

Effect of Gum Massage Therapy with Honey and Olive Oil on Common Pathogenic Oral Micro-organisms: A Randomized Controlled Clinical Trial

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the olive oil and honey can be used as a preventive and therapeutic agents.

Key Words: Gingivitis, gum massage, honey, olive oil

Introduction

Gingivitis is a bacterial infection due to long-term effects of micro-organisms present in plaque. Antibacterial mouth rinses like chlorhexidine are used as an adjunct to mechanical plaque control, but they are accompanied with side effects such as staining, allergy, and lingering after taste. Gingivitis, when left untreated, can progress to a more destructive form of periodontal disease.¹

In several years, a large number of oils and their constituents have been investigated for their antimicrobial properties. This clinical trial was done for assessing the oral health benefits of gingival massage therapy with olive oil and honey. Oil massage can mechanically disrupt the biofilm on the teeth. It stimulates the blood circulation to the gingival tissues and strengthen the immune response of gingival tissues. Furthermore, it can have a better patient compliance without much expenditure. The olive oil and honey are easily accessible to most of the Indian population at home.² Olive oil plays a significant role as it has inhibitory effect that reduces the growth of bacteria and fungi.³ Olive belonging to *Olea europaea* L. is a typical Mediterranean species where more than 95% of the world total production is localized.⁴ An important report shows that the olive as anti-inflammatory that oleocanthal, phenolic compound of virgin olive oil also shows similar anti-inflammatory properties to ibuprofen.³ "Olive oil" has been used medicinally various times for its health benefits which have antimicrobial effect against a wide range of micro-organisms found within the body.² The bactericidal activity of many different types of olive oils against several micro-organisms has been studied *in vitro*. Moreover, this activity was higher in virgin olive oils, followed by olive oils and pomace olive oils, which is in accordance with their decreasing content in phenolic compounds.⁵

Honey is used as a medicine since ancient times. Honey has antimicrobial activity because of its bacteriostatic and bactericidal effect.⁶ Honey has antibacterial activity was first recognized by Van Ketel in 1892.⁷ Natural honey is a simple, potent and inexpensive agent, which is easily available, and it can be an affordable therapeutic agent.⁸

Honey clears infection, removes malodors, reduces inflammation and pain, subsides edema and exudation, and it has healing properties by stimulating angiogenesis.⁶

The use of concentrated raw honey has been proved to promote faster eradication of pathogenic bacteria, reduce the length of antibiotic treatment and hospitalization, and prevent wound dehiscence and Eschar formation. Honey is also recommended for dental hygiene. The honey chewing-gum significantly reduces plaque and the risk of gingivitis. Honey is effective for the treatment of gingivitis and periodontal diseases.⁹ Its resistance has never been reported nor any toxicity or side effects, low cost of maintenance, and local availability confer valuable advantages to using honey as an alternative antimicrobial therapy (Othman *et al.*, 2014).¹⁰

The aim of this study is to find out the effect of honey and olive oil on gingivitis and the common oral micro-organisms.

Materials and Methods

The double-blind, randomized controlled clinical trial was conducted by the Department of Public Health Dentistry on 40 participants aged 18-35 years who were housekeeping staff of KD Dental College and Hospital in Mathura city. Ethical clearance was obtained prior to the start of the study from the Ethical Committee of the KD Dental College and Hospital, Mathura.

The participants received detailed information about the study from the examiner. A total of 65 housekeeping staff members were selected in the study.

Inclusion criteria

- Subjects who were willing to participate
- Subjects with mild to moderate gingivitis.

Exclusion criteria

- Subjects undergoing orthodontic treatment
- Subjects with an intraoral prosthesis
- Having used mouth rinse containing chemical agents
- Any other systemic illness.

Participants were randomly allocated into two different groups by lottery method:

1. Honey group ($n = 20$)
2. Olive oil group ($n = 20$).

The study proforma was prepared in terms of demographic characteristics and oral hygiene practices. The study proforma was recorded prior to the clinical examination. Gingival scores were recorded using "Gingival index" (Loe and Silness, 1963). A collection of saliva from each participant for bacterial assessment. The collection of saliva sample was done after the clinical examination. The participants were made comfortable and asked to swallow pre-existing saliva in order to clear the mouth of any residual saliva. A sterile hard plastic container was given to each participant and the participants were asked to spit the saliva into it. All the saliva samples of participants were decoded during the period of sample collection. At baseline,

