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COMPARATIVE EVALUATION OF MULTIFLOWER HONEY, JAMUN HONEY AND CHLORHEXIDINE GLUCONATE GEL (0.2%) ON CLINICAL LEVELS OF DENTAL PLAQUE: ONE WEEK RANDOMIZED CONTROLLED CLINICAL TRIAL.

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ABSTRACT

Honey produced by bees has been used as medicine since ages and in more recent times has been "rediscovered" indicating its potential in the treatment of inflammatory diseases like gingivitis. This study was intended to compare the effect of multiflower honey, jamun honey and chlorhexidine gluconate gel (0.2%) on clinical levels of dental plaque in patients with gingivitis. Ninety healthy patients aged between 18 to 50 years participated in the study and were randomly divided into three groups, i.e. the multiflower honey group, the jamun honey group and the chlorhexidine gluconate gel group. Once the Plaque index (PI), gingival index (GI) and bleeding index (BI) were recorded at baseline & 7th day, Statistical analysis was carried out using Paired t-test and one way ANOVA test. All the three groups showed statistically significant reduction in all the parameters except for plaque scores in jamun honey group, wherein significant reduction was not seen. The mean plaque scores for groups I, II, III on baseline and day7 were 4.08, 4.32, 4.50 and 3.60, 4.18, 4.22 respectively. There was a statistically significant difference with respect to reduction in BI scores amongst the three groups on day 7, while no statistically significant difference of PI, GI scores were evident. On the other hand both the honeys showed significant reduction of plaque and gingival indices similar to chlorhexidine gluconate gel. Hence the findings of this study elicit that honey can be used as a plaque control agent in patients with gingivitis.

KEYWORDS: ***Dental plaque, multiflower honey, jamun honey, chlorhexidine gluconate gel***

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INTRODUCTION

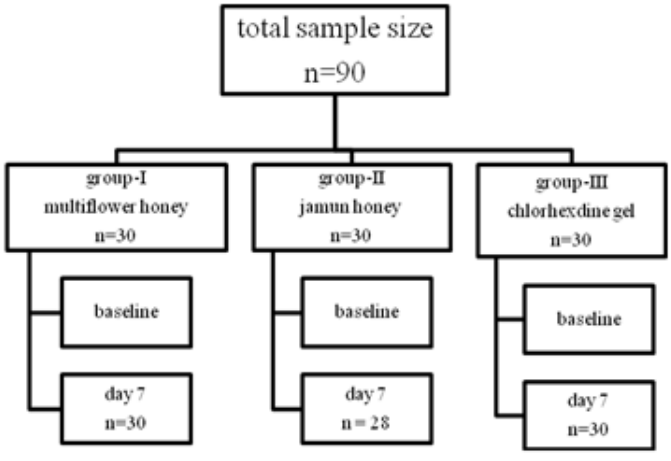
Dental plaque is a complex, specific entity resulting from colonization of microorganisms embedded in a gelatinous extracellular matrix on tooth surfaces, restorations and other parts of oral cavity. This complex biofilm is associated with the most prevalent oral diseases like dental caries and periodontal disease, harboring various microorganisms producing bacterial endotoxins that are responsible for inflammation and tissue destruction leading to gingivitis and periodontitis. The removal of plaque is a determining component in the prevention and treatment of these diseases.[1] Removal of this supragingival plaque is the mainstay in the maintenance of a healthy periodontium.[2] Amongst the various methods advocated in an attempt to achieve acceptable periodontal health, use of mechanical agents is a simple and cost-effective method that has been demonstrated to be efficient in the control of gingivitis. Most individuals all over the world do not practice an acceptable standard method of mechanical plaque removal due to lack of dexterity in performing oral hygiene methods which led to the incorporation of plaque control by chemical means. Therefore, several anti-plaque agents came in to existence. Although innumerable conventional mouthwashes do exist in the market, the most effective antiplaque agent till date is chlorhexidine. However, with the rise in bacterial resistance to antibiotics, a shift of interest towards the development of herbal antimicrobials was evident in the literature. Many of the currently available mouth rinses including chlorhexidine do have drawbacks, such as alteration in taste sensation and staining of teeth. In order to overcome such side effects, the WHO has initiated investigation of possible use of natural products (herb and plant extracts)[3-4]; which led to the development of Complementary and alternative medicine (CAM). CAM encompasses a diverse group of medical treatments such as acupuncture, aromatherapy, massage therapy, meditation, hydrotherapy and herbal therapy. The increasing interest in CAM by the public has encouraged dental professionals to investigate the existing science of CAM. On the other hand an alternative medicine branch called Apitherapy offers treatments for many diseases based on honey and other bee products. Though many comparisons have been made to evaluate the efficacy of various chemotherapeutic agents as an adjunct to scaling in the treatment of gingivitis, there is a dearth of literature available to evaluate the efficacy of different types of honey in the treatment of gingivitis. Hence, the present study was undertaken with an aim to evaluate the effect of multiflower honey, jamun honey and chlorhexidine gel on clinical levels of dental plaque in patients with gingivitis.

