

Assessment of Effectiveness of *Barleria prionitis* on Oral Health

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ABSTRACT

Aim: To evaluate the efficacy of *Barleria prionitis* extract mouthwash in comparison with gold standard chlorhexidine (CHX) mouthwash on the oral health. **Materials and Methods:** A total of 30 subjects were randomly divided into two groups, *B. prionitis* group and the CHX gluconate mouthwash group. The data were collected at the baseline and 3 days. The plaque was disclosed using erythrosine disclosing agent and their scores were recorded using the Quigley and Hein plaque index modified by Turesky-Gilmore-Glickman. Statistical analysis was performed to compare the effect of the two drug regime. **Results:** Our result showed that the CHX and the *B. prionitis* were statistically equally effective against dental plaque. Although the action of CHX was more pronounced. **Conclusions:** This study has confirmed antimicrobial potential of the plant *B. prionitis*, thus supporting its folklore application as preventive remedy against oral microbial diseases.

Key words: *Barleria prionitis*, Chlorhexidine, Oral health

SUMMARY

- Within the limitation of this trial, herbal mouthwash has been shown to demonstrate similar effects on plaque as compared to the standard drug CHX. Further long term research needs to be done to check the efficacy and effectiveness of herbal products over standard drug regime.

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INTRODUCTION

The general quality of life influence Oral health. Many systemic diseases and chronic conditions are associated with poor oral health. The main causative factor of chronic gingivitis is bacterial plaque. Dental caries is one of the major oral health problems.^[1] The most common periodontal diseases which affects more than 90% of the population, is Dental plaque induced gingivitis. The removal of bacterial biofilm is a crucial component in the prevention and treatment of this disease. Effective mechanical cleaning of the teeth helps in regular plaque removal. It is a cost-effective and simple method which proved effective in the control of gingivitis. Individual's motivation and manual ability influence the Efficiency of mechanical cleaning. Thus, the synergistic effect of antiseptics with mechanical oral hygiene is recommended.^[2] There is a great need of research for the discovery of new antimicrobial agents that can serve as adjuvants or replace mechanical hygiene methods. Such compounds, particularly chlorhexidine (CHX), have been used to prevent plaque formation and development of gingivitis and are often indicated in situations in which oral hygiene is difficult, compromised or even impossible maintain. The lipophilic, hydrophobic and positively charged molecule of CHX interacts with lipopolysaccharides and phospholipids portion of bacteria and then through some type of passive and active transport mechanism CHX enters the cell.

Despite commonly known side effects such as temporary loss of taste; staining of the teeth, restorations, and mucosa; dry, sore mucosa; bitter taste; and a slight increase in supragingival calculus formation, CHX is considered the "gold standard" of antimicrobial rinses because of broad-spectrum antibacterial activity and substantivity of 8-12 hours.^[1] As antibiotics and chemicals show more side effect, Hence, there is an urgent need to find out an alternative way.^[3]

Effective oral care is important for all individuals; it is especially important for those who are compromised due to poor dexterity, an immune system deficiency, and/or are undergoing chemotherapeutic

or radiation therapy. Despite one's best efforts, mechanical aids may fail to adequately remove plaque biofilm or "reduce the bacteria below the patient's threshold for disease." For these individuals, a therapeutic mouthrinse is often recommended as an adjunct to mechanical plaque control to help maintain gingival health.^[4]

According to World Health Organization about 80% of the world's population use herbal medicine for some aspect of primary health care. Natural products are easily bio-degradable, non-narcotic, have less adverse effects and are easily available & affordable and pose minimum environmental hazards that's why change in the scenario occurred. The most cost effective method of preventing dental plaque is mouth rinse. It is used as adjuncts to maintain oral hygiene and in the delivery of active agents to the teeth and gums. Extensive studies have been undertaken to measure the capacity of these mouth rinses to influence plaque formation.

Barleria prionitis (Sanskrit kuranta; Marathi vjradant, porcupine flower), is one such plant. It is a species of plants in the family Acanthaceae. This plant is common in India, Central Africa, Sri Lanka and Eastern Southern. It is having many medicinal properties and thus use for various medicinal purposes. 6-Hydroxyflavone is the main ingredient of its leaves which is a noncompetitive inhibitor of the protein cytochrome P450 2C9.

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A variety of oral rinses are available to consumers either by prescription (Rx) or over-the-counter. The increasing popularity of herbal or “natural” products has led companies to include these in their oral care product lines. Since herbal products may be purchased OTC, research is needed on this aspect. It has attracted millions of consumers who are looking for an alternative mouthrinse; however, more research has to be undertaken to determine the effectiveness and safety of these products.^[5]

Hence the present study has been conducted to check the effect of this herbal preparation *Barleria prionitis* the clinical level of dental Plaque in comparison with CHX.

MATERIALS AND METHODS

Authentication of the product

The bark was obtained freshly from the botanical garden of Teerthanker Mahaveer University (Western part of Uttar Pradesh, India) and was authenticated by the professor of Botany, Teerthanker Mahaveer University.

