



EFFECT OF VIRGIN OLIVE OIL PULLING AND CHLORHEXIDINE MOUTH WASH ON PLAQUE AND GINGIVITIS: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Aim: The objective of this study is to compare the efficacy of oil pulling with virgin olive oil and chlorhexidine mouthwash in reducing plaque and gingivitis.

Material and Methods: A total of sixty subjects satisfying the inclusion criteria were selected. The subjects were then randomly divided into two groups of thirty each. Group I used oil pulling with olive oil and Group II used 0.2% chlorhexidine as mouthwash. The plaque index and modified gingival index scores were measured at baseline, first week and second week.

Results: The results showed that there was statistically significant reduction of mean plaque and gingivitis scores from baseline to first week and second week in both olive oil ($p < 0.05$) and chlorhexidine group ($p < 0.05$). There was significant difference in mean plaque scores between olive oil group and chlorhexidine group at second week ($p < 0.05$). There was no significant difference in mean gingivitis scores between olive oil group and chlorhexidine group at second week ($p < 0.05$).

Conclusions: Oil pulling with virgin olive oil was found to be effective in reducing plaque and gingivitis. Regular and proper oil pulling with virgin olive oil can therefore be recommended as a routine home-based practice in promoting oral health.

KEYWORDS: anti-plaque, anti-gingivitis, oil pulling

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INTRODUCTION

The knowledge and practice of using certain herbs and whole food for therapeutic health effect is age old. Some substances have high medicinal value and could be useful in treating various health conditions ranging from simple

infections to even cancers.^{1,2}In spite of major advancements in the field of pharmacology, the desire for self-medication and interest in natural health and the use of herbal based products has increased. This can be attributed to the general belief that herbal drugs are less

expensive, locally available, and moreover, without any adverse effects. The World Health Organization has reported guidelines and strategic action plan including policy and regulations to control the safety, efficacy and quality of traditional medicines.³

A vast number of literature exists concerning traditional use of specific tree twigs like miswak and neem tree as natural toothbrushes. Such chewing sticks are shown to have antimicrobial properties and when properly used can be as efficient as toothbrushes in removing dental plaque.⁴ Several herbs like propolis, rosemary, sage, thyme, peppermint, aloe vera are shown to be useful in dentistry.⁵ Herbal extracts with active anti-microbial and anti-inflammatory properties are now incorporated into tooth pastes and mouth rinses as therapeutic agents for gingivitis.^{6,7}

Oil pulling is an ancient Indian ayurvedic procedure where oil is "swished" (kavala graha) or "held" (snigda gandoosha) in the mouth. The practice of oil pulling is believed to have health benefits, both oral and systemic.^{8,9} Several types of oils like sesame oil, sunflower oil and coconut oil have been clinically tested for its therapeutic effect on oral health.¹⁰⁻¹² Such oils are commonly used in the Indian subcontinent owing to local availability and personal preference in traditional Indian culture.

A traditional Arab diet is rich in olive and olive oil has shown to aid in explaining reduced morbidity and mortality in the population.¹³ The apparent health benefits ascribed to dietary consumption of olive oil by Arab populations has shifted focused on its biologically active phenolic ingredients.^{14,15} The majority of polyphenols found in olive oil or table olives are derived from hydrolysis of oleuropein.¹⁶ The benefits of olive oil in oral health largely remains unexplored. It is well established that prolonged use of the gold standard chlorhexidine mouthwash can cause dysgeusia and staining of teeth.¹⁷ Therefore, the objective of the present study was to compare the clinical

effectiveness of Virgin Olive Oil (VOO) against the gold standard mouthwash Chlorhexidine (CHX) on reduction in dental plaque and gingivitis.

MATERIAL AND METHODS

A double blind, parallel arm randomized controlled study was planned with a null hypothesis that oil pulling with virgin olive oil is not effective in reducing dental plaque and gingivitis as compared to 0.2% chlorhexidine mouthwash. The study protocol was developed and ethical clearance was obtained from Institutional Review Board, King Khalid University College of Dentistry, Saudi Arabia.

The study was conducted among the patients attending OPD clinic of King Khalid University College of Dentistry, Saudi Arabia. The sample size was calculated as 30 subjects in each group using the formula Where, $Z_{1-2} = Z\text{-value for level}=1.96$ and $Z_{1-} = Z\text{-value for level}=1.282$. The power of the study was set at 80%. A total of 150 subjects were screened for the study of which 60 subjects satisfied the inclusion criteria and informed consent was obtained. The inclusion criteria were: Subjects who are 18 years and above, positive Plaque Index (PI) and Gingival Index (GI) scores and those willing to participate in the research, a minimum of 20 permanent teeth. The exclusion criteria were: Subjects with localized or generalized periodontitis, subjects currently on antibiotics or any medical history with recent antibiotic exposure, symptomatic patients needing urgent dental care, pregnant women, recent history of dental treatment like oral prophylaxis and topical fluoride treatment.