SUBJECTS AND METHODS

This was a single blinded randomized controlled clinical trial wherein the patient was blinded to the material. The study was conducted on Patients who visited the Department of periodontics and Implantology and volunteered for the study. A total of 90 patients (both male and female) were included in the study, who were randomly divided in to three groups of 30 per each. The study was approved by the Institutional Review Board (IRB). Inclusion criteria included 1.patients with age group between 18 to 50 years diagnosed with chronic generalized gingivitis, 2.Minimum of 22 teeth in the mouth, 3.Patients who have not received periodontal treatment for past 6 months to 1 year. Exclusion criteria included 1.Patients with uncontrolled systemic diseases, 2.Patients with known hypersensitivity or who are allergic to honey, 3.Patients with fixed or removable prosthesis and 4.pregnant and nursing women.

Study design

The current study was designed as a single-masked, randomized, placebo-controlled clinical trial. Ninety individuals who met the inclusion criteria were recruited in the study and were randomly assigned in to one of three groups. At baseline, plaque index (PI), gingival index (GI) and gingival bleeding index (BI) were recorded and the same were repeated at day 7 follow up visit. Subjects were randomly divided into three groups, i.e. group-I the multiflower honey group, group-II the jamun honey group and group-III the chlorhexidine gel group (0.2%).In all the three groups the patients were trained to apply the material gently in to the gingival sulcus of all the teeth, wait for a period of 5 minutes and then repeat the procedure. Rinsing with water or any other fluids was not allowed till 30 minutes after the application to retain the material on the gingiva and in the gingival sulcus thereby preventing washing out of the material. The patients were recalled on 7th day and the measurements were again recorded.



Study design

STATISTICAL ANALYSES

Analyses of data were carried out using SPSS statistical software (version 20.0). Values of different parameters collected were expressed as mean – standard deviation (SD).probability value (p) of less than 0.05 is considered statistically significant. Paired t-test was used for intra group variations and repeated measures analysis of variance (one way ANOVA) and Tukey Post Hoc test were performed for comparison of differences among the three groups.

RESULTS

All the patients successfully completed the study except for two people in jamun honey group who failed to report for day7 observation. The mean plaque scores of group I, II, III were 4.08, 4.32 and 4.50 respectively on baseline and 3.60, 4.18, 4.22 respectively on day 7 (Tables-1,2,3). The mean gingival index scores of group I, II, III were 4.04, 4.14, and 4.18 respectively on baseline and 3.31, 3.37, 3.70 on day 7(Tables-1,2,3). The Gingival bleeding scores of three groups were 75.86, 83.74, and 87.86 on baseline and 55.77, 78.58, 76.69 on day 7 respectively (Tables-1,2,3). There were no significant differences between groups I, II, and III in baseline scores of PI, GI, and BI. All three groups showed gradual decrease in PI, GI, and BI values from baseline to follow-up visits at day 7. There was a statistically significant difference with respect to reduction in BI scores amongst the three groups on day 7, but no statistically significant difference of PI, GI scores (Table-4) were evidenced.

Table 1

Mean comparison between Baseline and 7 days scores in Group I variables.

GROUP I	BASELINE		7 DAYS		Difference	t value	P Value
Clinical Variables	MEAN	SD	MEAN	SD	MEAN±SD		
PI	4.08	1.02	3.60	0.91	0.48±0.11	5.120	0.000
GI	4.04	0.88	3.31	0.68	0.73±0.20	6.708	0.000
BI	75.86	14.67	55.77	15.45	20.09±0.78	7.820	0.000

Statistical Analysis: Paired t test. Statistically significant if P<0.05

Table 2

Mean comparison between Baseline and 7 days scores in Group II variables.

GROUP II	BASELINE		7 DAYS		Difference	t value	P Value
Clinical Variables	MEAN	SD	MEAN	SD	MEAN±SD		
PI	4.32	0.98	4.18	0.93	0.14±0.05	1.475	0.157
GI	4.14	0.85	3.77	0.76	0.37±0.09	5.430	0.000
BI	83.74	14.96	78.58	15.01	5.16±0.05	3.868	0.001

Statistical Analysis: Paired t test. Statistically significant if P<0.05

Table 3

Mean comparison between Baseline and 7 days scores in Group III variables.

