Advances in
Dentistry & Oral Health

Research Article
Volume 2 Issue 1 - April 2016

Adv Dent & Oral Health

Comparative Evaluation between Honey and Chlorhexidine Gluconate on the Dental Plaque Levels and Gingival Health

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Submission: March 15, 2016; **Published:** April 22, 2016

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Abstract

Honey has been used since ancient times, in folk medicine for healing the infected wounds. Its efficiency is also well known against the infectious diseases caused by microorganisms. However, very few studies are available in literature, which show the antibacterial effect of honey on the levels of dental plaque when used as a mouth rinse. The purpose of the present study was to compare the effectiveness of honey (10%) with chlorhexidine gluconate (0.12%) on the dental plaque levels and gingival health. 30 healthy subjects (mean age 19.4±3 years) participated in the study. Subjects were randomly divided into: test group (10% Honey) and control group (0.12% Chlorhexidine gluconate). Use of any form of mechanical oral hygiene method during the experimental period was not permitted. Rinsing with water or any other fluid after the procedure was not allowed. Full mouth Plaque Index (PI) and Full mouth Papillary Bleeding Index (PBI) were recorded at baseline, 7th and on the 15th day. The differences in the PI score between the group 1 and group 2 at baseline, 7th and 15th day during the experimental period were 0.05, 0.10 and 0.28 which were statistically insignificant. The differences in the PBI score between group 1 and group 2 at baseline, 7th and 15th day were 0.24, 0.32 and 0.55 respectively. These differences were not statistically significant. Both test and control groups showed significant reduction of plaque formation, however the reduction levels were slightly better with test group, but the differences were not statistically significant indicating that honey at 10% concentration appears to be effective for plaque control without any side effects.

Keywords: Chlorhexidine gluconate; Dental plaque; Gingivitis

Introduction

Although there is an overwhelming amount of data of favouring the specificity of periodontal infection [1,2], at present the removal of bacterial biofilm is still the most reliable method in the prevention and treatment of gingival and periodontal diseases. The use of mechanical agents is a simple and cost effective method that has been demonstrated to be efficient in the control of gingivitis [3]. The effectiveness of this method, however, is influenced by the individual's manual dexterity and motivation. Because of the difficulty to ensure adequate removal of plaque by mechanical means, there is a great interest in the use of antimicrobial agents to replace or to be adjuncts to the mechanical approaches. Mouth rinses are widely used as adjuncts to oral hygiene and in the delivery of active agents to the teeth and gums. Chlorhexidine (CHX) is one of the most effective antimicrobial agents for plaque control [4,5]. Rinsing for 60 seconds twice a day with 10 ml 0.2% chlorhexidine gluconate solution in the absence of normal tooth cleaning inhibited plaque regrowth and development of gingivitis [6]. Unfortunately qualities of chlorhexidine do not reserved entirely for bacteria , a review of literature has shown CHX to be noxious to a variety of mammalian cells, polymorphonuclear leukocytes, macrophages, erythrocytes and gingival fibroblasts [7]. In addition, to that, CHX application directly to surgical wounds in the oral cavity can delay and alter wound healing [8]. Local side effects associated with the use of chlorhexidine [9] such as unpleasantness, alteration of taste sensation and particularly extrinsic staining of teeth as well as restorations have limited the long term use of chlorhexidine as an adjunct to oral hygiene. Despite the great benefit of chlorhexidine gluconate as an antiplaque agent, the search continues for active ingredients that could prevent dental plaque formation without affecting the biological equilibrium within the oral cavity. Honey has been used since ancient times, in folk medicine for healing the infected wounds. Its efficiency is also well known against the infectious diseases caused by microorganisms [10,11]. Honey has been reported to have an inhibitory effect to around 60 species of bacteria including aerobes and anaerobes, gram positives and gram negative microorganisms [12]. The major antibacterial activity in honey has been found to be due to the production of hydrogen peroxide enzymatically [13]. The fact that the antibacterial activity of honey increased when diluted was clearly observed and reported in 1919 [14]. On dilution, the antibacterial activity increases by a factor of 2,500-50,000, thus giving a slow release antiseptic at a level which is antibacterial but not tissue damaging [12]. However, very few studies

are available in literature, which show the antibacterial effect of honey on the levels of dental plaque when used as a mouth rinse. Therefore, the present study was carried out to compare the effectiveness of honey (10%) mouth rinse with chlorhexidine gluconate (0.12%) mouth rinse on the dental plaque levels and gingival health.

