

EFFECT OF HONEY, CHLORHEXIDINE GLUCONATE AND COMBINATION OF XYLITOL AND CHLORHEXIDINE GLUCONATE ON GINGIVAL HEALTH – 4 WEEKS RANDOMIZED CONTROL TRIAL

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Abstract

Aim: The aim of the study was to assess the effect of honey, chlorhexidine mouthwash and combination of xylitol chewing gum and chlorhexidine mouthwash on gingival health.

Material and methods: 135 healthy dental students aged 21-25 years subjects were divided into 3 groups randomly, namely Honey group (n=45), chlorhexidine group (n=45), and the combination of xylitol chewing gum and chlorhexidine (CHX) mouthwash group (n=45). In a 30 day period, the subjects were told to use the named agent, 2 times a day and on the 0,15th and 30th day, Gingival Index (GI) was assessed. For comparing the effects posed by the three given groups, later, a statistical analysis was carried out. $P \leq 0.05$ was considerably significant statistically.

Results: - Result depicted that all the groups, all three, are effective in improving gingival health. Also it was seen that the Honey group as well as Chlorhexidine + xylitol group shows more efficient results when compared to the chlorhexidine group. A significant reduction of gingival indices in Honey group and Chlorhexidine + xylitol group was shown in the results over a period of 15 and 30 days in comparison to chlorhexidine.

Conclusion: - The results of the present study gives an indication towards honey to prove itself as a much more effective agent owing to its ability in reducing gingival index. Xylitol when given with chlorhexidine proves to be better than chlorhexidine alone in improving gingival health.

Key Words: Chlorhexidine, Honey, Gingival Index, Xylitol.

INTRODUCTION

According to various studies dental plaque is the main risk factor in gingival inflammation. This condition is followed by chronic periodontitis in most of the patients, due to apical extension of supragingival plaque to the subgingival area.¹ This subgingival area is a favorable ecological site for the accumulation of anaerobic gram-negative bacteria. Mechanical tooth brushing is the most common and potentially effective form of oral hygiene practice in most of the developed countries and many developing countries.^{2,3} But most of the individuals fail to practice an acceptable method of mechanical plaque removal due to chaotic tooth brushing or lack of dexterity in performing tooth cleaning methods. Therefore the need for Chemical preventive agents came into existence. These agents may add beneficial effects to daily mechanical oral hygiene measures.

Chlorhexidine is regarded as benchmark control in plaque removal, but side effects such as staining of the teeth and the tongue, altered taste sensation, and increased calculus formation often deters its use for long periods. The buffering capacity of salivary pH is increased after chewing of any gum which in turn, neutralizes the reduction in plaque pH that normally follows eating.⁴ Direct inhibition of the glycolytic route resulting from the xylitol 5-phosphate derivative and/or

between glucose and xylitol are the two mechanisms by which xylitol inhibits bacterial growth. Thus a combination of Chlorhexidine & xylitol or a naturally occurring and cost-effective oral hygiene aid like honey can be used to improve gingival health.^{5,6,7}

Honey has been successfully used in medicine since antiquity. It is the wound-healing properties of honey that are useful in the treatment of gum diseases such as gingivitis, bleeding and receding gums. When mixed with water, an enzyme in honey (glucose oxidase) produces hydrogen peroxide. Hydrogen peroxide is an antiseptic and there are other antioxidant elements of honey that act as antimicrobial agents. Studies show that honey stops the growth of plaque-forming bacteria and prevents the bacteria from developing polysaccharide or the glue that enables it to stick to your teeth and gums.^{8,9} Although the medicinal use of Honey has been reported, not much literature is available regarding its use to improve gingival health. The purpose of this study was to evaluate clinically the efficacy of Honey, Chlorhexidine and a combination of chlorhexidine & xylitol in preventing gingival inflammation.

MATERIALS AND METHOD

This placebo controlled, triple blind randomized control trial; three group parallel study was conducted in the

department of public health dentistry on 135 (both male and female) volunteered university students of age 21-25 years of Teerthanker Mahaveer University. The Institutional Review Board (IRB) of Teerthanker Mahaveer University approved the protocol. An IRB approved consent form was signed by all the subjects taking part in the study. 5 patients out of each group were taken and a pilot study was performed on them to check whether the study was feasible or not ; results are not included in the present study. The study was conducted abided by the guidelines of the Declaration of Helsinki for biomedical research involving human subjects.

