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Research Article

COMPARISON OF THE ANTI-GINGIVITIS AND ANTI-PLAQUE EFFICACY OF A HERBAL MOUTH WASH AND 0.2% CLORHEXIDINE GLUCONATE- A CLINICAL STUDY

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ABSTRACT

Chlorhexidine on long term use is known to cause local side effects hence demanding the need for some alternative chemical plaque control agents. The present study was conducted to compare the anti-plaque and anti-gingivitis efficacy of 0.2% chlorhexidine gluconate mouthwash and the herbal mouthwash with normal saline. The present study is an examiner-blinded, parallel designed clinical trial and included a total of 120 dental students. Gingival index (GI) and plaque index (PI) were recorded at baseline and brought to zero by scaling and polishing. The subjects were then assigned randomly to 1 of the 3 groups of 40 subjects each after fulfilling the necessary inclusion and exclusion criteria. All the groups were instructed not to perform regular oral hygiene measures mainly tooth brushing and dental flossing, except for swishing with respective mouthwash as per therapeutic dose. Group A subjects were instructed to rinse with 10 ml of 0.2% chlorhexidine gluconate mouthwash twice daily for 1 minute a standard regimen for chlorhexidine mouthwash. Similarly, Group B subjects were requested to rinse with 5 ml of herbal mouthwash diluted with 5 ml of water twice daily for 1 minute and Group C subjects were asked to rinse with 5 ml of normal saline twice-a-day for 1 minute. The same investigators re-evaluated GI and PI scores on the 5th day which were then compared statistically. According to the results of our study, the anti-plaque and anti-gingivitis effects of herbal mouth rinse was similar to that of 0.2% chlorhexidine mouth rinse and significantly better than rinsing with normal saline.

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INTRODUCTION

Dental plaque, the main etiologic factor for periodontal destruction is defined clinically as a structured, resilient yellow-grayish substance that adheres tenaciously to the intraoral hard surfaces, including removable and fixed restorations.^[1] Plaque accumulation and maturation leads to the onset of gingivitis.^[2,3] Gingivitis if allowed to progress leads to periodontitis^[4,5]. Thus a proper plaque control is a pre-requisite for a healthy periodontium^[6].

Plaque control is defined as the removal of microbial plaque and food debris from the oral cavity.^[7] It is of two types, mechanical and chemical. The mechanical plaque control is mainly achieved through tooth brushing. Chemical plaque control agents are mouthwashes, toothpastes, spray, irrigators etc. with mouthwashes being simple and widely accepted as an oral hygiene aid.^[8]

Chlorhexidine gluconate (CHX), a cationic bis-biguanide is considered as most effective and most widely used. It has been found to be effective against both gram-positive and gram-negative bacteria including aerobes, anaerobes, yeast and fungi.

This molecule being cationic binds to anionic compounds such as free sulphates, the carboxyl and phosphate groups of the pellicle and salivary glycoproteins thereby reducing their adsorption to the tooth surface thus interfering with formation of dental pellicle. Coating salivary bacteria with chlorhexidine molecules also alters the mechanisms of adsorption of bacteria to the tooth. Because of its high cationic nature, chlorhexidine rapidly binds to the cell wall of microorganisms. Osmotic equilibrium is lost, and as a consequence, cytoplasmic membrane is extruded, vesicles are formed, and the cytoplasm precipitates^[9] inhibiting the repair of the cell wall. Substantivity is a unique property of chlorhexidine that helps in maintaining its effective concentrations for prolonged period of time thus making it especially suitable for the prolonged inhibition of plaque formation and accumulation.^[10-12] A number of side effects however have been reported on its long term use.^[13] Brown discoloration of teeth, restorative materials and tongue, taste disturbances, ulcerations in mouth, abnormal sensations, swelling of the parotid gland and increased supra-gingival calculus formation.

