

Chamomile – A Herbal Medicine of The Past with Bright Future!: A Randomized Control Clinical Trial

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Abstract

Background: Oral and systemic infections are closely linked to poor oral hygiene. Dental plaque is a well-known etiologic factor for gingivitis. Chlorhexidine (CHX) mouthwash is considered the “gold standard” but recently, many herbal extracts have shown potent antiplaque activity. This study aimed to clinically evaluate the efficacy of 1% chamomile mouthwash on plaque and gingival indices and compare its effect with 0.12% CHX mouthwash in treating chronic gingivitis. **Materials and Methods:** A total of 30 subjects aged 18–45 years old with chronic gingivitis underwent scaling and root planing; 15 subjects received 1% chamomile mouthwash and 15 subjects received 0.12% of CHX mouthwash. Mouthwash was used twice daily for 14 days by the subjects. At the baseline and on the 15th day of the study, clinical periodontal parameters (plaque and gingival indices) were recorded. **Results and Conclusion:** Chamomile mouthwash is as effective as CHX mouthwash in reducing Plaque Index ($P \leq 0.05$) and Gingival Index ($P \leq 0.05$) and can be used as an alternative to CHX mouthwash without any adverse effects.

Keywords: Chamomile mouthwash, Chlorhexidine mouthwash, Dental plaque, Gingivitis, Oral hygiene.

INTRODUCTION

Periodontal disease is a term to describe an inflammatory disease of the dental supporting tissues caused by plaque.^[1] Gingivitis, in which the gingival tissues become inflamed but not destroyed, is a form of periodontal disease.^[2] Various scientific findings suggest that microbial plaque is a significant contributor to gingivitis and can be avoided by removing plaque.^[3] Optimal plaque control is necessary to prevent and/or arrest uncomplicated gingival inflammation.^[4] Mechanical measures such as tooth brushing and other home devices are the most commonly used methods to clean the teeth. However, it has been revealed that the vast majority of patients will not always completely remove all the plaque by these ways.^[5] Handicapped or elderly individuals' use of mechanical methods is more problematic due to their compromised dexterity or motivation.^[6] To overcome those shortcomings, chemical plaque control has been a subject of scientific research interest.^[7] Chlorhexidine (CHX) is the most common and extensively studied chemical agent for plaque control till date.^[8] As it is a broad-spectrum antiseptic, it is considered the most commonly used adjunct antiseptic in periodontal treatment and the “gold standard” agent for chemical plaque control methods.^[9] Depending on the dosage, CHX is either bacteriostatic or bactericidal. Despite its effectiveness in

lowering levels of microorganisms in the oral cavity, long-term use of CHX drugs is associated with local side effects.^[10]

Herbal extracts as alternative agents are therefore of particular interest. There are evidence-based studies indicating the beneficial effect of plant extracts on gingival inflammation and plaque accumulation^[11,12] or subgingival periodontopathic microorganisms.^[13] Natural products in medicinal plants have been shown to be a rich source of biologically active compounds, with many of them acting as a base for the manufacturing of new pharmaceutical chemicals. Chamomile (*Matricaria chamomilla* L.) (family *Asteraceae*) is well-known and one of the world's most widely used medicinal plants.^[14]

Chamomile has anti-inflammatory, antibacterial, wound-healing promoter, and deodorant properties and can be used to improve the gingival health.^[15] Few phenolic compounds

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are among the plant's main components (primarily terpenoids, chamazulene, and sesquiterpenes). The flavonoids apigenin, quercetin, luteolin, and patuletin are also seen in chamomile.^[16] Apigenin and quercetin have been widely studied for their anti-inflammatory and antioxidant properties.^[17] When used twice a day for 2 weeks, chamomile mouthwash reduced plaque buildup and gingival inflammation while having a non-significant effect on tooth staining.^[18]

The aim of this study was to clinically evaluate the efficacy of 1% chamomile mouthwash on plaque and gingival indices and compare its effect with 0.12% CHX mouthwash in the treatment of chronic gingivitis.

MATERIALS AND METHODS

Preparation of the chamomile mouthwash

M. chamomilla flowerheads (1 kg) were air-dried and powdered, then percolated with 55% EtOH (Ethanol) at room temperature. The dried residue (87.6 g) was suspended in the water after the combined EtOH extracts were purified and evaporated under a vacuum at a low temperature. As a result, 1 kg of concentrated liquid extract was obtained. A concentration of 1% is obtained by diluting 1 mL of concentrated liquid extract in 100 mL of pre-boiled water.

