



Effect of Coconut Oil Pulling on Streptococcus Mutans Count in Saliva in Comparison with Chlorhexidine Mouthwash

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ABSTRACT

Purpose: The aim of this study was to evaluate the antimicrobial effect of Coconut oil on Streptococcus mutans count in saliva in a group of Egyptian children and compare its effect with chlorhexidine mouth wash. **Material and Methods:** A total of 60 Egyptian children were included in this study, their ages ranging from (5-10) years. The children (60) were divided into two groups; each group consists of 30 children (Group A, Group B). Group A (study group): Coconut oil consisted of thirty child, each participant was instructed to rinse with 10 ml of Coconut oil 3 times per day for two weeks with average (1minute /rinse) Group B (Control group):Chlorohexidine mouthwash (0.2%) consisted of thirty child, each participant was instructed to rinse with 10 ml of chlorohexidine mouthwash, 3 times per day for two weeks with average (1minute /rinse). **Results:** Statistically significant reduction in Streptococcus mutans count was seen in both oil pulling and chlorohexidine groups but the reduction was found to be more in the oil pulling group than chlorohexidine group. **Conclusion:** Use of coconut oil pulling therapy may be used as preventive therapy at home to maintain oral hygiene as it is natural, safe and has no side effects.

KEYWORDS

Coconut oil,
Chlorohexidine mouthwash,
oral microorganisms

INTRODUCTION

Dental caries is a chronic bacterial disease influencing a large number of people; it influences the mineralized tissues of teeth as enamel, dentin and cementum. It is a continuous disease and if no intervention

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to treat it, the size may increase to the pulp causing pulp degeneration, pain, loss of vitality of tooth and eventually missing of tooth ⁽¹⁾.

Streptococcus mutans are most common microorganisms related to dental caries, these bacteria are able to produce lactic acids on metabolism of fermentable carbohydrates, this acid able to disintegrate the mineralized tissue of teeth. The acidogenic bacteria are found in dental plaque but they present in low concentrations to produce problems, if there is change in normal balance, which produced by local change in environment as multiple sugar intake or no biofilm removal, this may produce discomfort, pulp necrosis and infection, therefore suppress of these microorganisms should decrease the incidence and susceptibility to dental caries ⁽²⁾.

Prohibition of dental disease can be done by using antimicrobial components used inside the oral cavity besides cleaning of teeth; these chemical products can prohibit bacterial attachment, aggregation and metabolic activity influencing the bacterial growth. Among these antimicrobial agents is chlorohexidine mouthwash. Chlorohexidine is an agent with a broad spectrum biocide effect. It is highly effective against bacteria and fungi. It has both bactericidal and bacteriostatic effect; it is regarded as gold standard for differentiation with other products due to its proven effectiveness ⁽³⁾.

Traditional medicine recommends oil pulling therapy to inhibit tooth caries, foul breath, bleeding gum, dryness of throat, mouth and cracked lip. It is a method in which the participants gargle oil in their mouth ⁽⁴⁾.

Coconut oil has wonderful unbelievable components. It's packed with rich fatty acids, vitamins, and antioxidants. Lauric acid on coconut oil has antimicrobial effects, as it can destroy bacteria, viruses and fungi that make it very suitable for oral health. Coconut oil has pleasant taste compared to other oils ⁽⁵⁾.

MATERIAL AND METHODS

Materials used: Virgin coconut oil (Imtenan health shop-the industrial area-Obour City-product of Egypt), Chlorohexidine mouthwash (0.2%) (Manufactured by Riyadh pharma medical and cosmetic products -product of Saudi Arabia) and Mitis Salivaris Bacitracin "MSB". **Case selection:** The children included in this study their ages ranging from (5-10) years. **Inclusion criteria:** Children with no history of antibiotic administration for the last 2 weeks, Children with no antimicrobial mouth rinse for the last 12 hours, Children with non-compromised oral health, children with no systemic diseases. **Exclusion criteria:** children with systemic disease, children with history of recent antibiotic administration or antimicrobial mouth rinse or topical fluoride treatment. **Methods:** A total of 60 Egyptian children were included in this study their ages ranging from (5-10) years. The children (60) were divided into two groups; each group consists of 30 children (Group A, Group B). **Group A (study group):** Coconut oil consisted of thirty child, each participant was instructed to rinse with 10 ml of Coconut oil 3 times per day for two weeks with average (1minute / rinse), **Group B (Control group):** Chlorohexidine group mouthwash (0.2%) consisted of thirty child, each participant was instructed to rinse with 10 ml of chlorohexidine group mouthwash 3 times per day for two weeks with average(1 minute/rinse).

