



THE EFFECT OF MOUTHWASH CONTAINING OLIVE OIL AND CHLORHEXIDINE MOUTHWASH ON PLAQUE INDUCED GINGIVITIS AMONG A GROUP OF CHILDREN WITH MIXED DENTITION

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ABSTRACT

Objective: To evaluate the effect of mouthwash containing Olive oil and chlorhexidine mouthwash on plaque induced gingivitis among a group of children with mixed dentition. **Subjects and Methods:** This study was carried out on 75 children with age ranged from 6 to 13 years. They were divided into three equal major groups: Group (a): include 25 children that were used Extra Virgin Olive Oil 0.9% mouth wash. Group (b): include 25 children that were used Extra Virgin Olive Oil 0.5% mouth wash. Group (c): include 25 children that were used chlorhexidine 0.12% as a control group mouth wash. The Plaque Index and Modified Gingival Index scores were measured at baseline, after 1 week, 3 weeks and after 3 months. **Results:** Olive Oil 0.9% group showed a less mean plaque index and modified gingival index than Olive Oil 0.5% group than Chlorhexidine group. Olive Oil 0.9% group showed maximum reduction (30%) in MGI score during the 3 weeks and 3 months of follow up as compared to the CHX mouth wash (16.1%). **Conclusion:** Olive Oil mouth rinses can be used as an alternative for short term maintenance therapy that can reduce plaque and gingivitis.

KEYWORDS: Olive oil, chlorhexidine, plaque induced gingivitis, mixed dentition

INTRODUCTION

Oral health is of the utmost importance to all people. Oral hygiene habits are taught in childhood itself, regardless of a person's nationality or geographic location. The most reliable and recognized methods of maintaining oral hygiene in the world are mechanical methods of cleaning teeth. However, adjuvants to reduce plaque buildup and maintain oral hygiene have been sought. Oral hygiene practices using chemo-mechanical methods reduce the incidence of plaque-related diseases by reducing plaque accumulation⁽¹⁾.

As an antimicrobial agent, chlorhexidine is effective against both gram-positive and gram-negative bacteria. Its antibacterial effect is based on increased cell membrane permeability, followed by coagulation of the cytoplasmic macromolecules⁽²⁻⁴⁾. Chlorhexidine has also been shown to reduce the adhesion of *Porphyromonas gingivalis* to epithelial cells⁽⁵⁾. Mouthwashes containing chlorhexidine are most effective against bacteria in the oral cavity. Listerine (phenolic compound) and Meridol (a mouthwash made from amine and stannous fluoride) were less productive than chlorhexidine in fighting plaque-induced gingivitis⁽⁶⁾.

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Chlorhexidine changes the taste sensation with long-term use and creates brown stains on the teeth that are very difficult to remove. The mucous membranes and tongue can also be affected and are related to the precipitation of chromogenic nutritional factors on teeth and mucous membranes⁽⁷⁾. Coloring is also associated with long-term use of phenolic compounds and mouthwashes containing stannous fluoride⁽⁸⁾.

Some substances have high medicinal value and could be useful in treating various health conditions ranging from uncomplicated infections to even cancers. Despite significant pharmacology advancements, the desire for self-medication and interest in natural health and herbal-based products has increased. It can be attributed to the general belief that herbal drugs are less expensive, locally available, and without any adverse effects. 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⁽⁹⁾.

The obvious health benefits that the Arab population ascribes to olive oil consumption have shifted to its biologically active phenolic ingredients. Most of the polyphenols found in olive oil or table olives come from the hydrolysis of oleuropein^(10,11). The benefits of olive oil for oral health remain largely unexplored. It is known that prolonged use of the gold standard chlorhexidine mouthwash can lead to dysgeusia and tooth discoloration⁽¹²⁾.

SUBJECTS AND METHODS

This study was carried out on 75 children:

Inclusion criteria: Children whose age ranged between 6 and 13 years, Positive Plaque Index (PI) and Gingival Index (GI) scores, Free of systemic diseases, Cooperative child, and Children with mixed dentition.

Exclusion criteria:

Children suffering from localized or generalized periodontitis, Children currently on antibiotics or any medical history with recent antibiotic exposure, Symptomatic patients needing urgent dental care, and recent history of dental treatment like oral prophylaxis and topical fluoride treatment.

They were divided into three equal major groups: Group (a): include 25 children 12 males and 13 females, that were used oil pulling with Extra Virgin Olive Oil 0.9% mouth wash. Group (b): include 25 children 10 males and 15 females that were used oil pulling with Extra Virgin Olive Oil 0.5% mouth wash. Group (c): include 25 children 15 males and 10 females, that were used chlorhexidine 0.12% as a control group mouth wash. The baseline scores were recorded using Plaque Index and Modified Gingival Index. The products used in the study were contained in similar plastic containers that were coded and sequentially numbered by principal investigator alone.