Study design

The present study is a randomized controlled clinical trial carried out in the Department of Periodontology, Pacific Dental College and Research Center, Udaipur, Rajasthan.

Thirty subjects (age range 18–45 years old), visiting the department of periodontology, were recruited for this study. Inclusion criteria were subjects with more than 20 teeth present and subjects diagnosed with chronic generalized gingivitis. Exclusion criteria were probing depth >3 mm, use of anti-inflammatory medications, tobacco smoking, antibiotic prophylaxis in the past 6 months, pregnancy, and orthodontic appliances. Before enrolling for the study, each of the subjects provided a signed (witnessed) consent to participate in this study. Clinical parameters Plaque Index (Loe and Silness)^[19] and Gingival Index (Silness and Loe)^[20] were recorded at baseline and then followed by scaling and root planning. The subjects were randomly allocated to two groups (15 subjects in each group) and received the assigned mouthwash, that is, either 1% chamomile mouthwash (test group) or 0.12% CHX mouthwash (control group). They were instructed to rinse with 5 mL of their assigned mouthwash for 1 min 2 times daily (in the morning and at night just before bedtime) for 14 days. At the end of the study on the 15th day, clinical parameters were re-recorded. The subjects were instructed to continue their usual oral hygiene measures and not to use any other mouthrinse for the duration of this study period and also asked to report any adverse reactions experienced during the use of mouthwashes.

Statistical analysis

The mean reduction in plaque and gingival scores in the test and control groups was calculated. Paired and unpaired *t*-tests were used. $P \leq 0.05$ was accepted as significant.

RESULTS

All the participants who were enrolled for the study completed it and did not report any adverse effects from using both chamomile and CHX mouthwash. The mean Plaque Index score and Gingival Index score at baseline and on the 15th day of both the groups after periodontal therapy are shown in Tables 1 and 2 and Figures 1 and 2. For both measures, the mean results were greatest on the baseline and notably decreased after the rinsing period by both types of mouthwash.

As the data in Table 1 reveal, in the intragroup comparison of the control group, both the Plaque Index ($P \leq 0.001$) and Gingival Index ($P \leq 0.001$) demonstrated a statistically significant reduction in scores from baseline to the 15th day. A similar finding was also seen in the test group for both the indices showing a statistically significant reduction on the 15th day ($P \leq 0.001$ for both groups).

Table 2 reveals that the intergroup comparison of Plaque Index at the baseline ($P \leq 0.833$) and on the 15th day ($P \leq 0.017$) showed no significant difference. Similarly, no statistically significant difference was found in the intergroup comparison of Gingival Index at baseline ($P \leq 0.465$) and on the 15th day ($P \leq 0.019$).

DISCUSSION

Chamomile is a well-known ingredient in alternative medicine. It has been used for numerous purposes from dermatological to gastrointestinal and even neurological and psychiatric.^[21] Combination products with chamomile, such as toothpaste or oral rinse, have demonstrated beneficial effects on oral hygiene status.^[12,22]

Table 1: Intragroup comparison of clinical periodontal parameters PI, GI at baseline, and on the 15th day in control group (CHX) and test group (Chamomile), *n*=30

Group	Mean	P-value	Result
Control group			
Plaque Index			
Baseline	1.444±0.399	0.000	S
15 th day	0.283±0.087		
Gingival Index			
Baseline	0.463±0.160	0.000	S
15 th day	0.194±0.071		
Test group			
Plaque Index			
Baseline	1.421±0.144	0.000	S
15 th day	0.363±0.084		
Gingival Index			
Baseline	0.427±0.093	0.000	S
15 th day	0.299±0.083		