Collection of saliva samples

Prior to the start of the experiment, samples of unstimulated saliva were taken from each child by asking the child to spit in a sterile container in the morning before breakfast. Initial salivary samples were collected to establish base levels (S_1) using selective culture media, the salivary samples (S_2) were collected after 2 weeks of using the mouthwash by asking the child to spit in sterile container in the morning before breakfast and after rinse with mouthwash.

Statistical analysis

Statistical analysis was then performed using a commercially available software program (SPSS 19; SPSS, Chicago, IL, USA) to compare the mean bacterial count within and between groups. As data was parametric, significance of the difference between groups was evaluated using unpaired t test; whereas pre-treatment and post- treatment mean values were compared using paired t-test.

The percentage of change was calculated by the following formula:

$$\frac{\text{Value after}-\text{value before}}{\text{Value before}} \times 100$$

The level of significance was set at $P < 0.05$.

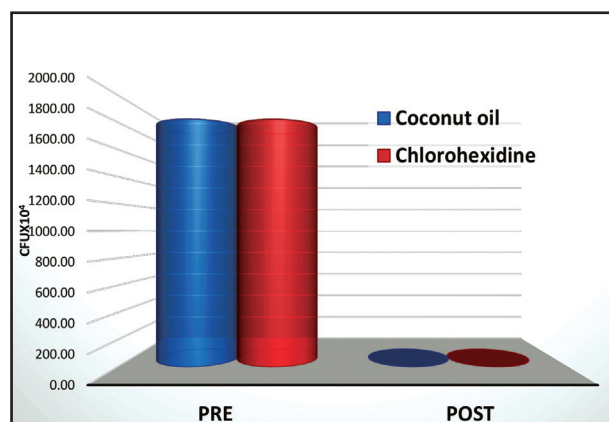
RESULTS

Before treatment, there was no significant difference in mean colony forming unit of Streptococcus mutans ($\times 10^4$) of both groups ($p=0.998$), while after treatment, a greater mean colony forming unit of Streptococcus mutans ($\times 10^4$) was recorded in coconut oil (1.12 ± 0.325), in comparison to chlorohexidine group (0.0905 ± 0.0251). Unpaired t test revealed that this difference was statistically significant ($p=0.043$), so the results of this study revealed that the use of coconut oil as mouth-rinse in children achieved statistically significant reduction in streptococcus mutans count was seen in both oil pulling and chlorohexidine group (Table 1, Figure 1).

Table 1: Comparison of mean colony forming unit of Streptococcus mutans ($\times 10^4$) in coconut oil and chlorohexidine groups (unpaired t test).

	Groups	Mean	Std. Dev	Std. Error Mean	Mean Difference	Std. Error Difference	95% CI of Difference		t value	P value
							Lower	Upper		
pre	Coconut oil	1821.5	429.60	498.56	1.32	679.83	1375.19	1377.82	.002	.998 NS
	Chlorohexidine	1820.2	466.95	462.18						
post	Coconut oil	1.1233	0.325	0.475	1.033	.48	.04	2.03	2.17	.043*
	Chlorohexidine	.0905	0.0251	0.019						

Significance level $p < 0.05$, *significant, NS=non-significant



Figure(1) Column chart showing mean Colony forming unit of Streptococcus mutans ($\times 10^4$) in coconut oil and chlorohexidine groups' pre and post treatment

DISCUSSION

Dental decay is most common bacterial disease of people throughout the world; it is produced by variable reaction between oral microorganisms, diet and host factor. Dental caries and periodontal disease are microbiological disease leading to tooth ache, infection in the mouth and may cause missing of the tooth ⁽⁶⁾.

Chlorohexidine is a chemical product with highly powerful action against oral microorganisms. The antimicrobial effect due to increase in permeability of cell membrane and congealment of the cytoplasmic macromolecules. The cationic group

of chlorohxidine is effective against streptococcus mutans. Its effect is due to it keeps attached to the tooth surface even after its removal from mouth, for this reason chlorohexidine was used as control group in present study⁽⁷⁾. Complementary traditional medicine recommends oil pulling therapy by using oils such as sesame oil, sunflower oil, coconut oil, olive oil, and almond oil. It is effective conventional method which is become famous today. Scientific experiments showed that oil pulling therapy could decrease plaque index, improve gingival scores and decrease total oral bacteria number⁽⁸⁾. Oil pulling is economic and simple to use compared to other mouth rinses. It has a benefit over available mouthwashes as it doesn't cause discoloration on the tooth, no lingering after taste and no sensitivity reaction⁽⁹⁾.

