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Efficacy of Chlorhexidine Gluconate Mouthwash and Turmeric in Prevention of Gingivitis:a Comparative Study

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Abstract
To evaluate the effectiveness of turmeric mouthwash compared to chlorhexidine gluconate mouthwash in preventing gingivitis and plaque formation. The study involved 100 randomly selected individuals visiting the Department of Periodontology at Government Dental College And Hospital, Rahui, Nalanda,Bihar, India, After Obtaining Ethical Clearance. Gingival index (GI) scores, as per Loe and Silness, were recorded, followed by Turesky-Gilmore-Glickman modification of Quigley Hein plaque index (TQHPI) at baseline, 14 days and 21 days. Participants were aged 25 to 35 years, had fair to poor gingival index scores and a plaque index score greater than 1. All participants provided informed consent. The study revealed a statistically significant reduction ($p < 0.05$) in mean plaque index (PI) with chlorhexidine gluconate mouthwash compared to turmeric mouthwash. However, there was no significant difference in mean gingival index (GI) between the two mouthwashes. Both groups showed a significant reduction in total microbial count ($p < 0.05$), with no significant difference between the groups in this regard. The findings indicate that both chlorhexidine gluconate and turmeric mouthwash can be effectively used as adjuncts to mechanical plaque control methods for preventing plaque and gingivitis. Chlorhexidine gluconate was found to be more effective in terms of its antiplaque properties. Significance: This study suggests that turmeric mouthwash is a viable adjunct to mechanical plaque control. Further research is needed to confirm the effectiveness of turmeric-based mouthwash as a cost-effective plaque control measure.

INTRODUCTION

Gingival and periodontal diseases affect a significant portion of the global population. Various types of deposits on the teeth contribute to periodontal disease, with dental plaque being a primary factor. Extensive research by Harold Loe in 1965[1] established dental plaque as a critical factor in the initiation and progression of gingival and periodontal diseases. A direct relationship between plaque levels and the severity of gingivitis has been demonstrated[1].

Since bacterial plaque is the principal causative factor in gingival and periodontal diseases, the most effective prevention methodology involves regular and thorough removal of plaque through personal oral hygiene practices. Plaque control procedures include both mechanical and chemical methods. Mechanical methods, while effective, are time-consuming and rely heavily on the individual's skills and technique. The difficulty most people face in maintaining adequate levels of plaque control, especially at interproximal sites, highlights the need for chemical agents as adjuncts to mechanical plaque control procedures[1].

Several chemical agents, including fluorides, bisbiguanides, essential oils, quaternary ammonium compounds, sanguinarine and triclosan, are available either as toothpaste or mouthwash. Among these, chlorhexidine gluconate (CHX) is considered the gold standard in dentistry for the prevention of dental plaque. Despite its effectiveness[1], CHX mouthwash has side effects such as brown discoloration of the teeth, oral mucosal erosion and a bitter taste[2,3]. Consequently, there is a need for an alternative medicine that is safe, economical and culturally ingrained in traditional practices.

Turmeric, commonly known as 'Haldi,' possesses anti-inflammatory, antioxidant and antimicrobial properties, in addition to hepatoprotective, immunostimulant, antiseptic and antimutagenic benefits. Given these properties[4], promoting the use of turmeric in dental care could prove advantageous.

MATERIALS AND METHODS

The study was conducted in the Department of Periodontology at Government Dental College And Hospital, Rahui, Nalanda, Bihar, India, After Obtaining Ethical Clearance. Subjects were selected from individuals aged 25 to 35 who visited the department's outpatient department (OPD). An ADA Type III clinical examination was performed.[5] Individuals who provided informed consent, had fair to poor gingival index scores and a plaque index score greater than 1 were included in the study. The sample size comprised 100 subjects, randomly allocated to two groups (A and B) of 50 participants each, using simple random sampling by the lottery method.

Exclusion criteria included individuals suffering from systemic diseases, pregnant or lactating females, those with a mouth-breathing habit, individuals wearing oral appliances and smokers. Ethical clearance was obtained from the Institutional Ethics Committee before the commencement of the study. A pilot study was conducted for 1 week with 5 subjects in each of the 2 groups to assess the feasibility of the study; these results were not included in the main study.

The gingival index (GI)[6] by Loe and Silness was recorded, followed by the Turesky-Gilmore-Glickman modification of the Quigley-Hein plaque index (TQHPI)[7]. 'Plaksee' disclosing solution containing erythrosine was used to disclose plaque before recording. The investigator was calibrated and a double-blind trial was carried out. Indices were recorded on days 0, 14 and 21 and all records were maintained on a chart. Oral hygiene and mouthwash usage instructions were provided. Group A subjects were given chlorhexidine gluconate (CHX) mouthwash and Group B subjects were given turmeric mouthwash. CHX mouthwash was procured from ICPA Health Products Ltd. Turmeric mouthwash was prepared by dissolving 10 mg of curcumin extract in 100 mL of distilled water, adding 0.005% peppermint oil as a flavoring agent and adjusting the pH to 4.

Subjects were instructed to gargle with 10 mL of mouthwash, diluted 1:1 with water, twice a day after brushing. Compliance was monitored using a reminder sheet that subjects filled out daily after using the mouthwash. These sheets were checked by the investigator during subsequent examinations. Subjects with low compliance were reinforced with oral hygiene instructions. All mouthwashes were provided free of cost to study participants for the duration of the study.

Microbiological study: For the microbiological evaluation, a total of 10 subjects (5 from each group) were selected. Supragingival plaque samples were collected from the buccal surfaces of tooth numbers 16 and 36 using a sterile Gracey curette on days 0 and 21. These plaque samples were transported in phosphate buffer solution (PBS) for microbiological analysis and were assessed for total microbial count.

