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Evaluation of the Clinical Efficacy of 0.1% Curcumin Mouth Wash Versus 0.2% Chlorhexidine Mouth Wash as an Adjunct to Scaling and Root Planing for the Treatment of Chronic Periodontitis.

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Introduction

Chronic periodontitis is a prevalent inflammatory disease affecting the supporting structures of the teeth. It is characterized by the destruction of periodontal ligaments, alveolar bone loss, and eventually, if left untreated, tooth loss. This condition is primarily caused by the accumulation of bacterial biofilms, which trigger an immune response leading to tissue destruction. Common risk factors for periodontitis include age, smoking, diabetes, and poor oral hygiene. The disease often progresses painlessly, which leads to late diagnosis and more severe outcomes [2].

The traditional treatment for chronic periodontitis involves mechanical debridement through scaling and root planing (SRP). SRP aims to remove bacterial biofilms and calculus from the tooth surfaces and periodontal pockets. However, due to the complexity of root anatomies and the depth of periodontal pockets, SRP alone is often insufficient. Therefore, antimicrobial agents are used as adjuncts to SRP to enhance its efficacy [1].

Chlorhexidine (CHX) is widely recognized as the gold standard antimicrobial mouthwash in periodontal therapy. It possesses broad-spectrum antibacterial properties and substantivity, allowing it to remain active in the oral cavity for an extended period. However, prolonged use of chlorhexidine can lead to adverse effects such as tooth staining, altered taste, and mucosal irritation. These side effects have prompted the search for alternative adjunctive agents with fewer side effects [1].

Curcumin, a polyphenolic compound derived from the turmeric plant (Curcuma longa), has gained attention for its anti-inflammatory, antioxidant, and antimicrobial properties. Curcumin has been used for centuries in traditional medicine and has shown promise in various therapeutic applications, including periodontal therapy. Its ability to modulate inflammatory pathways and inhibit microbial growth makes it a potential alternative to chlorhexidine [3].

This study aims to compare the clinical efficacy of 0.1% curcumin mouthwash with 0.2% chlorhexidine mouthwash when used as adjuncts to SRP in the treatment of chronic periodontitis. By evaluating the clinical outcomes of these two treatments, this study seeks to provide evidence-based recommendations for the use of curcumin as an effective and safer adjunctive therapy in periodontal treatment.

Methodology

This randomized controlled trial was conducted at the Rajarajeswari Dental College and Hospital, Bangalore. A total of 40 patients, aged between 18 and 45 years, diagnosed with chronic periodontitis, were randomly assigned to two groups:

- **Group A**: Received SRP combined with 0.1% curcumin mouthwash.
- **Group B**: Received SRP combined with 0.2% chlorhexidine mouthwash.

Baseline subgingival plaque samples were collected from all participants. Clinical parameters, including Plaque Index (PI), Gingival Index (GI), Probing Pocket Depth (PD), and Modified Sulcus Bleeding Index (SBI), were recorded at baseline and at 21 days post-treatment. The collected plaque samples were analyzed microbiologically for colony-forming units (CFUs).The inclusion criteria for this study were: patients diagnosed with chronic periodontitis, aged between 18 to 45 years, with at least 20 natural teeth, and periodontal pocket depth of 4 to 8 mm with radiological evidence of bone loss, willing to participate, return after 21 days, and sign informed consent, with no history of allergies.

Exclusion criteria included pregnant and lactating women, patients allergic to curcumin or chlorhexidine, those using tobacco or tobacco-related products, those under antibiotic therapy within the last three months, patients with systemic diseases such as hypertension, diabetes, or chronic kidney diseases that can affect periodontal status, those who had undergone periodontal surgery, and those using mouthwash regularly.

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Study Design

1. **Patient Selection**:
   - Inclusion criteria: Patients aged 18-45 years with clinically diagnosed chronic periodontitis.
   - Exclusion criteria: Patients with systemic conditions affecting periodontal health, pregnant or lactating women, and those who had undergone periodontal therapy in the last six months.

2. **Randomization and Blinding**:
   - Patients were randomly assigned to one of the two groups using a computer-generated randomization table.
   - Both patients and clinical evaluators were blinded to the treatment allocation.

3. **Clinical Parameters Assessed**:
   - Plaque Index (PI): Assesses the thickness of plaque at the gingival margin.
   - Gingival Index (GI): Evaluates the severity of gingival inflammation.
   - Probing Pocket Depth (PD): Measures the depth of periodontal pockets.
   - Modified Sulcus Bleeding Index (SBI): Assesses bleeding on probing as an indicator of inflammation.

