapeeth Dental College and Hospital, Pune, India. The subjects were selected from age group 25 to 35 years who visited the OPD of the department.

An ADA Type III clinical examination was done.<sup>5</sup> Individuals who gave an informed consent, subjects in the age group of 25 to 35 years with having fair and poor gingival index scores and a score >1 for plaque index were included in the study. Sample size comprised total 100 subjects. Simple random sampling by lottery method was followed and the participants were allocated to two groups, A and B of 50 participants each.

Subjects suffering from systemic diseases, pregnant/lactating females, with mouth-breathing habit, wearing oral appliances and smokers were excluded from the study. Ethical clearance was obtained from Institutional Ethics Committee before commencement of the study. Pilot study was conducted for 1 week with 5 subjects in each of the 2 groups to know the feasibility of the study. Results were not included in the main study.

The gingival index (GI)<sup>6</sup> by Loe and Silness was recorded which was followed by Turesky-Gilmore-Glickman modification of Quigley-Hein plaque index (TQHPI).<sup>7</sup> 'Plaksee' disclosing solution containing erythrosine was used to disclose plaque before recording. Calibration of the investigator was done and a double-blind trial was carried out. Recording of indices was done on 0, 14 and 21 days and all records were maintained on a record chart. Oral hygiene and mouthwash usage instructions were given. Group A subjects were dispensed CHX mouthwash and group B turmeric mouthwash.

CHX mouthwash was procured from ICPA Health Products Ltd. For preparing turmeric mouthwash 10 mg of curcumin extract was dissolved in 100 ml of distilled water and flavoring agent 0.005% peppermint oil was added and the pH was adjusted to 4.

The subjects were asked to gargle with 10 ml of mouthwash in 1:1 dilution with water twice a day after

brushing. Compliance was checked with the help of a reminder sheet to be filled by the subject daily after using the mouthwash. These compliance sheets were checked by the investigator during subsequent examinations. Subjects, whose compliance was less, were reinforced with oral hygiene instructions during subsequent examinations. All the mouthwashes were provided to the study subjects free of cost during the entire duration of the study by the investigator.

## MICROBIOLOGICAL STUDY

For microbiological evaluation, total 10 subjects (5 from each group) were selected. The supragingival plaque samples were collected from the buccal surfaces of tooth numbers 16 and 36 with help of sterile Gracey curette on 0 and 21st day. The supragingival plaque samples were carried in transport media phosphate buffer solution (PBS) for microbiological study. The plaque samples were assessed for total microbial count.

The clinical and microbiological data were compiled and subjected to statistical analysis. Paired t-test was used for intragroup comparisons at baseline and unpaired t-test was used for intergroup comparisons.

## Statistical Analysis

Changes from baseline to different time intervals in various clinical parameters were analyzed by paired t-test (Intragroup). Intergroup comparisons of posttreatment changes were analyzed by unpaired t-test. p-value (<0.05) was considered as statistically significant.

## RESULTS

In group A, the difference of mean plaque index between 0 to 14th and 0 to 21st day was  $1.59 \pm 0.33$  and  $2.48 \pm 0.48$  respectively, which was statistically significant ( $p < 0.01$ ) (Table 1).

In group B, the difference of mean plaque index between 0 to 14th and 0 to 21st day was  $1.27 \pm 1.86$  and  $2.05 \pm 0.48$  respectively, which was statistically significant ( $p < 0.01$ ) (Table 1).

Intragroup observations for plaque index showed significant reduction in plaque score from 0 to 14th day and 0 to 21st days for both the groups ( $p < 0.01$ ).

In group A, the difference of mean gingival index between 0 to 14th and 0 to 21st day was  $0.90 \pm 0.15$  and  $1.04 \pm 0.67$  respectively, which was statistically significant ( $p < 0.01$ ) (Table 2).

In group B, the difference of mean gingival index between 0 to 14th and 0 to 21st day was  $0.90 \pm 0.12$  and  $1.1 \pm 0.11$  respectively, which was statistically significant ( $p < 0.01$ ) (Table 2).

Intragroup observations for gingival index showed significant reduction in plaque score from 0 to 14th day and 0 to 21st days for both the groups ( $p < 0.01$ ).

In groups A and B, the difference between mean reduction of total bacterial count from 0 to 21st day was  $126.87 \pm 51.6$  and  $178.68 \pm 28.92$  respectively, which was statistically nonsignificant ( $p > 0.01$ ) (Table 3).

**DISCUSSION**

The difference of mean PI for group A between 0 to 14 and 0 to 21 days was statistically significant ( $p < 0.01$ ). Similar observations were made by JL Leyes et al (2002)<sup>8</sup> where comparative efficacy of chlorhexidine with and without alcohol along with placebo was studied. In our study, 0.2% chlorhexidine gluconate was used with base alcohol and similar antiplaque effects were observed. Our results are also similar to the study carried out by Grundemann et al (2002).<sup>9</sup> The mouth rinses used for this study were chlorhexidine alone (0.12%) and chlorhexidine in combination with an oxidizing agent (sodium perborate monohydrate). In our study, the comparative results of chlorhexidine mouthwash showed significant reduction in mean plaque score from baseline. This may be because of the antiplaque property of chlorhexidine gluconate and concentration used in our study was 0.2% and routine oral hygiene methods were also advised. The study carried out by Francetti et al (2002)<sup>10</sup> showed similar antiplaque activity of chlorhexidine mouthwash.

The difference of mean PI for group B between 0 to 14 and 0 to 21 days was statistically significant ( $p < 0.01$ ). Our results related to turmeric are similar with a study carried

out by Bhandari and Shankwalkar (1980)<sup>11</sup> where turmeric was used in the mouthwash. This may be because of antiplaque effect of turmeric.