To overcome the above mentioned side-effects, increased

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researches have been conducted on the herbal products, as an effective and safe alternative to chlorhexidine. The present study was conducted to compare the anti-plaque and anti-gingivitis efficacy of 0.2% chlorhexidine gluconate mouthwash (group A, positive control) and the herbal mouthwash (group B, experimental group) with normal saline (group C, negative control). Subjects in all the three groups were restrained from tooth brushing and the use of alternative mechanical plaque control measures for 4 days. Thus the aim of this study is to compare the plaque formation between the above mentioned 3 groups using a 4-day plaque re-growth model. [14]

MATERIALS AND METHODS

This study was performed in the Department of Periodontics, Govt Dental College and Hospital Srinagar and was an examiner-blinded, parallel designed clinical trial. It included a total of 120 dental students (63 males and 57 females, in the age range of 18 to 25 years).

Materials used were diagnostic instruments, scalers, polishing cups, abrasive paste, 0.2% chlorhexidine gluconate mouthwash, herbal mouthwash Hiora -Regular (Hiora, Himalaya Drug Company, Karnataka, India), normal saline, measuring cups and plaque disclosing agent.

The contents of this experimental herbal mouthwash are: *Pilu (Salvadora persica)* - 5.0 mg as an antioxidant^[15], *Ela* - 0.2 mg as antiseptic and agent for fighting bad breath, *Gandhapura taila*-1.2 mg as antimicrobial, anti-inflammatory, and analgesic, *Bibhitaka (Terminalia bellerica)*-10 mg as antibacterial and anti-inflammatory, *Nagavalli (Piper betel)* - 10 mg as anti-inflammatory, antioxidant, and antimicrobial^[16], *Peppermint satva*-1.6 mg as a natural mouth freshener, *Yavanisatva* - 0.4 mg also as an antimicrobial agent.

Gingival status was recorded by performing gingival index (GI) (Loe and Silness 1963) ^[17,18] on all teeth present, except third molars. It was performed on each tooth at 4 sites - mesial, distal, facial, and palatal/lingual. Plaque formation was recorded by plaque index (PI) (Turesky et al. 1970) ^[19], a modification of the Quigley and Hein plaque index (1962) ^[20] on all teeth, except third molars.

Inclusion criteria

No Systemic disease should be there in the participants.

≥20 teeth should be present in all the participants.

Mean value of GI ≤ 1,

Exclusion criteria

Subjects excluded were those with severe mal-alignment of teeth, those wearing removable partial dentures, Orthodontic appliances. Smokers and medically compromised subjects were also excluded.

Professional scaling and polishing was performed in all the subjects and baseline scores both plaque and gingival, were brought to zero. The subjects were then assigned randomly to 1 of the 3 groups of 40 subjects each after fulfilling the necessary inclusion and exclusion criteria. Informed consent was taken from all the participants of the study and permission was taken from the authorities. All the groups were instructed not to perform regular oral hygiene measures mainly tooth

brushing and dental flossing, except for swishing with respective mouthwash as per therapeutic dose.

Group A subjects were instructed to rinse with 10 ml of 0.2% chlorhexidine gluconate mouthwash twice daily for 1 minute a standard regimen for chlorhexidine mouthwash. Similarly, Group B subjects were requested to rinse with 5 ml of herbal mouthwash diluted with 5 ml of water twice daily for 1 minute and Group C subjects were asked to rinse with 5 ml of normal saline twice-a-day for 1 minute. The same investigators re-evaluated GI and PI scores on the 5th day which were then compared statistically.

A questionnaire for the evaluation of side effects was given to the patients after 4-day use of the 3 mouthwashes to mention for the pain, burning sensation, dryness of the mouth, itchiness, taste disturbance, discoloration of teeth and tongue surfaces.

Pain severity was reported as none, mild, moderate, or severe. Discoloration was recorded as present or absent and if present was further classified as none, mild, moderate and severe. The patients were also asked to specify which taste (i.e., salt, bitter, sweet, or sour) had altered in perception. Subjects were asked to perform their regular oral hygiene measures after the completion of the study period.

RESULTS

Table 1 and Table 2 show ANOVA test for difference between pre-rinsing gingival index (GI) and plaque index (PI) scores of various groups respectively. For both the indices, no significant difference was observed.