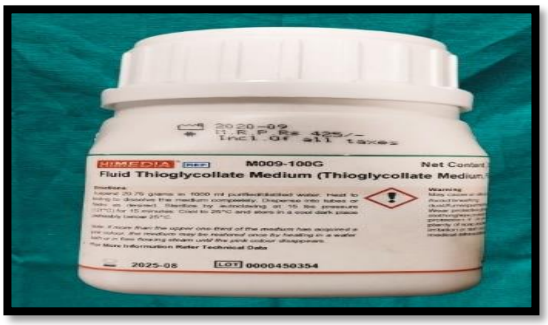
STATISTICAL ANALYSIS

The data obtained was subjected to statistical analysis. The data recorded were transferred and tabulated to the computer - Windows Microsoft Excel (2007) - for the purpose of the data analysis. Statistical Package of Social Science (SPSS Version 22; IBM Chicago Inc., USA) was used for statistical analysis. The total data was subdivided and distributed meaningfully and presented as individual tables along with graphs. The significance level was fixed to be $p \leq 0.05$ for the analysis.

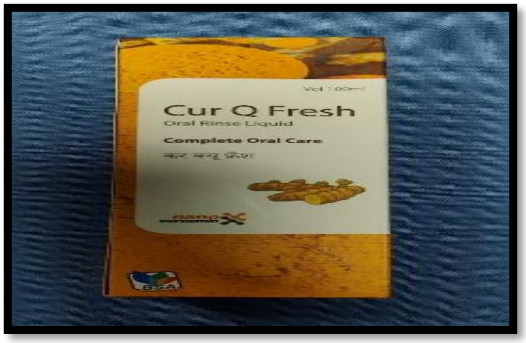
Depending upon the nature of the data, the statistical tests were chosen. Categorical data expressed in terms of frequency were analyzed for statistical significance using Chi-square test. All continuous data were subjected to Kolmogorov-Smirnov test for normality. It was found that the data was normally distributed ($p > 0.05$) and hence parametric tests of significance were used.

Independent t-test was used to analyze the difference in the means of continuous variables. For all comparisons, a p-value of < 0.05 was considered to be statistically significant.

p >0.05 - Not Significant
p <0.05* - Significant (significant at 95% confidence interval)
p <0.01** - Highly Significant (significant at 99% confidence interval)
p <0.001*** - Very Highly Significant (significant at 99.9% confidence interval)



THIOGLYCOLLATE MEDIUM **ANAEROBIC GAS PACK**



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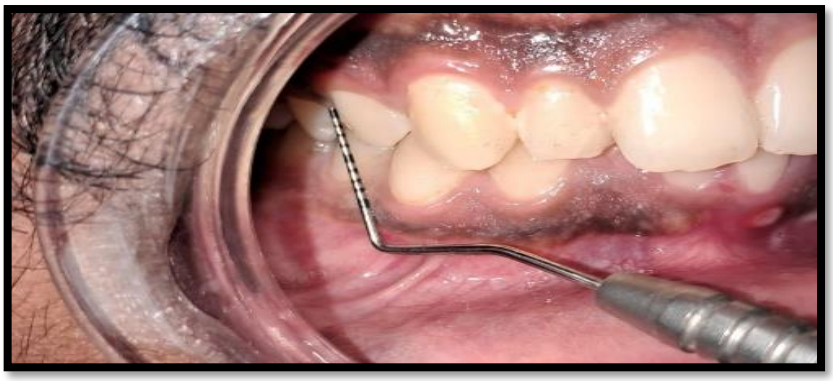
COMMERCIALLY AVAILABLE CURCUMIN MOUTHWASH CHLORHEXIDINE MOUTH WASH

ANAEROBIC GAS CHAMBER



RECORDING OF BASELINE PROBING POCKET DEPTH GROUP A (SRP+ 0.1% CURCUMIN MOUTH WASH)

RECORDING OF 21DAYS PROBING POCKET DEPTH GROUP A (SRP+ 0.1% CURCUMIN MOUTH WASH)