Coconut oil therapy is effective and completely safe compared to chlorohexidine mouthwash. It composed of lauric acid; this lauric acid has anti-inflammatory and antimicrobial properties. It is edible oil and easily obtainable in market, thus it was used in the present study⁽¹⁰⁾. Another reason for using coconut oil in this study as described by other studies⁽¹¹⁾. Use of 0.2% chlorohexidine mouthwash displayed mild discoloration on teeth in few practitioners, while no discoloration was obtained in participants using coconut oil as mouthwash.

The aim of this study was to evaluate the effect of coconut oil pulling therapy on streptococcus mutans count in saliva in group of Egyptian children and compare its effect with chlorohexidine mouthwash.

This current study concentrated on child age ranges from (5-10) years which in an accordance with other studies concentrated on the child age⁽¹²⁾. While previous studies were done in oil pulling therapy focusing on adult age with a mean age (18-22) years⁽¹³⁾. It is unsuitable for children below 5 years due to risk of aspiration therefore prescribing a safe and harmless antibacterial factors in children has important role in prohibiting of dental caries at older ages⁽¹⁴⁾. In the present study child was advocated to rinse with coconut oil, 3 times per day with average (1 minute /rinse) in the morning before

breakfast or at least 1 hour before meal, while other studies done on oil pulling therapy rinsing with average (5-10) minutes⁽¹⁵⁾. During oil pulling, the oil acquires emulsified and surface area of the oil increased. The process of emulsification begins on 5 min of oil pulling, this oil will cover the teeth and gingival inhibiting bacterial attachment and plaque formation, thus plaque responsible for dental caries, gingivitis, periodontitis and foul breath are removed from mouth, but from practical point of view child cannot rinse for long time⁽¹⁶⁾. In the present study samples were taken before treatment and after 2 weeks of intervention, the saliva samples were taken before breakfast as eating nutritious substances with high sugar or acidity, or high caffeine content, may compromise the survey by decreasing saliva pH and increasing bacterial growth⁽¹⁷⁾.

Mitis salivaris bacitracin (MSB) media was selected for identification and counting of colonies of streptococcus mutans because it is selective media for such colonies. The insertion of bacitracin to the media permits streptococcus mutans to grow and construct colonies and inhibit the growth of oral bacteria. It remains reference procedure for identification and segregation of Streptococcus mutans⁽¹⁸⁾.

In present study as regards test group, the mean number of colony forming units (CFU $\times 10^4$) decreased from 1821.5 $\pm$ 498.56 before treatment to 1.1233 $\pm$ 0.325 after treatment. Paired t test showed that this difference was statistically significant ($p=0.002$), while in control group, the mean number of colony forming units (CFU $\times 10^4$) decreased from 1820.2 $\pm$ 466.95 before treatment to 0.905 $\pm$ 0.0251 after treatment. Paired t test revealed that the difference was statistically significant (0.001).

The result of the present study was suited with other studies^(12, 13, 19). Which studied the effect of coconut oil on streptococcus mutans and contrast its effect with chlorohexidine, it was exhibited that coconut oil has high saponification index. It contains lauric acid which can react with alkalis in saliva such as sodium hydroxide and bicarbonates to make sodium laureate-soap like substance, this can decrease plaque attachment, accumulation and

it has highly washing action. Coconut oil has antimicrobial action and is potent against streptococcus mutans and fungi in a vitro biofilm; it also has an agreeable test and it is useful for oral health ⁽²⁰⁾.

CONCLUSIONS

1. Daily use of coconut oil as mouth wash can reduce salivary level of streptococcus mutans which are the most virulent cariogenic pathogen.
2. Coconut oil therapy explored safe and effective alternative to chlorohexidine with no side effect. In long term use of chlorohexidine it alters taste and produces stain on teeth but coconut oil does not alter taste or produce stain.
3. Statistically significant reduction in Streptococcus mutans count was seen in both oil pulling and chlorohexidine group.
4. Reduction in the mean Streptococcus mutans counts was found to be more in oil pulling group than in chlorohexidine group.
5. Use of coconut oil pulling therapy may be used as preventive therapy at home to maintain oral hygiene as it is natural, safe and has no side effects.

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