GROUP III	BASELINE		7 DAYS		Difference	t value	P Value
Clinical Variables	MEAN	SD	MEAN	SD	MEAN±SD		
PI	4.50	1.36	4.22	1.35	0.28±0.01	3.569	0.001
GI	4.18	1.48	3.70	1.28	0.48±0.20	4.591	0.000
BI	87.86	10.91	76.69	12.71	11.17±1.80	5.987	0.000

Statistical Analysis: Paired t test. Statistically significant if P<0.05

Table 4

Mean comparison among Group I, Group II and Group III scores at Day 7.

ANOVA						
		Sum of Squares	Df	Mean Square	F Value	P value
PI (DAY 7)	Between Groups	7.075	2	3.537	3.007	0.055
	Within Groups	99.982	85	1.176		
	Total	107.056	87			
GI (DAY 7)	Between Groups	3.634	2	1.817	2.006	0.141
	Within Groups	77.009	85	.906		
	Total	80.644	87			
BI (DAY 7)	Between Groups	9476.874	2	4738.437	22.766	0.000
	Within Groups	17691.274	85	208.133		
	Total	27168.148	87			

Statistical Analysis: ANOVA one way test. Statistically significant if P<0.05

DISCUSSION

Microbial dental plaque is a very dense, structured bacterial aggregation in a complex matrix comprised of extracellular polysaccharides. As these microbial aggregations are the main causative factor for periodontal diseases, removal of plaque becomes the prominent step in disease control. Plaque control is the removal of dental plaque on a regular basis and the prevention of its accumulation on the teeth and adjacent gingival surfaces which can be achieved by mechanical and chemical methods.Mechanical cleaning aids are the most efficacious means of maintaining oral hygiene but, most individuals all over the world do not practice an acceptable standard level of mechanical plaque removal due to lack of manual dexterity and limited use of interdental aids, thereby requiring a need to employ agents requiring minimal compliance and skill in their use and which are further effective in reducing the plaque and thereby preventing the initiation and progression of periodontal disease. With these drawbacks plaque control by chemical means came in to existence. Although innumerable conventional mouthwashes do exist in the market, the most effective antiplaque agent till date is chlorhexidine. However, with the rise in bacterial resistance to antibiotics, a shift of interest towards the development of herbal antimicrobials was evident in the literature. Many of the currently available mouth rinses including chlorhexidine do have drawbacks, such as alteration in taste sensation and staining of teeth.[5] Keeping in view these aforementioned drawbacks of chlorhexidine, many other alternatives have been tried in the recent times; leading to the incorporation of CAM in the research protocols and thereby warranting use of natural agents which can be equally effective with minimal disadvantages. CAM encompasses a diverse group of medical treatments, such as acupuncture, aromatherapy, massage therapy, meditation, hydrotherapy and herbal therapy. The increasing interest in CAM by the public has encouraged dental professionals to investigate the existing science of CAM.[6-7] Currently natural products are being widely used for treatment of various diseases. In this context, Ayurvedic drugs are rapidly replacing chemicals in treatment of various conditions, including periodontal diseases, because of equivalent potential and lesser side effects. On the other hand an alternative medicine branch called Apitherapy offers treatments for many diseases based on honey and other bee products. Honey which is defined as a sweet liquid substance is produced by bees from nectar collection that has been used as medicine throughout the ages and in more recent times has been "rediscovered" by the medical profession.[8] In most ancient cultures, honey has been used for both nutritional and medicinal purposes. Honey has evidenced therapeutic features that indicate its potentiality in the treatment of periodontal disease, mouth ulcers and other problems of oral health.[9] The remarkable antibacterial properties, easy availability, and economic feasibility make honey a prospective therapeutic agent. Identification of honeys with high levels of antibacterial activity in laboratory studies has put a new light on the possibility of honey being of benefit to oral health. Honey is a saturated sugar solution containing 17% water with fructose, followed by glucose as predominant sugars. It also contains small amounts of protein, vitamins and minerals. Apart from these, natural honey is also rich in amino acids of which proline is the most important amino acid.[10]The antibacterial property of honey was first recognized in 1892 by Van Ketel.[11] Honey inhibits a wide range of bacterial species *in vitro* which is due to its high osmotic pressure, physical properties and enzymatic glucose oxidation reaction. Honey has high osmotic properties by which it extracts water from bacterial cells thus causing death of the cells. Among the possible mechanisms are the presences of inhibitory factors such as flavonoids, hydrogen peroxide, low pH, and high osmolarity due to its sugar concentration. All types of saturated sugar syrups including honey have a tendency to reduce microbial growth due to its high osmolarity. Hydrogen peroxide is the main antibacterial substance produced by enzymatic reaction from honey.[12-14] According to some researchers honey shows greatest antibacterial activity at 100% concentration.[15] Honey works differently from antibiotics, which attack the cell wall of the bacteria or inhibit intracellular metabolic pathways. It is hygroscopic, meaning it draws moisture out of the environment and thus dehydrates bacteria and its sugar content is also high enough to hinder the growth of microbes, but the sugar content alone is not the sole reason for the antibacterial properties of honey. Thus, the antibacterial and antiplaque actions of honey may possibly be attributable to the above-mentioned mechanisms. [16-17] Carcinogenicity and demineralization of tooth surface would be of concern with honey having a high content of fermentable sugars and an acidic pH. However, honey has been found to inhibit growth as well as acid production by cariogenic bacteria.[18] Amongst the more than 300 unique types of honey available, each originating from a different floral or fruit source, the color, flavor and even aroma of different types of honey vary depending on the nectar source of flowers visited by the honey bee.[19] Some important types of honey available are multiflower honey, Manuka honey, jamun honey, litchi honey, eucalyptus honey, clover honey, and neem honey. Manuka honey comes from the Manuka tree, which grows only in New Zealand. This is considered to be the most powerful, healing honey in the world. This honey has powerful and unique antibacterial compounds that are not found in any other type of honey. Methylglyoxal content – a substance with a powerful antimicrobial effect present in this, fights the most antibiotic resistant types of infections. Neem honey highly valued in Ayurveda for its medicinal properties is as appreciated as Maharishi honey. It is known to be anti-inflammatory, anti-coughing and antiseptic. Litchi Honey is natural & effective cough suppressant thus helps in reducing cough & throat irritation, particularly along with Eucalyptus honey. Irrespective of the type of honey, due to its low glycemic index honey is beneficial in maintaining blood glucose levels. The current study was designed to determine effectiveness of multiflower honey, jamun honey and chlorhexidine gel in reducing dental plaque, gingival inflammation, and bleeding in individuals with gingivitis. Being the gold standard antiplaque agent, CHX was used as a positive control in the present study. The honey types used in present study were multiflower and jamun honey. Multiflower honey also called wild flower or mixed flower honey, contains less than 40% of one particular type of pollen