Materials and Method

Thirty systemically healthy volunteers (mean age 19.39±1.39 years) were selected as participants in this study, from the Outpatient Department of Periodontics, Sharad Pawar Dental College, Sawangi (Meghe), Wardha. Inclusion criteria for the study recruited those volunteers who had full component of teeth except 3rd molars, fair oral hygiene, minimal levels of pre-existing gingivitis ≤ 0.5 PBI score. The exclusion criteria for the study excluded volunteers requiring antibiotic cover for dental procedures, having adverse habits such as smoking, drinking etc, volunteers undergoing orthodontic treatment or who have received any complex periodontal therapy 6 months prior to baseline examination. Volunteers allergic to pollen, bee products or honey were also excluded from the study. Prior to initiating this study, the purpose and design of this clinical trial was explained to the participants and informed consent was obtained from all the participants of the study. This study was approved by the ethical committee, DMIMS, Sawangi (Meghe), Wardha. A randomized controlled design was employed. The 30 participants who were selected for the study were randomly allocated by using coin flip method to either the test group (10% honey) or the control group (0.12% chlorhexidine gluconate) for the 15 days experimental period. Each group consisted of 15 patients. All the participants received a professional prophylaxis at the start of the study with the purpose of making the dentition 100% free of plaque and calculus. The scaling was finished with help of hand instruments and polishing was done with rotating cups and brushes with a fluoride free polishing paste. After polishing, disclosing solution was applied with cotton buds. All visible plaque was removed.

Recording of Clinical Parameters

The plaque levels were recorded on the buccal and lingual surface of every tooth using the Plaque Index by [15], while the presence or absence of buccal and lingual gingival bleeding was recorded using the Full Mouth Papilla Bleeding Index [16] at baseline, 7, and 15 days. Before the commencement of the study, the sole examiner (NM) was calibrated in the use of the Plaque Index and the criteria for recording the bleeding score by the senior author (PC). The intervention was assessed using the single blinding examination method, where the examiner was unaware as to which mouth rinse each participant had used during the experimental period. Following collection of all data the confidential code was broken and the results were statistically analysed.

Preparation of Material

For the test group, 10% honey mouth rinse was prepared by diluting 10ml of commercially available honey (containing 80g-natural sugar, 80g-carbohydrate, 5mg-phosphorus, 1.5mg-iron, 13mg-calcium) with 90ml of distilled water. For the control group, commercially available mouth rinse having 0.12% chlorhexidine gluconate was used. Both the solutions were stored in dark amber colored bottles and coding of the bottles was done as Group A or Group B, each group consisting of 15 bottles. The coding of the bottles and the preparation of 10% honey mouth rinse was done by a technician of Research & Development Cell, Dept. of Pharmacology, Jawaharlal Nehru Medical College, Sawangi, Wardha. The study was conducted for a period of 15 days during which, participants were instructed to stop routine oral hygiene procedures following the baseline examination, which was carried out immediately after the professional prophylaxis received by the participants at the start of the study. The participants in both the test and the control group were instructed to rinse using 10 ml of the respective mouth rinse twice daily immediately after main meals. Patients were further instructed to rinse around the mouth with the mouth rinse for 60 seconds and then expectorate the solution. Thereafter patients were not permitted gargling, eating or drinking for at least 20 minutes.

Results

A total of 30 patients reported, 15 in each group. The mean age of the patients in the test group was 19.28 ± 1.48 while for control group patients, it was 19.50 ± 1.69 and the difference was not statistically significant. All the patients in both the groups had at least 28 teeth. The comparison of the mean plaque index scores between test and control group at baseline, 7th day and on 15th day shown in Table 1.The mean plaque index score at baseline for test group was 0.08 ± 0.01 and at 7th day it was further increased to 0.29 ± 0.02. On the 15th day, the mean plaque index score was further increased to 0.46 ± 0.02 and this increased plaque index score was significantly higher compared to baseline as well on 7th day. The mean plaque index score at baseline for control group (CHX) was 0.08 ± 0.01 and at 7th day it was increased to 0.23 ± 0.01. When comparison was made between baseline plaque score and 7th day mean plaque score, there was statistically significant difference. On the 15th day, the mean plaque index score was further increased to 0.39 ± 0.03 and this increased plaque index score was significantly greater compared to baseline mean plaque index score. When comparison was made between test and control group, the test group showed significantly higher mean plaque index score compared to control group. The comparison of the mean papilla bleeding index scores between test and control group at baseline, 7th day and on 15th day shown in Table 2. The mean papilla bleeding index score at baseline for test group was 0.29±0.02 and at 7th day it was decreased to 0.24 ± 0.03. When comparison was made for papilla bleeding index score between baseline and 7th day, there was statistically significant difference. On the 15th day, the mean papilla bleeding index score was increased to 0.35 ± 0.03 and this increased papilla bleeding index score was significantly

How to cite this article: Nupoor S, Priti C, ML Bhongade. Comparative Evaluation between Honey and Chlorhexidine Gluconate on the Dental Plaque Levels and Gingival Health. Adv Dent & Oral Health. 2016; 2(1): 555571.

higher compared to baseline as well on 7th day. The mean papilla bleeding index score at baseline for control group (CHX) was 0.30 ± 0.04 and at 7th day it was decreased to 0.20 ± 0.01. When comparison was made for between baseline papilla bleeding index score and 7th day mean papilla bleeding index score, there was statistically significant difference. On the 15th day, the mean papilla bleeding index score was further increased to 0.29 ± 0.01 and this increased papilla bleeding index score was significantly greater compared to baseline mean papilla bleeding index score. When comparison was made between test and control group, the test group showed significantly higher mean papilla bleeding index score compared to control group.