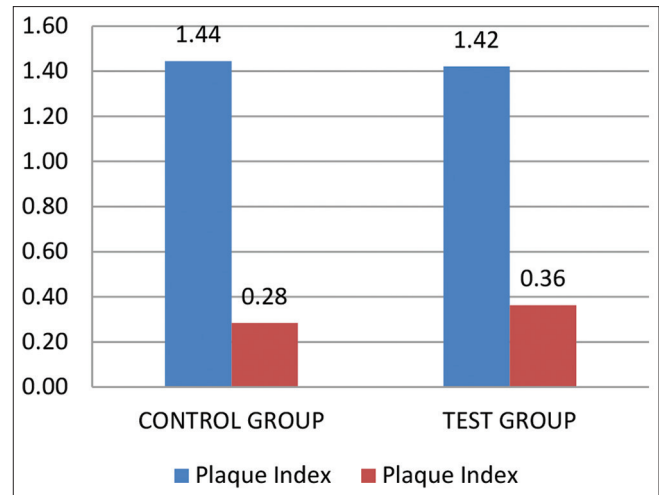
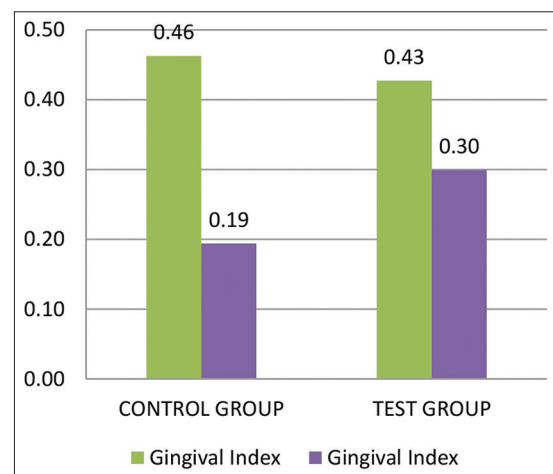
Table 2: Intergroup comparison of clinical periodontal parameters PI, GI at baseline, and on the 15th day in control group (CHX) and test group (Chamomile), *n*=30

Group	Mean	P-value	Result
Plaque Index			
Baseline			
Control group	1.444±0.399	0.833	NS
Test group	1.421±0.144		
15 th day			
Control group	0.283±0.087	0.017	NS
Test group	0.363±0.084		
Gingival Index			
Baseline			
Control group	0.463±0.160	0.465	NS
Test group	0.427±0.093		
15 th day			
Control group	0.194±0.071	0.019	NS
Test group	0.299±0.083		

GI: Gingival Index, PI: Plaque Index

The present study showed that the chamomile mouthwash resulted in a reduction in the Gingival Index and Plaque Index scores. These findings are in agreement with the previous studies which have stated the ability of herbal extracts to reduce parameters of gingival inflammation.^[22] Chamomile extract has demonstrated anti-inflammatory properties in various studies, likely due to specific components in the mouthwash. One such component is salicylic acid, present as a methyl ester.^[23] The effect of mouthwashes containing salicylic acid and essential oils, on gingival inflammation, and plaque accumulation has been well documented by both short-term and long-term research.^[24] The other constituents such as flavonoids and terpenoids such as α -bisabolol, azulene, matricin, and chamazulene chamomile its anti-inflammatory, antispasmodic, and antibacterial properties.^[25] By interfering with the arachidonic acid pathway, the flavones act as anti-inflammatory agents.^[26] In addition, it has been stated that chamomile extract promotes wound healing by decreasing the inflammatory responses and regeneration of the tissues on topical application.^[21] Various studies show that plant extracts can inhibit plaque accumulation, benefit gingival health,^[15,22,27] and suppress subgingival pathogens.^[19]

Its pharmacological activity has been studied, especially for its antioxidant properties. The flavonoid apigenin in chamomile extract has important anti-inflammatory and antioxidant activities which inhibit nitric oxide (NO) production and the activities of hyaluronidase, collagenase, and cyclooxygenases, enzymes which play key roles in the inflammatory process.^[28] The anti-inflammatory effect of apigenin was observed in *in vitro* studies of human periodontal ligament cells stimulated with nicotine and lipopolysaccharide. The release of NO, prostaglandin E₂, interleukin-1 β , -6, and -12, and tumor necrosis factor- α are significantly inhibited by apigenin.^[17] Chamazulene, another constituent of chamomile, undergoes various chemical processes, chamazulene within