The children were randomly allocated by investigator to either oil pulling using commercially available virgin olive oil or chlorhexidine group using lottery method. The container also contained details regarding usage instructions. The children 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 spitted out completely. The subjects in CHX group were instructed to take 1 ml of the mouth rinse and rinse for one minute and not to rinse with water immediately later. The respective children in all 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.

The Plaque Index and Modified Gingival Index scores were measured at baseline, after 1 week, 3 weeks and after 3 months. 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 IBM SPSS software package version 20.0. Significance of the obtained results was judged at the 5% level.

Sample size:

Based on a sample size of 25 in each group has a 90% power to detect an increase in survival proportion of 0.457 with a significance level (alpha) of 0.05 (two-tailed) and 95% confidence intervals. In 90% (the power) of those experiments, the P value was less than 0.05 (two-tailed) so the results were deemed "statistically significant". In the remaining 10% of the experiments, the increase in survival proportion was deemed "not statistically significant". Report created by GraphPad StatMate 2.00.

Ethical consideration:

The study was approved by Ethical Committee of Faculty of Dental Medicine, boys, Cairo, Al-Azhar University. EC Ref No: 120192/3/21. An informed written consent was signed by each child parent guardian before involving in the study.

Statistical analysis of the data:

The used tests were Chi-square test for categorical variables, to compare between different groups and F-test (ANOVA) for normally distributed quantitative variables, to compare between more than two groups.

RESULTS

All group showed a statistically a significant decrease in mean plaque index and modified gingival index measurements at 3 weeks with increase at 3 months. At 1 and 3 weeks: there was a statistically a significant difference in mean plaque index and modified gingival index in the three groups. Olive Oil 0.9% group showed a less mean plaque index and modified gingival index than Olive Oil 0.5% group than Chlorhexidine group.

At 3 months: there was a statistically non-significant difference in mean plaque index and

modified gingival index in the three groups. Comparing between Group (a) Olive Oil 0.9% and Group (b) Olive Oil 0.5% the difference was statistically significant ($p_1=0.012^*$). Group (a) and Group (c) Chlorhexidine 0.12% the difference was statistically significant ($p_2=0.032^*$). Furthermore, it is also interesting to note that Olive Oil 0.9% group showed maximum reduction (30%) in MGI score during the 3 weeks and 3 months of follow up as compared to the CHX mouth wash (16.1%).

TABLE (1) Comparison between the three studied groups according to demographic data, Plaque index, and Modified gingival index.

	Olive Oil 0.9 (n = 25)	Olive Oil 0.5 (n = 25)	Chlorhexidine 0.12 (n = 25)	p
Gender				
Male	12 (48.0%)	10 (40.0%)	15 (60.0%)	0.670
Female	13 (52.0%)	15 (60.0%)	10 (40.0%)	
Age (years)				
Mean \pm SD.	10.10 \pm 0.99	10.40 \pm 0.84	10.50 \pm 0.85	0.591
Plaque index				
At baseline	2.60 \pm 0.52	2.50 \pm 0.53	2.70 \pm 0.48	0.668
1 week	1.30 \pm 0.48	1.80 \pm 0.63	2.0 \pm 0.67	0.044*
Sig. bet. groups	$p_1=0.076, p_2=0.016^*, p_3=0.526$			
3 weeks	0.60 \pm 0.52	0.60 \pm 0.52	0.80 \pm 0.42	0.560
3 months	0.20 \pm 0.42	0.50 \pm 0.53	0.80 \pm 0.42	0.031*
Sig. bet. groups	$p_1=0.187, p_2=0.008^*, p_3=0.187$			
Modified gingival index				
At baseline	1.60 \pm 0.52	1.70 \pm 0.48	1.50 \pm 0.53	0.668
1 week	0.60 \pm 0.70	1.30 \pm 0.48	1.20 \pm 0.42	0.025*
Sig. bet. groups	$p_1=0.012^*, p_2=0.032^*, p_3=0.711$			
3 weeks	0.60 \pm 0.52	0.80 \pm 0.42	1.0 \pm 0.0	0.89
3 months	0.20 \pm 0.42	0.80 \pm 0.42	0.90 \pm 0.32	0.003*
Sig. bet. groups	$p_1=0.006^*, p_2=0.001^*, p_3=0.648$			

DISCUSSION

The main cause of gingivitis is plaque. Dental plaque is clinically defined as a structured, elastic substance that adheres to intraoral hard surfaces and consists of bacteria in a matrix of salivary glycoprotein and extracellular polysaccharides Newman et al⁽¹³⁾. Plaque-induced gingivitis is the result of an interaction between plaque and tissue and the host's inflammatory response. It's associated with the subtle microbial changes as the plaque matures. Plaque-induced gingivitis is the most common form of gum disease and the result of an interaction between microorganisms in the dental plaque biofilm and the host's tissues and inflammatory cells Marsh⁽¹⁴⁾. Chlorhexidine changes the taste sensation with long-term use and creates brown stains on the teeth that are very difficult to remove⁽¹⁵⁾. Olive oil has the following advantages over chlorhexidine: no coloration and no allergy. There are no disadvantages to oil pulling therapy other than the increased duration of the procedure compared to chlorhexidine⁽¹⁶⁾. The aim of our study was therefore to compare the clinical effectiveness of extra virgin olive oil in reducing plaque and gingivitis in three groups of children with mixed dentition.