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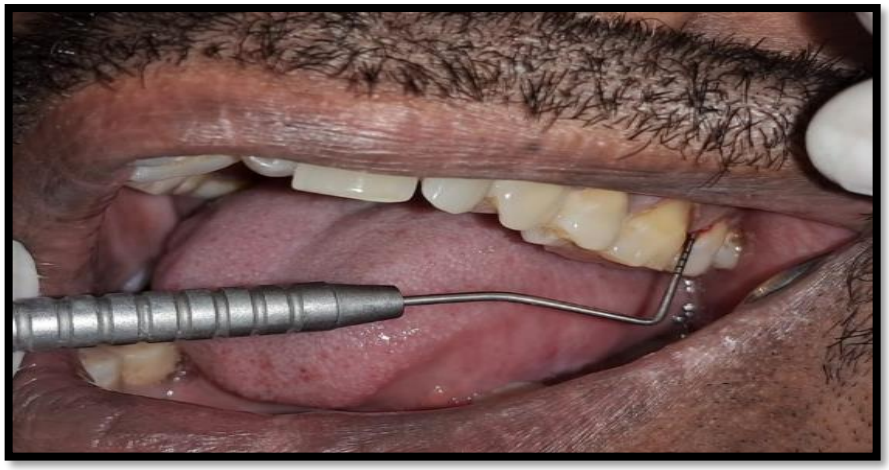
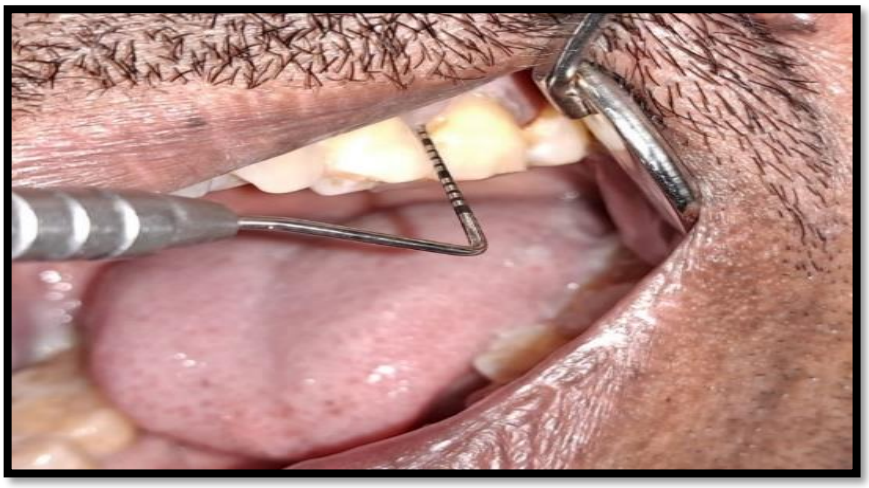


RECORDING OF BASELINE PROBING POCKET DEPTH GROUP B (SRP+ 0.2% CHLORHEXIDINE MOUTH WASH



RECORDING OF 21DAYS PROBING POCKET DEPTH GROUP B (SRP+ 0.2% CHLORHEXIDINE MOUTH WASH)

Results
Both treatment modalities showed significant improvements in clinical parameters at 21 days. The following tables and graphs illustrate the comparative outcomes between the two groups:

Parameter	Baseline (Group A)	Baseline (Group B)	21 Days (Group A)	21 Days (Group B)
Plaque Index (PI)	1.8	1.9	0.58	0.60
Gingival Index (GI)	2.0	2.1	0.65	0.66
Probing Pocket Depth (PD)	4.5 mm	4.6 mm	2.1 mm	2.2 mm
Sulcus Bleeding Index (SBI)	1.9	2.0	0.69	0.70

Graph 1: Plaque Index (PI) Reduction
Graph 2: Gingival Index (GI) Reduction
Graph 3: Probing Pocket Depth (PD) Reduction
Graph 4: Sulcus Bleeding Index (SBI) Reduction

Microbiological Results
The microbiological analysis showed a reduction in the number of CFUs in both groups from baseline to 21 days. Group A (curcumin mouthwash) exhibited a slightly greater reduction in CFUs compared to Group B (chlorhexidine mouthwash), but the difference was not statistically significant.

At baseline, the study groups were well-matched in terms of demographic and clinical characteristics. The mean age of subjects in Group A was 36.75 years, while in Group B it was 34.95 years. The gender distribution was balanced with a slight male predominance in Group A (55% males) and a slight female predominance in Group B (55% females).
The mean gingival index score at baseline was 1.8 for Group A and 1.72 for Group B, indicating similar initial gingival inflammation levels. After 21 days of treatment, Group A showed a more significant reduction in gingival index score (mean 0.655) compared to Group B (mean 0.76). However, statistical analysis revealed no significant difference between the two groups at baseline (p=0.708) and at 21 days (p=0.827).

Pocket depth measurements at baseline showed mean values of 4.35 mm for Group A and 4.55 mm for Group B. After 21 days, the mean pocket depth reduced to 2.3 mm in Group A and 3.1 mm in Group B, with Group A showing a significantly greater reduction. However, the statistical analysis showed there was no significant difference in pocket depth reduction between the groups at 21 days (p=0.211).