A total two examiners were trained and calibrated for recording plaque index and modified gingival index

on ten subjects who were not a part of the main study.^{18,19} The kappa scores for plaque and gingival index were found to be 0.90 and 0.83 respectively. The baseline scores were recorded using both indices. The products used in the study were contained in similar plastic containers that were coded and sequentially numbered by principal investigator alone. The subjects were randomly allocated by a supporting staff to either oil pulling using commercially available virgin olive oil or chlorhexidine group (Oraxine, 0.2% chlorhexidine, Riyadh Pharma) using lottery method. The container also contained details regarding usage instructions. The subjects were instructed to perform oil pulling during early morning hours, on an empty stomach after tooth brushing in sitting position with chin up. A tablespoon of VOO is taken in the mouth, sipped, sucked and pulled between the teeth for 10 to 15 minutes then to be spat out completely. The subjects in CHX group were instructed to take 10 ml of the mouth rinse and rinse for one minute and not to rinse with water immediately later. The respective subjects in both groups were instructed to continue using the mouth rinse and/or oil pulling every day and were recalled for clinical assessment on the 7th day and the following baseline scores. All study subjects received oral prophylaxis at the end of the research period. The collected data was entered into a computer on MS-Excel spreadsheet and further subjected to analysis using SPSS Version 20.0. The level of significance was set at 5%.

RESULTS

The collected data were checked for normal distribution and accordingly parametric tests were employed for analysis. The Student's t test for PI scores and GI scores showed no statistically

significant difference between the two groups at baseline (p=0.058 and p=0.497 respectively) (Table 1 and 2). The repeated measure ANOVA showed a statistically significant reduction in PI scores among

both olive oil and chlorhexidine groups from baseline to first and second week follow up (p=0.041 and p=0.000 respectively)(Table 1). Similarly, a statistically significant reduction in GI

scores among both olive oil and chlorhexidine groups were found from baseline to first and second week follow up (p=0.000 for both groups) (Table 2).

Table 1. Comparison of Plaque Scores (PI) within the groups by Repeated Measures ANOVA and between groups by student's t-test.

| | | Baseline | 1 st Week | 2 nd Week | Wilk's | F | P-value |
|---------------|----|-------------|----------------------|----------------------|--------|--------|---------|
| | N | Mean ± SD | Mean ± SD | Mean ± SD | Lambda | | |
| Olive Oil | 30 | 0.8207±0.16 | 0.7583±0.19 | 0.7117±0.25 | 0.797 | 3.576 | 0.041* |
| Chlorhexidine | 30 | 0.8907±0.11 | 0.5330±0.24 | 0.4343±0.27 | 0.174 | 66.610 | 0.000* |
| T-Value | | -1.937 | 3.940 | 4.073 | | | |
| P Value | | 0.058 | 0.000* | 0.000* | | | |

*Significant at 5% level of Significance

Table 2. Comparison of Gingival Scores (GI) within the groups by Repeated Measures ANOVA and between groups by student's t-test.

| | | Baseline | 1 st Week | 2 nd Week | Wilk's | F | P-value |
|---------------|----|-------------|----------------------|----------------------|--------|--------|---------|
| | N | Mean ± SD | Mean ± SD | Mean ± SD | Lambda | | |
| Olive Oil | 30 | 1.2240±0.28 | 0.8573±0.23 | 0.7463±0.25 | 0.057 | 230.72 | 0.000* |
| Chlorhexidine | 30 | 1.1823±0.17 | 0.9923±0.26 | 0.7640±0.21 | 0.216 | 50.811 | 0.000* |
| T value | | 0.684 | -2.067 | -0.286 | | | |
| P value | | 0.497 | 0.043* | 0.776 | | | |

*Significant at 5% level of Significance

Table 3. Reduction in Plaque (PI) and Gingival (GI) scores between the groups during follow up.

| | | Plaque Score | | | Gingivitis Score | | |
|-------------------------------|---------------|--------------|------------|---------|------------------|------------|---------|
| | | Mean | | P-value | Mean | | P-value |
| | | Difference | Percentage | | Difference | Percentage | |
| | | (PI) | reduction | | (GI) | reduction | |
| Baseline-1 st Week | Olive oil | 0.0624 | 7.6 | 0.000* | 0.3667 | 30.0 | 0.043* |
| | Chlorhexidine | 0.3577 | 40.2 | | 0.19 | 16.1 | |
| Baseline-2 nd Week | Olive oil | 0.1090 | 13.3 | 0.000* | 0.4777 | 39.0 | 0.776 |
| | Chlorhexidine | 0.4564 | 51.2 | | 0.4183 | 35.4 | |

*Significant at 5% level of Significance

The percentage plaque reduction was significantly greater among chlorhexidine group both at first week and from baseline to second week follow up(40.2% and 51.2% respectively)

as compared to olive oil group at first week and from baseline to second week follow up(7.6% and 13.3% respectively) (p=0.000)(Table 3). There was significantly greater reduction in GI

scores among olive oil group (30%) at first week as compared to the chlorhexidine group (16.1%) (p<0.043). At the end of two weeks there was no statistically

significant difference in GI scores between the groups ($p=0.776$) (Table 3).