and is the most commonly available variety. Jamun honey is from the pollen of jamun trees, which is rich in minerals and vitamins, with mild sweet flavor. The darker color of this honey indicates its high anti-oxidant levels, which can be beneficial to inflamed gingival tissues. Many studies have been conducted on 0.12% [20] and 0.2% CHX mouth rinses with few studies focusing on comparative evaluation of CHX and other naturally available products as mouthwashes to treat gingivitis.[21-22]In the present study all the three groups have shown statistically significant reduction of PI, GI and BI scores from baseline to day 7 within the group except for the plaque scores in group- II wherein there was no statistically significant difference. In inter group comparison there was a significant difference between honey groups and chlorhexidine gel group for gingival bleeding (BI). Statistically significant difference was observed in gingival bleeding index between groups I and II, and groups II and III. No significant difference was observed amongst the groups regarding plaque and gingival index scores. In a study conducted by Nayak PA *et al*., [23] the effect of Manuka honey and chlorhexidine mouthwash were analyzed and found no significant difference between both the groups was evidenced. The results of present study suggest that the two different types of honey used in the current study had shown a plaque inhibitory effect which is statistically equivalent to chlorhexidine gel and these results could not be compared with others as no studies have been reported in the literature which had tried to assess the effect of various types of honey on clinical levels of plaque. Other important properties of honey, such as anti-inflammatory action that reduces edema and the amount of exudate by down regulating the inflammatory process, stimulation of tissue growth, collagen synthesis and angiogenesis has shown excellent cytocompatibility with healthy tissue cell cultures further inhibiting fungal growth. No adverse effects have been reported so far in the literature regarding use of the honey. The varied benefits of honey accounting to its easy availability, economic feasibility, antibacterial property and excellent healingability make honey a potential therapeutic agent in periodontal therapy.

CONCLUSION

Within the limitations of the study, honey is effective against gingival inflammation and reduces plaque formation in a manner similar to CHX. Both multiflora honey and jamun honey were found to decrease inflammatory parameters and thus, leading to improvement in gingivitis. Results were comparable to those of CHX, which has been used as the gold standard in the treatment of gingivitis and periodontitis. So, it can be concluded that honey can be considered a potential therapeutic agent in treatment of gingivitis and can be given along with standard anti-plaque agents to achieve synergistic effects. However clinical trials of longer duration with larger sample size and microbial analysis are required for better validation of honey as antiplaque agent.

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CONFLICT OF INTEREST

Conflict of interest declared none.

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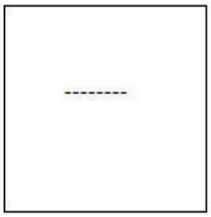

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