the participants were provided olive oil and honey in opaque containers. The examiner and microbiologist were unaware of this distribution. Study groups were instructed to massage their gums with olive oil and honey for 2 min 2 times a day. The participants were advised to use this formation for 3 weeks. The samples collected were handed over to the Rangeswar Pathology Laboratory, Mathura city for analysis on the same day. The samples were pre-coded and not disclosed to the technician. In the laboratory, samples were stored at room temperature ($17-25^{\circ}\text{C}$) prior to the analysis. Assessment of saliva was done at baseline and on the 21st day by using mitis salivarius bacitracin agar (MSB) and Rogosa SL agar. The sample was inoculated on the MSB agar and Rogosa SL agar. The plates were incubated at 37°C anaerobically. Colony characteristics were studied after 72 h. *Streptococcus mutans* on the MSB agar and *Lactobacilli* on the Rogosa SL agar was determined by using colony counter, and the number of colony forming units was counted.

Mean and standard deviation for gingival scores and colony forming count in samples were determined using paired and unpaired Student's *t*-test. Statistical analysis –Statistical Package for Social Sciences version 16 was used for statistical analysis.

Results

Our study comprised of 50% males and females in the Group 1 (honey), and 45% were males and 55% were females in the Group 2 (olive oil) (Table 1).

Regarding the question asked about oral hygiene practices used in Group 1 (honey) and Group 2 (olive oil), 20% participants cleaned the teeth with finger and 80% participants cleaned the teeth with toothbrush in Group 1 (honey). In Group 2 (olive oil), 25% participants cleaned the teeth with a finger, and 75% participants cleaned the teeth with toothbrush. All the participants cleaned their teeth once in a day in the morning in both groups. Total 80% participants used toothpaste and 20% participants used toothpowder in Group 1 (honey) while 70% participants used toothpaste and 30% participants used toothpowder in Group 2 (olive oil). Frequency of rinsing the mouth with water after eating was reported 100% in both the groups. Furthermore, all 100% participants did not use any other oral hygiene aids in both the groups (Table 2).

In this study, at baseline the mean gingival scores were 1.40 ± 0.18 in Group 1 (honey) and 1.46 ± 0.21 in Group 2 (olive oil). After 21 days, the mean gingival scores were

Table 1: Distribution of study subjects according to gender in Group 1 (honey) and Group 2 (olive oil).

Gender distribution	Male (%)	Female (%)
Group 1	50	50
Group 2	45	55

0.51 \pm 0.12 in Group 1 (honey) and 0.58 \pm 0.12 in Group 2 (olive oil). The comparison was found to be highly statistically significant ($P = 0.000$) in both groups (Table 3).

In the present study, at baseline the mean colony forming units were found to be 543.50 \pm 71.61 in Group 1 (honey) and 570.50 \pm 56.98 in Group 2 (olive oil). After 21 days, the mean colony forming units were found to be 412.75 \pm 68.54 in Group 1 (honey) and 416.75 \pm 61.60 in Group 2 (olive oil). The results were found to be highly statistically significant ($P = 0.000$) in both groups (Table 4).

Table 2: Distribution of study subjects according to oral hygiene practices used in Group 1 (honey) and Group 2 (olive oil).

Oral hygiene practices	Group 1 (%)	Group 2 (%)
How do you clean your teeth?		
Finger	20	25
Toothbrush	80	75
Others	0	0
How often do you clean your teeth in a day?		
No cleaning	0	0
Once	100	100
Twice	0	0
Thrice	0	0
When do you clean your teeth?		
Morning only	100	100
Night only	0	0
Morning and night	0	0
After every meal	0	0
What material do you use to clean teeth?		
Toothpaste	80	70
Toothpowder	20	30
Others (specify)	0	0
How often do you rinse your mouth with water after eating?		
Never	0	0
Sometimes	0	0
Always	100	100
Do you use any other oral hygiene aids?		
Yes	0	0
No	100	100

Table 3: Distribution of study subjects according to comparison of mean gingival scores before and after 21 days of gum massage therapy in Group 1 (honey) and Group 2 (olive oil).

GI (scores)	Mean \pm SD		Mean difference	P value
	At baseline	After 21 days		
Group 1	1.40 \pm 0.18	0.51 \pm 0.12	8900 \pm 0.1553	0.000*
Group 2	1.46 \pm 0.21	0.58 \pm 0.12	0.88 \pm 0.18	0.000*

*Statistically significant. GI: Gingival index, SD: Standard deviation

Table 4: Distribution of study subjects according to comparison of mean difference of colony forming unit count reported as log¹⁰ (CFU) per ml of saliva sample, before and after 21 days of gum massage therapy in Group 1 (honey) and Group 2 (olive oil).