Table 1 Showing pre-rinsing gingival index scores of various groups

| Group | Mean | SD | Range | ANOVA | |
|---------|------|-------|---------|---------|--------------------|
| | | | | F-value | P-value |
| Group A | 0.96 | 0.209 | 0.6-1.3 | 0.226 | 0.798 [#] |
| Group B | 0.94 | 0.193 | 0.7-1.3 | | |
| Group C | 0.93 | 0.208 | 0.6-1.3 | | |

Table 2 Showing pre-rinsing plaque index scores of various groups

| Group | Mean | SD | Range | ANOVA | |
|---------|------|-------|----------|---------|--------------------|
| | | | | F-value | P-value |
| Group A | 3.40 | 0.361 | 2.8-3.86 | 1.222 | 0.298 [#] |
| Group B | 3.51 | 0.282 | 3.05-3.9 | | |
| Group C | 3.45 | 0.203 | 3.2-3.9 | | |

Similarly Table 3, Table 4, Fig1 and Fig2 Shows post-rinsing GI scores and PI scores of various groups respectively. Mean GI at post-rinsing stage was least with group A subjects (1.09±0.13), followed by group B subjects (1.10±0.09) and then group C subjects (1.21±0.15). Similarly, mean PI at post-rinsing stage was least with group A subjects (4.05±0.53), followed by group B subjects (4.15 ± 0.41) and then group C subjects (4.38±0.44). Table 3(a), 4(a), Fig1 and Fig 2 shows Inter-group Comparison based on post-rinsing GI scores and PI scores of various groups respectively.

Table 3 Showing post-rinsing gingival index scores of various groups

| Group | Mean | SD | Range | ANOVA | |
|---------|------|-------|-----------|---------|---------|
| | | | | F-value | P-value |
| Group A | 1.09 | 0.212 | 0.76-1.28 | | |
| Group B | 1.10 | 0.178 | 0.9-1.28 | 4.561 | 0.012* |
| Group C | 1.21 | 0.195 | 1.0-1.7 | | |

Table 3 a Intergroup Comparison among various groups based on post-rinsing gingival index scores

| Group Comparison | Mean Difference | P-value@ | Inference |
|------------------|-----------------|----------|-----------|
| A vs B | -0.01 | 0.855 | NS |
| A vs C | -0.12 | 0.008 | S |
| B vs C | -0.11 | 0.013 | S |

Table 4 Showing post-rinsing plaque index scores of various groups

| Group | Mean | SD | Range | ANOVA | |
|---------|------|-------|-----------|---------|---------|
| | | | | F-value | P-value |
| Group A | 4.05 | 0.559 | 3.2-4.8 | | |
| Group B | 4.15 | 0.360 | 3.3-4.7 | 5.416 | 0.004* |
| Group C | 4.38 | 0.415 | 3.76-4.82 | | |

Table 4 a Intergroup Comparison among various groups based on post-rinsing plaque index scores

| Group Comparison | Mean Difference | P-value@ | Inference |
|------------------|-----------------|----------|-----------|
| A vs B | -0.10 | 0.325 | NS |
| A vs C | -0.33 | 0.001 | S |
| B vs C | -0.23 | 0.023 | S |