In our study, the Plaque Index and Modified Gingival Index were used because, it was approved that they are the most widely used index in clinical trials of therapeutic agents. In the present study the results of group (a) Olive oil (0.9%), group (b) Olive oil (0.5%) that showed a significant decrease in Plaque Index and Gingival Index after 1 week and 3 weeks, This is in agreement with Nabeeh et al, who concluded that the efficacy of virgin olive oil in reducing plaque and gingivitis after 2 weeks⁽¹⁶⁾. Beside McCombs and Melvin, who concluded that Olive oil based mouth rinses is believed to inhibit plaque formation and inhibition⁽¹⁷⁾, our results also showed a significant reduction of plaque and gingivitis in group (a) Olive oil 0.9% and group (b) Olive oil 0.5%. These results of our study are in agreement with Nabeeh et al⁽¹⁶⁾, that showed there was statistically significant reduction of mean

plaque and gingivitis scores, and he also approved that 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⁽¹⁶⁾. And also in agreement with Amith et al, who assessed the effect of oil pulling on plaque and gingivitis, the reduction in plaque and gingival scores from baseline to 45 days. Oil pulling is having dental benefits. Hence this holds a chance to be added to other oral hygiene measures⁽¹⁸⁾.

The result of this study shows a significant reduction in plaque and gingivitis in a group (c) chlorhexidine of 0.12%. This agrees with Menendez and Michalek, who have also shown that chlorhexidine is very effective against the formation of dental plaque and is still considered the gold standard⁽¹⁹⁾. And also in agreement with Axelsson and Lindhe who have shown that chlorhexidine mouthwash is effective in reducing plaque and gingivitis⁽²⁰⁾.

On the other hand, comparing the results of Bulotta, who showed that the exact mechanism of oil pulling in plaque reduction is dependent on 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⁽²¹⁾. Also, by virtue of its viscosity; olive oil forms a smooth physical coating on the teeth and may prevent plaque adhesion. However, our results on the effect of Olive Oil pulling on reducing gingivitis were interesting. All groups had significantly lower MGI scores at the end of 3 weeks and 3 months from baseline.

In the present study, Olive Oil 0.9% group showed maximum reduction (30%) in MGI score during the 3 weeks and 3 months of follow up as compared to the CHX mouth wash (16.1%). Our observation suggests that Olive Oil 0.9% may have a strong antimicrobial action on plaque microorganisms. These results in agreement with Kalogeropoulos and Tsimidou, who approved that

Olive Oil has several nutrient and non nutrient phytochemicals which exert like antioxidant, anti-inflammatory, and antimicrobial⁽²²⁾. Also these results are in agreement with Y. Tsuji, who was approved that, the permeability of Olive Oil into mucous membrane has shown to increase oral bioavailability which might also explain our results in faster reduction in the MGI scores at 3 weeks and 3 months as compared to the chlorhexidine⁽²³⁾.

The results of our study may be due to, that evidence showed Olive Oil has several nutrient and non-nutrient phytochemicals which exert like antioxidant, anti-inflammatory, and antimicrobial⁽²²⁾. The minor components of olive oil, including phenolic compounds, triterpenes, tocopherols, and plant sterols was shown to make an important contribution to its anti-inflammatory properties^(21,24,25). Although the present research explored the benefits of Olive Oil in oral health, more research in the future can open new vistas in oral health care. 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⁽¹⁶⁾. Our conclusion was in accordance with the previous studies⁽¹⁷⁻¹⁸⁾, i.e. Olive Oil mouth rinses and 0.12% chlorhexidine mouth rinses have similar antiplaque and anti-gingival effectiveness. For short-term antiplaque effects, 0.12% chlorhexidine remains the “chemical toothbrush” of choice, as in agreement with Leard and Addy⁽¹⁵⁾.

CONCLUSION

Antiplaque effects of 0.12% chlorhexidine gluconate remain the “chemical toothbrush” of choice. Olive Oil mouth rinses and 0.12% chlorhexidine gluconate mouth rinses have similar antiplaque effectiveness. Olive Oil mouth rinses can be used as an alternative for short term maintenance therapy and has an advantage of having fewer side effects. Oil pulling can reduce plaque and gingivitis.

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