Preparation of extract

The samples were carefully washed under running tap water followed by sterile distilled water. These were air-dried at room temperature (40°C) for 5 days and pulverized to a fine powder using a sterilized mixer grinder and stored in air-tight bottles. A 10 g amount of pulverized bark was separately soaked in 100 mL of ethanol for 24 h with occasional shaking and kept undisturbed for 24 h. Sterilized Whatman No.1 filter paper was used for filtration of preparation and the filtered extract was concentrated under vacuum. The dried extract thus obtained was exposed to ultraviolet rays for 24 h and checked for sterility on nutrient agar plates and stored in labeled sterile bottles in a freezer at 4°C until further use.

Methodology

This double-blind randomized control trial was conducted in the Department of Public Health Dentistry on volunteered male and female university students of Teerthanker Mahaveer Dental College and Research Centre. All subjects signed an Institutional Review Board approved consent form.

Inclusion and exclusion criteria

Students inclusion criteria for those fulfilling the preliminary screening

1. Students with age group of 18–24 years
2. Students free from systemic illness
3. Students who are willing to participate in the study.

Exclusion criteria

1. Pregnant and nursing students
2. Students receiving concurrent antibiotic treatment for any other purpose and
3. Students who failed to give consent.

Withdrawal criteria

1. Students who did not turn up for follow-up after undergoing initial treatment.

Sample size and randomization

From the sampling frame of 100 students of Teerthanker Mahaveer Dental College and Research Centre of those who fulfilled the inclusion and exclusion criteria, 30 were selected to be taken into the study. Computer-generated random numbers were used to randomly allocate

30 volunteers to two study groups. Lottery method was done for random allocation of mouthrinses.

Group 1 ($n = 15$) was given *B. prionitis* mouthwash and instructed to use 10 mL twice a day for 3 days. Group 2 ($n = 15$) was given CHX (12%) and instructed to use 10 mL twice a day for 3 days.

B. prionitis mouthwash composed of 50% concentration of *B. prionitis*. Same oral hygiene instructions were given to both the groups, apart from the use of allocated mouthrinse. The color of both the mouthwash was standardized with the help of department of pharmacy. Then the mouthwashes were kept in coded containers and decoded later. Instructions were given to students of both the groups to rinse their mouth with 10 ml of mouthwash twice a day after breakfast and second time after lunch for 3 days for one minute and not to rinse with water thereafter.

The data were collected two times in whole of the study once at baseline and second at the end of study, that is 3rd day. The plaque was disclosed using erythrosine disclosing agent and their scores were recorded per tooth using the Quigley and Hein plaque index modified by Turesky-Gilmore-Glickman.^[6]

The plaque and gingival scores were recorded by a single examiner. The examiner was calibrated and trained at the department. Examiner recorded the findings at two intervals for both the groups.

Chemical antiplaque agents are rarely preferred by developed countries as well as even the most affluent due to high expense or ignorance.^[7]

Statistical analysis

The data were analyzed using Statistical Package for the Social Sciences version 21. Analysis of variance (ANOVA), followed by *post-hoc* least significant difference (LSD) were used for analysis. $P = 0.05$ was taken to be significant.

RESULTS

There were no reports of adverse reactions to any of the mouth rinses used. No dropouts were noted. ANOVA was used to analyze the reduction in plaque in the two groups [Table 1]. Significant decrease was noted in the plaque in both the *B. prionitis* and CHX groups at 3 days ($P < 0.05$). There was progressive decrease in the plaque at 5% level of significance. CHX group showed maximum decrease as compared to herbal group but it was not statistically significant. Multiple comparisons were obtained by *post-hoc* LSD. The difference in the decrease in plaque ($P = 108$ at 3 days) between herbal group and CHX group was not statistically significant. Our result shows that there is no significant difference in the efficacy of *B. prionitis* and CHX on dental plaque.

DISCUSSION

There is a very high prevalence of Periodontal diseases and caries in India, according to many studies.^[8] Majority of population gives a low precedence to oral health which may be attributed to such high prevalence of oral diseases. Other reasons for such high prevalence may be lack of availability of simple interventions to rural and underprivileged people and lack of basic oral health education.^[9]

Table 1: ANOVA for plaque scores of different groups

| ANOVA | Sum of squares | Mean square | F | Significant |
|----------------|----------------|-------------|-------|-------------|
| Between groups | 5.220 | 4.61 | 7.291 | 0.001 |
| Within groups | 12.901 | 0.671 | - | - |
| Total | 15.063 | - | - | - |

F: F value is very common statistical term so no explanation is required. ANOVA: Analysis of variance

Antimicrobial agents may aid in disrupting pathogenic bacteria associated with plaque, thus aiding in the control of gingivitis.^[10] Healthy oral flora is influenced by effective plaque control; however, the pathogenic degree of the bacteria in plaque also plays a significant role, as does the host response, immune status, and amount of time that plaque remains on the tooth. The World Health Organization estimates that 65–80% of the world's population uses traditional medicine as the primary form of health care. This study was an attempt to investigate if indigenously prepared mouthwashes from *B. prionitis* can effectively reduce plaque and gingival scores in the selected population.