DISCUSSION

The virgin olive oil was called 'liquid gold' by Homer and 'the great healer' by Hippocrates and its health benefits since then has been researched quite extensively.²⁰ A high habitual intake of olive oil like in a typical Mediterranean diet has shown to provide health promoting effects.¹³ According to a survey by World Health Organization life expectancy during 1960 to 1990 was found to be increased compared to more developed Western countries, despite poor access to health services during this period.²¹

There are various types of olive oil available in the market: the International Olive Oil Council (IOC) categorizes olive oil based on the nature of manufacturing process and free acid (expressed as oleic acid) levels. Olive oils are graded as Extra-virgin, virgin, ordinary virgin, refined, olive pomace and other combinations. The IOC defines 'Virgin' olive oil as the oils obtained from the fruit of the olive tree solely by mechanical or other physical means under conditions, particularly thermal conditions, that do not lead to alterations in the oil, and which have not undergone any treatment other than washing, decantation, centrifugation and filtration.²² The olive oil, specially extra-virgin and virgin grades have the lowest levels of free oleic acid and are linked to a host of diseases such as cancer, heart disease, and ageing.^{23,24}

Our study aimed at evaluating the effectiveness of oil pulling with VOO and CHX mouth wash as an adjuvant to tooth brushing in reducing the plaque accumulation and plaque induced gingivitis. Although both groups showed a statistically significant ($p<0.05$)

reduction in PI scores at the end of two weeks from baseline, the percentage reduction with VOO was only 13.3% against 51.2% in the CHX group. Chlorhexidine is referred to as 'Gold Standard' anti-plaque agent and has a unique property of substantivity, i.e. it chemically binds to the enamel surface for an extended period of time and prevents formation of new plaque.²⁵ On the other hand, the exact mechanism of oil pulling in plaque reduction is not clear. The mechanical shear forces exerted on the oil during oil pulling exercise leads to formation of foamy liquid due to emulsification of fat. The reduced surface tension of the liquid could be responsible for the cleansing action on the teeth.²⁶ Also, by virtue of its viscosity; olive oil forms a smooth physical coating on the teeth and may prevent plaque adhesion.

However, results on the effect of VOO pulling on reducing gingivitis were interesting. Both groups, VOO and CHX had significantly lower GI scores at the end of two weeks from baseline. Although there was no statistically significant difference found in GI scores between the groups at second week, the percentage reduction was slightly greater in VOO group (39%) as compared to the gold standard CHX group (35.4%). Furthermore, it is also interesting to note that VOO group showed maximum reduction (30%) in GI score during the first week of follow up as compared to the CHX mouth wash (16.1%). Our observation suggests that VOO may have a strong antimicrobial action on plaque microorganisms. Evidence shows VOO has several nutrient and non-nutrient phyto-chemicals which exert like anti-oxidant, anti-inflammatory, antimicrobial including anti-cancer action.²⁷ In addition to oleic acid, the minor components of olive oil, including

phenolic compounds, triterpenes, tocopherols, and plant sterols are shown to make an important contribution to its anti-inflammatory properties.²⁸⁻³⁰ The permeability of VOO into mucous membrane has shown to increase oral bioavailability which might also explain faster reduction in the GI scores at first week as compared to the chlorhexidine.³¹ The authors anticipated a concern regarding subject's compliance for oil pulling exercise during the research period since the same needs a lot of self-motivation. Our study witnessed good compliance to oil pulling exercise, perhaps due to the fact that olive oil is a part of their routine diet. There were no adverse effects reported due to oil pulling with VOO and hence it could be suitable as preventive home therapy for promoting oral health. Although the present research is the first study to explore the benefits of VOO in oral health, more research in the future can open new vistas in oral health care.

CONCLUSIONS

In conclusion, oil pulling with virgin olive oil was found to have comparable effect with chlorhexidine in reducing plaque and gingivitis. Virgin olive oil has strong antimicrobial potential. Regular and proper oil pulling with virgin olive oil could be recommended as a routine home-based practice in promoting oral health.

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