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Efficacy of Herbal Mouthwash with Extracts of *Coriandrum Sativum,* Mint and Clove in the Treatment of Chronic Gingivitis- A Randomized Controlled Clinical Trial

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Herbal antiseptic or antibiotic agents are introduced very widely that are effective against plaque microorganisms for the healing of gingival and periodontal tissue. However, none of literature has shown antibacterial effect of coriandrum sativum, clove and mint on the levels of dental plaque when used as a mouthwash.
Aim: To assess the efficacy of a newly formulated mouthwash containing Coriandrum *sativum*, mint and clove to reduce plaque and inflammation to maintain the oral hygiene.
Methodology: Twenty systemically healthy patients were randomly allocated to either the test group [G1(coriandrm sativum, mint,clove = 10 patients)] or the control group [G2 (Placebo gel = 10 patients]. Full mouth Gingival Index (GI); Full mouth Plaque Index (PI) was evaluated at baseline and on 14 and 21st day.
Result: The mean reduction in PI from 2.28 to 0.85 and 2.13 to 1.21 was noted in the experimental and control groups, respectively. The experimental group (2.21–0.76) comparatively showed better

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reduction in mean PBI than the control group (2.17–1.29). The results obtained were statistically significant at baseline and 14th and 21st day in all the groups. Remarkable improvement was noted from baseline to 14th and 21st day in all the groups.
Conclusion: The encouraging results of our study suggest that the newly formulated mouthwash containing coriandrum Sativum, mint and clove demonstrates anti-inflammatory properties, which may be useful as an adjunctive to mechanical therapy in the prevention and treatment of gingivitis.

Keywords: Coriandrum sativum; mint; clove; chronic gingivitis.

1. INTRODUCTION

Dental plaque and plaque microorganisms are considered to be the main etiological factor for gingival and periodontal disease. The complex interaction in the environment with the bacterial agent and the host defense mechanism against these bacteria determines the nature of the periodontal disease [1]. Gingival diseases are irreversible however they may progress if proper care is not taken and in due course of time may affect the periodontal attachment apparatus resulting in tooth loss, periodontal disease. Therefore accurate and effective plaque control is needed to overcome this.

Plaque control by means of tooth brush is the most common method used to maintain the oral hygiene. However, it is found that the use of such oral hygiene aid is not much effective signifying the use of mouthwash by means of chemical plaque control.

Now a day's various herbal antiseptic or antibiotic agents are introduced that are effective against these plaque microorganisms for the healing of periodontal tissue. These herbal agents can be used for a longer period of time as there are no side effects with the long term use. Herbal medications such as curcumin, coriander, clove, mint, neem, tulsi, honey, *Aloevera,* Babul, Bakul, lemongrass, tea tree oil, and green tea have been used since long period of time.

Coriandrum sativum, a widely used spice named coriander belonging to Umbelliferae family, has spasmolytic and carminative property [2] The extracts of the coriander seed oil are among the significant twenty essential oils in the world market [3]. This tannin-containing natural phytochemical is known to exert antimicrobial activity [4].

Mint (menthe piperita)is a perennial aromatic herb laden with multivitamins and minerals owing to its aroma it is commonly used as mouth freshner. Phytochemical analysis of mint leaves showed presence of tannins and flavanoids which offers anti-microbial and anti-inflammatory properties.

Clove, *Syzygium aromaticum* L. is a commonly used as a spice [5] The essential oil of clove is used for symptomatic relief of toothache and inflammation in the mouth and throat owing to which it has been reported to be used in preparation of certain toothpastes and mouth washes [6] The main anti-inflammatory of clove oil has been evident due to presence of eugenol (70–90%) [7-9]

A study was conducted to assess the efficacy of a newly formulated mouthwash containing Coriandrum *sativum*, mint and clove to reduce plaque and inflammation to maintain the oral hygiene.

2. METHODS AND MATERIALS

Twenty systemically healthy adult patients and diagnosed with gingivitis included in this study following prior approval from Institutional Ethical Board and taking prior informed consent from the patients. The patients with active orthodontic therapy; or those who are on antibiotic coverage; having smoking, drinking etc habits and received any periodontal intervention in last 6 months were excluded from the study.

The study was designed as a double-masked, randomized, placebo-controlled clinical trial wherein twenty patients were randomly assigned to two groups (Test & Control) using computer-generated random allocation sequence by the author (SP). Group sample sizes were decided by power of 95 and significance level of 0.05.

The test group received mouthwash containing Coriandrum *sativum* and clove and the control group received placebo mouthwash.

Clinical parameters such as plaque index (PI), [10] papillary bleeding index (PBI), [11] were recorded.

All the patients received complete oral prophylaxis, including SRP, using ultrasonic scaler (Woodpecker, UDS-N1, Guilin, China) and hand instruments (Hu-Friedy, Chicago, IL, USA) [12].