Inclusion and exclusion criteria

Subjects those who were included in the study had no antibiotic and anti-inflammatory drug history since past 3 months, had no history of any dental treatment; along with informed consent. Those with a good oral health overall and also with baseline plaque score more than 1.5 were taken in the study. The ones who were not included in the study were those with history of any systemic diseases / conditions, smoking, fibrotic gingival enlargement, who had used mouthwash for 5 consecutive days or corticosteroids in the past 30 days, ones sensitive to any mouthwashes or had used any removable prosthesis and also any orthodontic appliance and the ones with OHIS 3.1-6.0 and those who had less than 20 teeth in their oral cavity. Also, those who had undergone professional measures to remove plaque and calculus in the past 15 days were not included.

At baseline, the data was collected on the 15th & 30th day. Gingival index given by Loe H & Silness J is the parameter used to collect data regarding gingival status of the subjects. According to Loe & Silness to check the gingival status, six index teeth were taken under consideration for each subject. distal-facial papilla, facial margin, mesial-facial papilla and the entire lingual

gingival margin, were the four scoring units that were made by dividing the surrounding tissues around every index tooth. Then the average of six index teeth was taken into consideration for statistical analysis.

There were three groups into which subjects were divided randomly namely the honey, CHX and the CHX + Xylitol group. There were 45 subjects in each group. Subjects were told that they must brush twice daily and use of any other oral hygiene aid was prohibited during the period of experiment. Use of any other mouthwash was forbidden. Also they were advised to refrain from eating right after they have used the experimental material.

The honey group (group 1) subjects were told to practice application of honey, 2 times a day, after having meals, on the gingival sulcus of every teeth gently, and repeat the procedure twice after waiting for 5 minutes. The subjects in the Group I (Honey Group) were trained to apply honey gently into the gingival sulcus of all the teeth, wait for 5 min and then repeat the procedure twice. Group II (Chlorhexidine group) subjects had to rinse their mouth with 10 ml solution of 0.2% chlorhexidine mouthwash for 60 sec, 2 times a day. They were told to expectorate the mouth rinse after 60 sec. The CHX + Xylitol group, group 3, were asked to chew the sugarless xylitol chewing gum, 3 times a day, post meal for 5 minutes and then, rinse their mouth with 10 ml solution of 0.2% chlorhexidine mouthwash for 60 sec, 2 times a day and expectorate it after 60sec. twice a day for 60 seconds.

RESULTS

All the subjects prevailed till the end of the study. None dropped out. Table 1 shows Descriptive baseline statistics are represented. For group 1,2 and 3, Mean ± SD (Standard Deviation) & % change in gingivitis scores are shown in table - 2.

Table 1- Baseline background of the subjects			
	Group I (honey group)	Group II (Chlorhexidine Group)	Group III (Chlorhexidine + xylitol Group)
Total number of participants	45	45	45
Age (mean age = 21.45 years) (range = 18–30 years)	22.19	23.86	23.19
Frequency of brushing: Once daily	43	42	42
Frequency of brushing: Twice daily	2	3	3
Other oral hygiene aids used	None	None	None
Rinsing habit	None	None	None
DMFT (mean = 4.5)	4.2	4.4	4.6
Gingivitis Index Mean ± SD	2 ± 0.49	2.40 ± 0.35	2.45 ± 0.59
Gingivitis index Mean ±SD	2.87 ± 0.37	2.76 ± 0.44	2.40 ± 0.88

Table 2- Mean Standard Deviation, ANOVA of the three study groups, Post – hoc LSD test for multiple comparisons

Variable	ANOVA		(I) Group	Mean± Standard Deviation	Post-hoc LSD	
		F-value			(J) Group	Sig.
Gingivitis Baseline	Between Groups Within Groups	.826	Honey	3.09±0.48	Chlorhexidine CHX & xylitol	.039 .037
			Chlorhexidine	2.91±0.43 3.15±0.49	Honey CHX & Xylitol	.039 .049
			Chlorhexidine + Xylitol		Honey Chlorhexidine	.037 .049
Gingivitis (15 days)	Between Groups Within Groups	.001	Honey	2.78±0.45	Chlorhexidine CHX & Xylitol	.001 .619
			Chlorhexidine	2.55±0.52 2.65±0.51	Honey CHX & Xylitol	.001 .001
			Chlorhexidine + xylitol		Honey Chlorhexidine	.619 .001
Gingivitis (30 days)	Between Groups Within Groups	.001	Honey	2.30±0.43	Chlorhexidine CHX & Xylitol	.001 .808
			Chlorhexidine	2.05±0.50 2±0.54	Honey CHX & Xylitol	.001 .001
			Chlorhexidine + xylitol		Honey Chlorhexidine	.808 .001

(I) and (J) designations according to Post-hoc analysis by SPSS
The mean difference is significant at the 0.05 level.