Table 1: Comparison of the mean plaque index scores between test and control group at baseline, 7th day and at 15th day of experimental period.

Groups	Baseline	7th Day	Difference	15th Day	Difference
Test	0.08±0.01	0.29±0.02	0.20±0.03 0.000,S	0.46±0.02	0.38±0.03 0.000,S
Control	0.08±0.01	0.23±0.01	0.15±0.02 0.000,S	0.39±0.03	0.30±0.03 0.000,S
Difference	0.002±0.006 0.72,NS	0.002±0.006 0.000,S	-	0.07±0.01 0.000,S	-

Table 2: Comparison of the mean papilla bleeding index scores between test and control group at baseline, 7th day and at 15th day of experimental period.

Groups	Baseline	7th Day	Difference	15th Day	Difference
Test	0.29±0.01	0.24±0.03	0.05±0.02 0.000,S	0.35±0.03	0.05±0.03 0.000,S
Control	0.30±0.03	0.20±0.01	0.06±0.01 0.000,S	0.29±0.01	0.03±0.01 0.000,S
Difference	0.01±0.01 0.28,NS	0.04±0.009 0.000,S	-	0.05±0.01 0.000,S	-

Discussion

The present study was undertaken to compare the effectiveness of honey (10%) with chlorhexidine gluconate (0.12%) on the dental plaque levels and gingival health. The results of the present study show that both mouth rinse containing 0.12% chlorhexidine as well as 10% honey when used twice daily in absence of normal oral hygiene were found clinically useful in preventing regrowth of plaque and controlling gingival bleeding. In absence of routine oral hygiene measure, mean plaque index scores were slightly increased in both the groups on 7th day and on 15th day. However the mean plaque index score remained low ≤ 0.5 in both the groups during experimental period. In this study CHX rinse brought about significantly higher effect on preventing plaque accumulation than 10% honey. These finding are comparable with those reported by Abbas et al. [17] and Abdullah et al. [18]. These differences in preventing plaque accumulation could be attributed to the fact that both the potency and substaintivity of CHX is higher than that of honey. Chlorhexidine gluconate 0.12% is retained in the oral cavity and is progressively dissolved in bacteriostatic concentration 8-12 hours after rinsing [6]. The finding in the present study demonstrate that plaque levels and gingival bleeding scores could be reduced by the antibacterial properties of honey similar to the chlorhexidine. These findings are consistent with the finding of English et al. [19]. It is now well known that the first step of dental plaque formation is the adhesion of bacteria owning to the S. mutans group to the tooth surfaces. Badet and Quero [20] demonstrated that honey at the concentration of 10% was able to affect the formation of a biofilm of S. mutans in the experimental condition. Similar observations have been made by Fjallman [21] using different types of honey. Several activities of honey that contribute to their anti bacterial effect are now well known. They include low PH, osmotic effect or hydrogen peroxide which is produced by enzymes present in the honey. These findings further support the results of the present research, explaining the mechanisms which are thought to be responsible for the beneficial effect of honey in reducing plaque and gingivitis. The greater reduction seen in the gingival bleeding scores rather than the plaque score in the honey group in this study, may be the result of the anti-inflammatory properties of honey working in conjunction with its anti bacterial action, the latter reducing the quantity of supra gingival plaque. The potent anti-inflammatory action of honey has been noted in many clinical reports of its use in healing burns and other wounds. In the present study, we examine the potential benefits of honey on supra gingival plaque and on gingivitis. However, it was only a pilot study with a small sample size, therefore further research is required to confirm the present finding. There is also potential for further research to determine whether or not subgingival application of honey has any significant effects on organisms that

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cause periodontitis and whether or not there is any potential therapeutic role for honey in control of periodontal disease [22].

Conclusion

From the results of the present study we can concluded that 0.12% chlorhexidine in absence of oral hygiene was found to be clinically useful in preventing regrowth of plaque (PI ≤ 0.5). 10% honey was also found to be effective in controlling plaque level and gingival bleeding score (≤ 0.5) during experimental period. On comparing the effectiveness of chlorhexidine rinse with 10% honey, chlorhexidine was found to be significantly more effective than honey in preventing regrowth of plaque.

Acknowledgment and Disclosure Statement

We don't have any financial support or private connections to pharmaceuti¬cal companies, political pressure from interest groups, or aca¬demic problems (e.g., employment/affiliation, grants or fund¬ing, consultancies, stockownership or options, royalties, or patents filed, received, or pending).

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