On comparison between the chlorhexidine and turmeric mouthwash, the percentage reduction of plaque index between 0 and 14 days was 48.19 and 39.49, respectively. The percentage reduction of plaque index between 0 and 21st days was 74.36 and 61.76, respectively. Favorable results by 12.6% are seen with chlorhexidine mouthwash on 21st day. This is may be due to property of substantivity of chlorhexidine and also action of chlorhexidine at different levels of plaque formation. Though independently turmeric showed antiplaque effect, in comparison to chlorhexidine it was observed to be less effective. This may be due to dilution of turmeric which was followed in this study.

The difference of mean GI for group A between 0 to 14 and 0 to 21 days was statistically significant ( $p < 0.01$ ). In the studies carried out by Grundemann et al (2000),<sup>9</sup> JL Leyes (2002)<sup>8</sup> and GA Van der, CJ Timmerman, MS Mantel (1998),<sup>12</sup> significant reduction of gingival inflammation using chlorhexidine gluconate was observed similar to the findings in our study.

The difference of mean GI for group B between 0 to 14 and 0 to 21 days was statistically significant ( $p < 0.01$ ). RB Arora (1971),<sup>13</sup> also evaluated anti-inflammatory property of turmeric. The results showed significant reduction of inflammation ( $p < 0.01$ ). Our study results are similar to them. This suggests that turmeric has anti-inflammatory property which has also been observed in various studies carried out by Srimal (1971),<sup>14</sup> Ghatak and Basu (1972)<sup>15</sup> and Srivastava and Srimal (1985).<sup>16</sup>

**Table 1: Plaque index**

Interval	Chlorhexidine (group A)				Turmeric (group B)			
	Mean PI $\pm$ SD	Difference from baseline	t-value	p-value	Mean PI $\pm$ SD	Difference from baseline	t-value	p-value
0 day	3.31 $\pm$ 0.36	–	–	–	3.27 $\pm$ 0.47	–	–	–
14th day	1.72 $\pm$ 0.38	1.59 $\pm$ 0.33	26.68	$p < 0.01$	2.00 $\pm$ 0.46	1.27 $\pm$ 1.86	39.37	$p < 0.01$
21st day	0.83 $\pm$ 0.27	2.48 $\pm$ 0.48	28.62	$p < 0.01$	1.22 $\pm$ 0.13	2.05 $\pm$ 0.48	24.54	$p < 0.01$

**Table 2: Gingival index**

Interval	Chlorhexidine (Group A)				Turmeric (Group B)			
	Mean GI $\pm$ SD	Difference from baseline	t-value	p-value	Mean GI $\pm$ SD	Difference from baseline	t-value	p-value
0 day	1.77 $\pm$ 0.19	–	–	–	1.81 $\pm$ 0.13	–	–	–
14th day	0.87 $\pm$ 0.12	0.90 $\pm$ 0.15	32.50	$p < 0.01$	0.91 $\pm$ 0.09	0.90 $\pm$ 0.12	42.39	$p < 0.01$
21st day	0.73 $\pm$ 0.52	1.04 $\pm$ 0.67	8.64	$p < 0.01$	0.71 $\pm$ 0.12	1.1 $\pm$ 0.11	57.15	$p < 0.01$

**Table 3: Total microbial count**

	Day '0'	Day '21'st	Diff. from baseline	t-value	p-value
Chlorhexidine (A)	139.15 $\pm$ 51.92	12.28 $\pm$ 2.78	126.87 $\pm$ 51.6	1.96	0.086
Turmeric (B)	203.02 $\pm$ 34.03	24.34 $\pm$ 11.84	178.68 $\pm$ 28.92	–	–

In all the above studies in relation to turmeric, anti-inflammatory effect was observed but not in relation with gingiva. In our study, anti-inflammatory action of turmeric was evaluated on clinical parameters using the gingival index, which showed significant reduction.

On evaluating the literature, the possible mechanism of action of turmeric as an anti-inflammatory agent could be due to its inhibitory action on prostaglandin synthesis and a strong stabilizing action on the lysosomal membranes.<sup>4</sup> Taking into consideration the findings of our study, it is clear that both the mouthwashes are equally effective in reducing the gingival inflammation.

Comparison of percentage reduction of total bacterial count in group A and group B was 89.94 and 88.15, respectively, which showed no statistically significant difference between both the groups. Our study results are similar to the study by Rosin M, Welk A, Kocher T et al (2002).<sup>17</sup>

## SUMMARY AND CONCLUSION

Thus, it can be concluded that chlorhexidine gluconate as well as turmeric mouthwash can be effectively used as an adjunct to mechanical plaque control methods in prevention of plaque and gingivitis. Chlorhexidine gluconate has been found to be more effective when antiplaque property was considered. The effect of turmeric observed may be because of its anti-inflammatory action. Reduction in total microbial count is observed in both the groups, so microbiologically, it is clear that both the mouthwashes are equally effective. The antiplaque effect of chlorhexidine can be due to its substantivity. Substantivity of turmeric mouthwash is required to be further studied. Turmeric mouthwash was biocompatible and also well accepted by all the subjects without side effects.

To advocate the use of turmeric mouthwash, it is necessary to carry out a long-term study on a large sample to evaluate its efficacy as an antiplaque and anti-inflammatory agent and to study its substantivity and other properties. The various concentrations of this mouthwash also can be compared to evaluate their antiplaque efficacy. Also, in addition to total microbial count, culture methods for microbiological analysis of individual periodontopathogens should be carried out.

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