CFU	Mean \pm SD		Mean difference	P value
	At baseline	After 21 days		
Group 1	543.50 \pm 71.61	412.75 \pm 68.54	130.75 \pm 33.96	0.000*
Group 2	570.50 \pm 56.98	416.75 \pm 61.60	153.75 \pm 13.84	0.000*

*Statistically significant. CFU: Colony forming unit, SD: Standard deviation

Discussion

This clinical trial was conducted on participants who were mostly had low education, low income, and were housekeepers. These participants were unable to access the dental care. The olive oil and honey used in this trial were inexpensive, easily accessible, and easily available in most of the houses; they could be used to prevent dental diseases and were suitable for this population.² Honey is a delicious, natural sweet food and one of the most common causes in developing dental caries. The use of a low harmful sweetener in the diet is very important especially when honey has antibacterial against cariogenic bacteria.⁶ The olive oil and honey have been extensively used as a traditional Indian folk remedy for many years. It was claimed to have advantages over commercial mouthwashes since it causes no staining, has no lingering after taste, no allergic reactions and is readily available in the household.²

The present study was carried out since no study has been conducted in Mathura earlier regarding the effect of gum massage therapy with honey and olive oil on common pathogenic oral micro-organisms.

Out of 40 study participants who were willing to participate in the study, 50% both were males and females in the Group 1 (honey), and 45% were males and 55% were females in the Group 2 (olive oil). However, in the study conducted by Singla *et al.*,² 32 study participants who were willing to participate in the study, 6 were females and 2 were males in the group olive oil.

About 20% participants cleaned the teeth with finger, and 80% participants cleaned the teeth with toothbrush in Group 1 (honey). In Group 2 (olive oil), 25% participants cleaned the teeth with finger, and 75% participants cleaned the teeth with toothbrush. All the participants cleaned their teeth once in a day in the morning in both groups. Total 80% participants used toothpaste and 20% participants used toothpowder in Group 1 (honey) while 70% participants used toothpaste and 30% participants used toothpowder in Group 2 (olive oil). Frequency of rinsing the mouth with water after eating was reported 100% in both the groups. Furthermore, all 100% participants did not use any other oral hygiene aids in both the groups.

In the present study, the mean gingival scores were 1.40 \pm 0.18 in Group 1 (honey) and 1.46 \pm 0.21 in Group 2 (olive oil) at base line. After 21 days, the mean gingival scores were 0.51 \pm 0.12 in Group 1 (honey) and 0.58 \pm 0.12 in Group 2 (olive oil). The results were found to be highly statistically significant in both groups. This was in accordance with the study done by Singla *et al.*² in which the mean gingival scores of olive oil group was 1.74 \pm 0.46 at base line and 0.68 \pm 0.40 after 3 weeks of gum massage therapy. The results were found to be highly statistically significant in olive oil group.

In the present study, the mean colony forming units were found to be 543.50 ± 71.61 in Group 1 (honey) and 570.50 ± 56.98 in Group 2 (olive oil) at base line. After 21 days, the mean colony forming units were 412.75 ± 68.54 in Group 1 (honey) and 416.75 ± 61.60 in Group 2 (olive oil). The results were found to be highly statistically significant in both groups. In a previous study conducted by Singla *et al.*,² the mean of *S. mutans* and *Lactobacillus* counts were 3.09 ± 0.25 and 3.44 ± 0.55 in olive oil group after 3 weeks of gum massage therapy.

Yadav *et al.*¹¹ showed the antimicrobial effect of honey in their study in which streptococcus colony counts were recorded before and after honey application. The mean bacterial colony count of all the individuals before the honey application was 48.3 ± 18.6 and after honey application it reduced to 27.9 ± 14.6 . It was found that there was a significant reduction in *S. mutans* colony count after honey application in 20 study subjects.

The results cannot be generalized for the whole population, for which further studies are recommended taking larger samples with wider geographical representation. It was suggested that the further research should be conducted for longer duration.

Conclusion

Gum massage therapy with honey and olive oil has the ability to reduce gingivitis. It emerges from this study that an individual is able to maintain low levels of gingivitis even if he/she is performing gum massage therapy with honey and olive oil, just for 21 days. In this study, the olive oil and honey showed a significant reduction in values of gingival scores and colony forming unit count. Hence, it can be concluded that the olive oil and honey can be used as a preventive and therapeutic agents.

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