2.1 In vitro Preparation of Mouthwash

The mouthwash was prepared as per the protocol suggested by Fulbel et al. [13], in the original method of Coriander mouthwash preparation we have added cloves of equal quantity as the of coriander and was suspended in 10 and 20 times respectively its quantity of sterile distilled water in a flask and was kept undisturbed for 72 hrs at 4 degree Celsius.

The aqueous extract thus obtained was decanted and clarified by filtration through double layered muslin cloth.

This solution was then transferred to a porcelain dish and let to evaporate at 40 degree Celsius , The dried remnant obtained was stored for making the mouthwash solution.

200g of the powder was suspended in the polyehtlene glycol, and distilled water of 800 ml and was allowed to evaporate to get the final concentrate.

The final concentrate was then diluted with sterile distilled water to make a greenish brown mouthwash of 20% (w/v) concentration Two table spoon of mint extract were added as a flavoring Agent and stored in a brown-colored opaque bottle.

Placebo Mouthwash was prepared as a sterile water and stored brown colored opaque bottle .

The bottle were distributed to individuals by the clinical examiner (AS) who was masked to the bottle contents. Individuals were instructed to use 10 mL mouthwash thrice daily, 30 minutes after brushing, and further instructed not to rinse/eat anything for 30 minutes after mouthwash use. Individuals were also instructed to refrain from any forms of oral hygiene aids, including dental floss and chewing gum, during the study period.

Analysis of data were carried out using Graphpad Prism statistical software(USA). Values of different parameters collected are expressed as mean – standard deviation (SD). Paired 't' test was performed for comparison of differences among the two groups .

3. RESULTS

In this randomized controlled clinical trial, an analysis of 20 patients (10 experimental group and 10 control group) was selected. The experimental group showed uneventful healing with no signs of allergy, swelling, or inflammation. This ensures that the material is biocompatible and well tolerated by the patients.

The mean reduction in PI from 2.28 to 0.85 and 2.13 to 1.21 was noted in the test and control groups, respectively. The test group (2.21–0.76) showed significantly better reduction in mean PBI than the control group (2.17–1.29). The results obtained were statistically significant at baseline and 14^{th} and 21^{st} day in all the groups. Remarkable improvement was noted from baseline to 14^{th} and 21^{st} day in all the groups. (Tables 1 and 2)

4. DISCUSSION

Phytochemical agents have been documented in dentistry since long . They are known to inhibit microorganisms, reduces inflammation, ease irritation, and alleviate pain with little or no reported side effect till date we assess the efficacy of a newly formulated mouthwash containing Coriandrum *sativum*, mint and clove in reducing gingival inflammation thereby aids in maintaining the oral hygiene.

Table 1. Comparison of the mean plaque index scores between test and control group at baseline, 14 day and 21 days

Group	Baseline	Day 14	Day 21
Test	2.28 ±0.12	1.35±0.02	0.85±0.10
Control	2.13±0.06	1.87±0.13	1.21±0.16

Table 2. Comparison of the mean papillary bleeding index(PBI) scores between test and control group at baseline, Day 14 and Day 21

Group	Baseline	Day 14	Day 21
Test	2.21±0.14	1.39±0.05	0.76±0.09
Control	2.17 ±0.05	1.91±0.11	1.29±0.12

In the present study, the test group had significantly decreased the PI, GI scores, which can be attributed to the properties of mouthwash content. The placebo group also showed reductions in both the tested scores, which can be attributed to the Hawthorne effect .No adverse effects were reported from subjects of both groups. The newly formulated mouthwash consists of coriandrum sativum, mint and clove. Coriandrum Sativum , Mint and clove oil is known to have a antibacterial and antimicrobial properties.[8-12]. The addition of mint as a flavoring agent aids in patients compliance.

In the present study the use of our newly formulated mouthwash showed significant reduction in the plaque score, gingival index score at 14th and 21st when compared to placebo mouthwash. Fulbel et al 2020 used Coriandrum sativum in combination with curcumin as a gel for the treatment of chronic periodontitis and found that the gel was more effective in reducing periodontal clinical parameter when used as an adjunct to Scaling and Root planing [13] Yaghini *et al*. used a different herbal combination of oak and *C. sativum* but stated that this combination does not proved to be beneficial in the treatment of chronic periodontitis.[14] Rahim et al 2006 observed reduction of microbial cell surface hydrophobicity and inhibition of glucosyltransferase production by the use of clove's hydro methanolic extract. [15]

Overall the ingredients used in our formulation led to a superior reduction in the microbial load and improved the plaque and gingival index scores in the patients.

CONCLUSION

The encouraging results of our study suggest that the newly formulated mouthwash containing coriandrum Sativum, mint and clove demonstrates anti-inflammatory properties, which may be useful as an adjunctive to mechanical therapy in the prevention and treatment of gingivitis. But additional long-term longitudinal trials are warranted to further assess the efficacy of the mouthwash to be utilized as an adjuvant to periodontal therapy.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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