ANOVA (Analysis of Variance) was taken into account for the assessment of intra- and inter-group variations and the reduction in gingivitis in the three groups [Table 3]. No difference was seen in the baseline value in gingivitis $P > 0.05$. Marked reduction in gingivitis was appreciated in all the three groups on 15 and 30 days at 5% level of significance [Table 3]. Chlorhexidine + xylitol group gives an impression of greatest decrease in comparison to the honey group. However the difference isn't significant statistically. [Table 4]. There was statistical difference between honey group and chlorhexidine group where honey proved to be a better reducing agent in gum bleeding than CHX. Multiple comparisons were obtained by post-hoc LSD [Table 4]. The difference between the honey and CHX group in the decrease in gingivitis ($P = 0.619$ at 15 days and $P = 0.808$ at 30 days) between wasn't statistically significant. But was significant between the chlorhexidine and chlorhexidine + xylitol group ($P < 0.05$). Data says that honey is seen to be the better option when it comes to anti gingivitis agent when compared to but is statistically equivalent to combination of chlorhexidine and xylitol.

DISCUSSION

The study presents in its course that the antibacterial properties possessed by honey can significantly reduce gum bleeding scores in comparison to the group taken as control using CHX. These findings are consistent with the hypothesis of this research, and are explained by the

actions of hydrogen peroxide which is produced enzymatically in the honey. Honey inhibits a wide range of species of bacteria, namely against *Helicobacter pylori*, *Enterococci*, *Staphylococcus aureus*, and *Escherichia coli*. The anti inflammatory properties along with the antibacterial action possibly results in major decrease in the bleeding scores; the latter reducing the quantity of supragingival plaque. In various other clinical reports, it is seen that the anti inflammatory action of honey heals burns as well as other wounds too. The effective factor in the antimicrobial activity of honey includes, enzymatic glucose oxidation reaction, high osmotic pressure, physical properties, low PH, low water activity, antioxidants, phytochemicals, beeswax, nectar pollen and propolis.¹² Due to high osmotic properties, honey can extract water from bacterial cells and cause them to die. The osmolarity of honey proves to be apt to inhibit the growth of microbes.

Chlorhexidine is the most potent agent in improving gingival health till date, because of its many ideal properties. Chlorhexidine damages the cell membrane and disrupts the cytoplasmic constituents of microorganisms.[6] But oral bacteria depicts a natural resistance against chlorhexidine and hence eliminates the antibacterial efficacy on cariogenic microorganisms. Hence, the hawthome effect is held responsible for the mild improvement which was seen in the control group that might result in improved picture because of

participation in a research, possibly as the subjects will be aware that their actions are being monitored.

There was also overall improvement in gingivitis in the combination of chlorhexidine and xylitol chewing gum group. We already know that the flow of saliva is stimulated when sugarless chewing gums are chewed which lowers the acidity of plaque after eating and hence lowering the chances of decay of tooth. Salivary mutans streptococcus cannot metabolise xylitol. Hence with the constant use of xylitol-sweetened gum causes marked decrease in their population by literally starving them. Research shows that by chewing these gums, plaque is definitely reduced in the occlusal areas but still remains in the facial and lingual aspects. That is why the combination of xylitol chewing gum and 0.2% chlorhexidine mouthwash is termed better than that of just 0.2% chlorhexidine mouthwash alone.

The greatest inhibition of *Streptococcus mutans* and *Lactobacillus* was seen at 100% concentration in a study conducted by Ahmadi et al.[12] In present study also 100% concentration of honey was used.

The study demonstrated that there is a statistically significant difference between Honey group and Chlorhexidine group in reducing gingivitis. There was no significant difference between Honey and Chlorhexidine + xylitol group. The result of our study cannot be compared with other studies because in literature no such studies have been conducted. There is a statistically significant difference between Chlorhexidine and Chlorhexidine + xylitol group. According to a study conducted by Decker et al.[14] a combination of xylitol/chlorhexidine is more potent in reducing microbial count than xylitol or chlorhexidine used alone. If the gums are chewed three times a day just after meals, everyday, marked increase or the greatest outcome is visible.

CONCLUSION

The results of present study suggest that honey group is almost equal to combination of chlorhexidine gluconate/xylitol group in improving gingival health while they both are better than chlorhexidine group.

This also poses a potential possibility for further research so as to seek the subgingival honey application shows any marked effects on periodontitis causing organisms or not and whether or not there is any potential therapeutic role for honey products in the control of periodontal diseases.

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How to cite this article: Jain A, Tangade P, Yadav P, Gupta A, Singh V, Singhal D, Effect of Honey, Chlorhexidine Gluconate and Combination of Xylitol and Chlorhexidine Gluconate on Gingival Health – 4 Weeks Randomized Control Trial. *TMU J Dent* 2018;5:15-18.