The clinical and microbiological data were compiled and subjected to statistical analysis. Intragroup comparisons at baseline were analyzed using the paired t-test, while intergroup comparisons were analyzed using the unpaired t-test.

Statistical Analysis: Changes from baseline to different time intervals in various clinical parameters were analyzed using the paired t-test for intragroup comparisons. Intergroup comparisons of post-treatment changes were analyzed using the unpaired t-test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

In Group A, the mean plaque index difference between days 0 to 14 and 0 to 21 was 1.59±0.33 and 2.48±0.48, respectively, which was statistically significant (p<0.01) (Table 1). Similarly, in Group B, the mean plaque index difference between days 0 to 14 and 0 to 21 was 1.27±1.86 and 2.05±0.48, respectively, also statistically significant (p<0.01) (Table 1). Both groups showed a significant reduction in plaque score from day 0 to day 14 and day 21 (p<0.01).

For gingival index in Group A, the mean difference between days 0 to 14 and 0 to 21 was 0.90±0.15 and 1.04±0.67, respectively, which was statistically significant (p<0.01) (Table 2). In Group B, the mean difference between days 0 to 14 and 0 to 21 was 0.90±0.12 and 1.1±0.11, respectively, also statistically significant (p<0.01) (Table 2). Both groups exhibited a significant reduction in gingival index from day 0 to day 14 and day 21 (p<0.01).

Regarding total bacterial count, the mean reduction from day 0 to day 21 in Group A was 126.87±51.6 and in Group B, it was 178.68±28.92. However, this difference was statistically nonsignificant (p>0.01) (Table 3).

DISCUSSION

In Group A, the significant reduction in mean plaque index (PI) observed from days 0 to 14 and 0 to 21 aligns with findings from previous studies[8,9]. Our use of 0.2% chlorhexidine gluconate, known for its antiplaque properties, supported by routine oral hygiene instructions, mirrored similar outcomes reported in literature[10].

Similarly, in Group B, significant reductions in mean plaque index from days 0 to 14 and 0 to 21 were observed with turmeric mouthwash, consistent with earlier research[11]. Despite turmeric demonstrating independent antiplaque effects, our study noted it to be less effective compared to chlorhexidine, possibly due to its dilution method.

Comparing chlorhexidine and turmeric mouthwashes, chlorhexidine showed a greater percentage reduction in plaque index on both the 14th and 21st days. This superiority may stem from chlorhexidine's substantivity and multi-level plaque action. Turmeric, while effective alone, demonstrated lesser efficacy in comparison, likely due to our study's dilution approach.

In terms of gingival index (GI), both Group A and Group B exhibited statistically significant reductions from days 0 to 14 and 0 to 21, echoing findings from studies on chlorhexidine's anti-inflammatory properties[12]. Turmeric's anti-inflammatory effects, as reported by Arora[13] and other studies, were similarly reflected in our results, underscoring its potential in reducing gingival inflammation.

Exploring turmeric's mechanisms, its anti-inflammatory action is attributed to inhibiting prostaglandin synthesis and stabilizing lysosomal membranes[14,15]. Our study's evaluation using the gingival index corroborates these findings, highlighting turmeric's clinical impact on inflammation.

Regarding total bacterial count reduction, both groups showed comparable outcomes with no significant difference, akin to findings by Rosin *et al*. This suggests that both chlorhexidine and turmeric are equally effective in reducing bacterial load.

Table 1: Plaque index

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

Table 2: Gingival index

	Chlorhexidine (group A)				Turmeric (group B)			
Interval	Mean (PI±SD)	Difference from baseline	t-value	p-value	Mean (PI±SD)	Difference from baseline	t-value	p-value
0 day	1.77±0.19				1.81±0.13			
14th day	0.87±0.12	0.90±0.15	32.50	p<0.01	0.91±0.09	0.90±0.12	39.37	p<0.01
21st day	0.73±0.52	1.04±0.67	8.64	p<0.01	0.71±0.12	1.1±0.11	24.54	p<0.01

Table 3: Total microbial count

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

In conclusion, our study supports the efficacy of both chlorhexidine gluconate and turmeric mouthwashes in reducing plaque and gingival inflammation. While chlorhexidine demonstrated superior antiplaque effects, turmeric showed promise in reducing inflammation. Further studies could optimize turmeric's formulation and concentration for enhanced efficacy as a potential alternative to chlorhexidine in oral care.

CONCLUSION

In conclusion, both chlorhexidine gluconate and turmeric mouthwash demonstrate effectiveness as adjuncts to mechanical plaque control methods in preventing plaque and gingivitis. Chlorhexidine gluconate exhibits superior antiplaque properties, while turmeric's observed effects are likely attributed to its anti-inflammatory action. Both mouthwashes effectively reduce total microbial counts, indicating equal microbiological efficacy.

The substantivity of chlorhexidine contributes to its prolonged antiplaque effects, whereas further research is needed to explore the substantivity and optimize formulation of turmeric mouthwash. Our study found turmeric mouthwash to be biocompatible and well-tolerated without side effects among all subjects.

To promote the use of turmeric mouthwash, future long-term studies with larger sample sizes are necessary to evaluate its sustained antiplaque and anti-inflammatory efficacy. These studies should also investigate turmeric's substantivity and compare different concentrations for optimal effectiveness. Additionally, employing culture methods to analyze individual periodontopathogens alongside total microbial counts would provide comprehensive microbiological insights.

In conclusion, while chlorhexidine remains the gold standard, turmeric mouthwash shows promise as a natural alternative for oral hygiene, warranting further investigation and development in clinical settings.

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