This study focused on two specific mouth rinses: *B. prionitis* rinse and 0.12% CHX rinse (CHX), both claiming to be effective in the treatment of dental plaque. CHX (0.12%) has the American Dental Association (ADA) Seal of Acceptance and is Food and Drug Administration approved for the reduction of plaque and gingivitis. CHX also has long-standing research to substantiate its safety 13–16 and efficacy, whereas the herbal rinse mouth rinse used in this study is a newer, less researched product.^[11,12]

A variety of chemotherapeutic agents have been examined for their ability to control oral micro-organisms and to affect plaque formation. CHX digluconate has a 30 years history in Dental Medicine. Studies showed that the most disturbing side-effect of Chlorhexidine is extrinsic tooth staining and others such as unpleasant taste and burning sensation. There is rising awareness in the result of natural compounds as they have dual effect. On one hand they inhibit the growth of bacterial organisms which are associated with oral diseases and on other hand they uphold the growth of helpful microorganisms.^[13]

B. prionitis mouth washes were prepared based on the findings of an *in vitro* study conducted by Aneja *et al.* and Diwan. In this study, 50% extracts of *B. prionitis* was found to be most effective in inhibiting *Streptococcus mutans*.

To make the taste agreeable some amount of artificial sweetening agents were added. Flavoring agents like menthol, thymol, etc., are essential oils. Essential oils are excellent plaque inhibitory as chlorhexidine so they may act as confounders in plaque and gingival evaluation that's why they are not added in preparation.^[14]

Sodium benzoate, salt of benzoic acid, has been established safe for use and thus used as preservative in food and other compounds. Concentration of 0.03-0.1% concentration of sodium benzoate is used in US.^[15]

Methyl paraben is a methyl ester of p-hydroxybenzoic acid. It is a stable, nonvolatile compound that has been used as an antimicrobial preservative in foods, drugs, and cosmetics for over 50 years. Both the preservatives were used at a much lower concentration than what was found to inhibit oral bacteria.^[16]

A study by Aneja *et al.*^[17] and Diwan and Gadhikar^[18] have showed the antibacterial action of *B. prionitis in vitro* but there are no published reports on the antibacterial action of *B. prionitis in vivo*. So, this research can be considered as the only research in this aspect which limits its comparison with other such studies.

The antimicrobial potency of plants is believed to be due to tannins, saponins, phenolic compounds, essential oils and flavonoids (Cowan, 1999). The antimicrobial potency of *B. prionitis* may be due to the presence of five iridoid glucoside esters, acetylbarlerin (6, 8-di-O-acetylshanzhiside methyl ester), barlerin (8-O-acetylshanzhiside methyl ester), shanzhiside methyl ester and 6-O-acetylshanzhiside methyl ester, verbascoside (6-O-trans-p-coumaroyl-8-O-acetylshanzhiside methyl ester).^[17,19,20]

It is interesting to note that even crude extracts of *B. prionitis* showed good activity against dental caries causing oral pathogens where modern antibiotic therapy has failed.^[17]

In the present study, *Barleria prionitis* has shown a good potential as

an anti-plaque agent. *Barleria prionitis* has been proven to be less effective than CHX. Subjects answered the questionnaire that they found *Barleria prionitis* to be effective and convenient to use due to taste duration (aftertaste) in their mouth after rinsing, taste was better than CHX due to the of natural ingredients.

In regard to the efficacy of plaque reduction, CHX was considered to be more effective. However, CHX rinsing can cause a number of local side effects^[21-23] including extrinsic tooth and tongue brown staining, taste disturbance, enhanced supragingival calculus formation and less commonly, desquamation of the oral mucosa. Due to the side-effects of CHX users are not bale to accept CHX completely and for long-term use.^[24] *Barleria prionitis* doesnot have any side-effects due to its natural ingredients. It can be use as a good replacement to patients who wish to avoid alcohol, sugar, any artificial preservatives and artificial colors in their mouthrinses. Further studies of longer time period have to be conducted. The natural product in issue has to be compared to both positive as well as negative control.^[25-41] To establish the effectiveness of this product studies must be conducted where safety and microbiological parameters can be assessed.

Limitations

The present study was a short a term study employing a crude extract of *B. prionitis* as mouth rinse. Though significant results were obtained in 3 days in the *B. prionitis* groups, long term clinical efficacy (6 months as prescribed by ADA) and adverse effects associated with long term usage could not be assessed.^[42]

CONCLUSION

Within the limitation of this trial, herbal mouthwash has been shown to demonstrate similar effects on plaque as compared to the standard drug CHX. Further long term research needs to be done to check the efficacy and effectiveness of herbal products over standard drug regime.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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