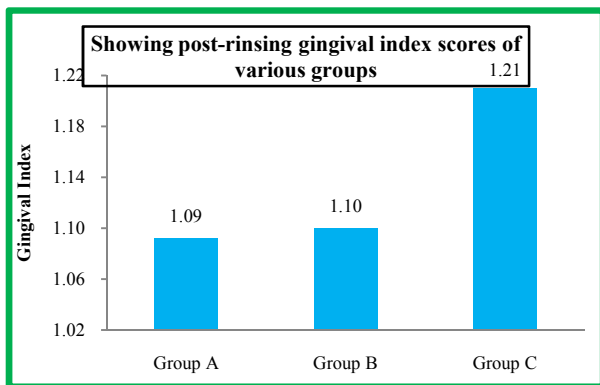


Figure 1

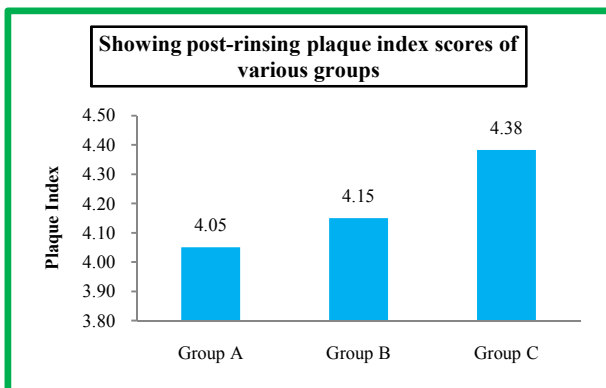


Figure 2

Table 3(a) and Figure1 show that the difference of post-rinsing GI scores between the group A and group B was

non-significant at probability value 0.855. This difference was significant between groups A and C at probability value 0.008. The difference between groups B and C was also significant at probability 0.013. Table4(a) and Fig 2 show that the difference of post-rinsing PI scores between the groups A and B was non-significant at probability value 0.325. This difference was significant between groups A and C at probability value 0.001 and the difference between groups B and C was also significant at probability 0.023

After 4 days of mouthwash use, the participants were evaluated for staining and unpleasant taste. 29 subjects in group A were found to have mild brown discoloration of teeth. 26 subjects in group A reported an unpleasant taste. Mild taste alterations were reported in 16 subjects in group B. Staining was not observed in any of group B subjects.

DISCUSSION

With the increasing understanding of the role of plaque in the development of gingivitis which further progresses to periodontitis, the use of mechanical and chemical plaque control agents has drastically increased. The chemical mouth washes are associated with side-effects like immediate hypersensitivity reaction, toxicity, tooth staining etc. The presence of these side effects, demand the need of relatively safe herbal compounds as an alternative to chemical ones.

The present study was designed to determine the efficacy of herbal mouthwash, Hiora versus chlorhexidine mouthwash on gingival status and plaque accumulation over a period of 4 days.

Hiora is one among the most commonly used antibacterial agent in traditional ayurvedic medicine. Its role as an anti-plaque agent has been reported extensively.

According to the results of our study, the anti-plaque and anti-gingivitis effects of herbal mouth rinse was similar to that of 0.2% chlorhexidine mouth rinse and significantly better than rinsing with normal saline.

At pre-rinsing stage, no significant difference between GI and PI scores of the 3 groups was found. No significant difference in the mean age of subjects was present. Mean GI and PI scores at post-rinsing stage were least with group A subjects, followed by group B and then group C. The difference of post-rinsing GI scores between the groups A and B was statistically non-significant, whereas this difference was significant between groups A and C, and groups B and C. Similarly the difference of post-rinsing PI scores between the groups A and B was statistically non-significant, whereas this difference was significant between groups A and C and groups B and C. Thus the results of present study show that the herbal mouthwash has an anti-gingivitis as well as anti-plaque effects, statistically comparable to that of chlorhexidine mouthwash. Subjects on 0.2% chlorhexidine gluconate mouthwash exhibited mild brown staining of teeth, which was not observed in herbal mouthwash subjects.

The findings of our study are in accordance to the studies conducted by Bagchi *et al*, Rahmani *et al*. and Ghazi *et al* who compared the anti-plaque and anti-gingivitis effect of a mouthwash containing *Salvadora persica* with 0.2%

chlorhexidine and showed improvement in both plaque and gingival index (GI) scores.^[21,22,23]

Parwani et al, Narayan and Mendon and Bhat et al also compared the efficacy of herbal and chlorhexidine mouth rinses on dental plaque formation and concluded that both the mouth rinses were effective as anti--plaque agents.^[24,25,26]

CONCLUSION

Within the limits of this clinical study it may be concluded that no significant difference in anti-gingivitis and anti-plaque efficacy of the Hiora^R and Chlorhexidene gluconate mouth wash is found. The side effects were also found to be very low in Hiora^Rpatient group. Thus it can be effectively used as an alternative to chlorhexidine mouth rinse.

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