The baseline plaque index scores were nearly identical between the groups, with mean values of 1.945 for Group A and 1.935 for Group B. After 21 days, Group A had a mean plaque index score of 0.72, whereas Group B had a mean score of 0.955. The reduction in plaque index was significantly greater in Group A. However statistical analysis did not show a significant difference (p=0.357), to suggest the superior efficacy of curcumin mouthwash in plaque control.
The sulcus bleeding index (SBI) scores at baseline were 47.7 for Group A and 46.8 for Group B. At 21 days, the scores significantly decreased to 23.1 for Group A and 28.35 for Group B. The reduction was more pronounced in Group A, although the baseline comparison showed no significant difference (p=0.454). The 21-day comparison indicated a trend towards better performance of curcumin mouthwash, but still without significant statistical difference (p=0.102). Further studies with larger samples might be needed for definitive conclusions.
Baseline CFU counts (log10) were 4.55 for Group A and 4.75 for Group B. At 21 days, Group A exhibited a significant reduction to 1.3, compared to 1.8 in Group B. The greater reduction in CFU counts in Group A was not statistically significant (p>0.001), indicating that curcumin mouthwash does not essentially have a stronger antibacterial effect than chlorhexidine.

Discussion
The study indicates that both 0.1% curcumin mouthwash and 0.2% chlorhexidine mouthwash are effective adjuncts to SRP in the treatment of chronic periodontitis. The results showed significant improvements in plaque index, gingival index, probing pocket depth, and sulcus bleeding index in both groups.

Plaque Index (PI) The reduction in plaque index indicates the effectiveness of both mouthwashes in controlling plaque formation. Curcumin mouthwash, with its antimicrobial properties, showed a comparable reduction in plaque levels to chlorhexidine mouthwash.

Gingival Index (GI) Both treatment groups exhibited a significant decrease in gingival inflammation, as evidenced by the reduction in gingival index scores. Curcumin's anti-inflammatory properties likely contributed to this outcome.

Probing Pocket Depth (PD) The decrease in probing pocket depth reflects the reduction in periodontal pocket depths, suggesting an improvement in periodontal health. Both curcumin and chlorhexidine mouthwashes showed similar efficacy in reducing pocket depths.

Sulcus Bleeding Index (SBI) The reduction in sulcus bleeding index scores indicates decreased bleeding on probing, a sign of reduced inflammation. Curcumin mouthwash performed comparably to chlorhexidine in this regard.

Microbiological Findings The microbiological analysis supported the clinical findings, showing a reduction in the bacterial load in both groups. The slightly greater reduction in CFUs in the curcumin group, though not statistically significant, suggests that curcumin has strong antimicrobial properties.

Advantages of Curcumin Curcumin's broad spectrum of biological activities, including anti-inflammatory, antioxidant, and antimicrobial effects, make it a promising alternative to chlorhexidine. Additionally, curcumin lacks the adverse effects associated with chlorhexidine, such as tooth staining and altered taste, making it more acceptable for long-term use.Gupta et al. (2020)[4] observed both curcumin and chlorhexidine mouthwashes resulted in significant improvements in clinical parameters, yet no significant differences were noted between the two groups. This consistency reinforces the potential of curcumin as a viable alternative to chlorhexidine.
Further, Kaur et al. (2019)[5] and Mali et al. (2012)[6] both reported significant reductions in gingival inflammation and bacterial load with the use of curcumin mouthwash, which supports our findings of notable clinical and microbiological improvements. Despite these positive trends, our study, much like those by Hugar et al (2016)[3], found that the statistical

significance in favour of curcumin was not always evident, suggesting that while curcumin is effective, it may not substantially surpass the efficacy of chlorhexidine.

Additionally, the microbiological outcomes observed in our study, where curcumin showed a significant reduction in CFU counts, align with the findings of Shah et al. (2023)[7], indicating its strong antibacterial properties. However, as with our results, the differences were not statistically significant when compared to chlorhexidine, underscoring the need for further studies with larger sample sizes to establish definitive conclusions.

Limitations and Future Directions The study's limitations include a small sample size and a short follow-up period. Future research should involve larger sample sizes and longer follow-up periods to validate these findings. Additionally, studies exploring different concentrations of curcumin and its long-term effects on periodontal health are warranted.

Conclusion

The study concludes that 0.1% curcumin mouthwash is as effective as the gold standard 0.2% chlorhexidine mouthwash when used as an adjunct to SRP for the treatment of chronic periodontitis. The results suggest that curcumin mouthwash could serve as a promising alternative to chlorhexidine due to its comparable efficacy and fewer side effects. Further research with larger sample sizes and longer follow-up periods is recommended to validate these findings.

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