**Figure 1:** Changes in the Plaque Index score from baseline to 15th day. Data have been expressed as mean $\pm$ SD (*n* = 30)**Figure 2:** Changes in the Gingival Index score from baseline to 15th day. Data have been expressed as mean $\pm$ SD (*n* = 30)

the chamomile extract effectively inhibits the formation of reactive chemical species, inhibits autoxidation, and prevents lipid peroxidation induced by Fe²⁺/ascorbate and suppresses the autoxidation of dimethyl sulfoxide.^[29,30] It also inhibits formation of leukotriene B₄ (by 50%),^[31] cyclooxygenase-2, and paw edema.^[32]

The aim of this study was to determine the mean values of gingival and plaque indices before and after the use of 1% of chamomile mouthwash and to compare this effect with 0.12% of CHX mouthwash in the treatment of chronic gingivitis. In this study, using both mouthwashes resulted in statistically significant decreases in periodontal parameters.

Bisabolol, an essential oil, possesses antimicrobial properties that contribute to reducing inflammation. It helps alleviate edema, inhibit leukocyte migration, prevent protein extravasation, suppress the release of tumor necrosis factor- α , and limit neutrophil degranulation.^[33,34] These observations are in agreement with other researcher's findings

who showed the effects of chamomile mouthwash on bacterial plaque and gingival inflammation and has a major impact on plaque accumulation, bleeding on probing, and gingival inflammation.^[18]

In vitro studies demonstrated that *M. chamomilla* was effective against 25 different Gram-positive and negative bacteria and 20 strains of *Listeria monocytogenes*.^[35] A study of oral pathogens stated that chamomile extract was effective against three strains of *Staphylococcus aureus* and *Candida* and inhibited the growth of *Streptococcus mutans* and *Streptococcus sanguinis*, which are important initial colonizers.^[36] Past and present research evidence indicates that chamomile has immunomodulatory activity.^[37]

CHX mouthwash has antibacterial activity which reduces plaque formation and greatly decreases and controls gingival inflammation in patients with poor oral hygiene.^[10]

CHX has a wide spectrum of action on Gram-positive and negative bacteria. It has a bactericidal activity at high concentrations, inducing cell lysis^[38] Varoni *et al.*^[39] confirmed that in gingivitis as compared to other topical antimicrobial agents used prophylactically or therapeutically, CHX has shown the best clinical effects in biofilm control.

The anti-inflammatory and antimicrobial action of CHX prevent the recolonization of putative pathogenic bacteria by forming a bacteriostatic milieu.^[40]

CHX is one of the most thoroughly investigated antiseptics which is used to control plaque and gingivitis. CHX digluconate is safe, stable, and effective in preventing and controlling biofilm accumulation, breaking up existing plaque, and inhibiting and reducing the development of gingivitis.^[8] Due to the CHX molecule's binding properties, it acts as a broad bactericidal and bacteriostatic spectrum and has a high substantivity of up to 12 h within the oral cavity.^[41] As CHX strongly binds to tissues, it is poorly absorbed in the gastrointestinal tract reducing its systemic toxicity.^[10]

However, some side effects have been reported during CHX treatment. The most common side effect of long-term CHX rinse use is an extrinsic brown staining of the teeth and tongue. Increased calculus formation and change in taste sensation are other common side effects. Burning sensation, mucosal lesions, hypersensitivity, and numbness have been noted less frequently.^[11] Due to these side effects of CHX, patients prefer herbal mouthwash solutions, which are effective in preventing and treating gingivitis without side effects.^[42] This study showed that chamomile mouthwash has no significant effect on the staining of tooth. We observed that both plaque and gingival scores slightly decreased at the end of the study in comparison to the baseline. Based on the results of this study, using chamomile mouthwash and CHX mouthwash twice daily for at least 14 days could reduce both plaque accumulation and gingival inflammation. Hence, this product could be used as an adjunct to daily oral hygiene measures.

Chamomile mouthwash reduced biofilm accumulation and gingival bleeding in patients with gingivitis. It is as effective as CHX mouthwash in reducing Plaque Index ($P \leq 0.05$) and Gingival Index ($P \leq 0.05$) and can be used as an alternative to CHX mouthwash without any adverse effects. Large-scale trials are required with a longer study time to support the findings of the present study.

CONCLUSION

Chamomile mouthwash is as effective as CHX mouthwash in reducing Plaque Index ($P \leq 0.05$) and Gingival Index ($P \leq 0.05$) and can be used as an alternative to CHX mouthwash without any adverse effects.

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