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Evaluating the Effect of Coconut Oil Pulling On Plaque-Induced Gingivitis among Young Adolescent Age Group: A Cross Sectional Study

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ABSTRACT

Background: Ayurveda medicines which is based on plantsare used for millennia for treatment of a variety of diseases which includes periodontal diseases. Most of the herbal mouthwashes have been showing positive results like reducing inflammationand bleeding of the periodontal ligament. Thisclinical study's objective was to evaluate the efficacy of a conventional oil pulling method which uses coconut oil for the treatment of the gingivitis induced by plaque. Materials and Methods: In this study thirty-five age-matched individuals (nineteen–twentyone years old) with gingivitis caused by plaque were selected. All registered participants are advised to use five millilitres of edible coconut oil for a five-minute oil pull every morning, on an empty stomach, shortly before brushing their teeth. At baseline, the fifteenthandthirtythday clinical indications such as gingival and plaque index scores were regularly evaluated. SPSS software version was utilized to analyze the data using the student paired t-test. Result:Throughout the trial period, afterpulling with coconut oil there was no unfavorable side effects reported by any of the study participants From the baseline, the fifteenth and the thirtythday, it showed a progressive and statistically significance decrease in plaque and gingival index of pre-treatment and post-treatment scores ($P < 0.0001$). Conclusion: Plaque production and the ensuing plaque-induced gingivitis can be reduced by pulling using coconut oil as a supplementary tool for hygiene of oral cavity

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1. INTRODUCTION

The most frequent and mild kind of periodontal disease is gingivitis, which is typically brought on by poor oral hygiene. Gum swelling, bleeding, and inflammation are its hallmarks. Plaque buildup on the gums and teeth's surface is the primary cause of gingivitis. In a world where gingivitis is prevalent, it starts in early infancy (ages 3–11) and increases to 70–90% by adolescence.[1].Maintaining good oral hygiene is crucial for everyone and entails using a mechanical toothbrush along with a complementary chemical or herbal remedy to lessen plaque development. Mouthwash and other chemical plaque management products have their own drawbacks, such as brown discoloration of the teeth and appliances in mouth, accumulation of tartar, transient taste changes, dry mouth, and burning sensation in the oral mucosa. Mouthwash which contain alcohol can exacerbate halitosis and cause dry mouth.[2,3]

For many years, oil pulling has been widely utilized as a herbal remedy in traditional Indian medicine for strengthening of the teeth, gingiva, dry throats also for chapped lips. This is named Kavala, Gandoosha/Kavala Graha in the Ayurvedic classic Charaka Samhita (Sutrasthana 5, 78–80). It was used for treatment of systemic disorders, asthma and diabetes, migraines. F. Karach, Dr. Articles of Research Chalke and associates: In the 1990s, oil pulling gained popularity in Russia due to the benefits of good health of oral cavity by pulling using coconut oil. It has been discovered that oil pulling therapy, which uses sesame and sunflower oils, reduces gingivitis brought on by plaque. The best thing about oil pulling is that it's simple to do at home using any type of oil, such sesame or sunflower oil[4-6]

In a pilot study the advantages of using coconut oil pulling therapy as a prophylactic supplement to maintain dental hygiene is highlighted. Since coconut oil is edible, it is a mainstay in many diets. Its abundance of medium-chain fatty acids (MCFAs), which have been shown to have anti-inflammatory and antibacterial properties, makes it special. An effective detoxifying Ayurvedic method that is doable to use in daily life, oil pulling can be employed as a preventive measure as well as a therapeutic approach. Therefore, this study evaluates how pulling using coconut oil affects the development of plaque and gingivitis caused by plaque

2. MATERIALS AND METHODS

The Department of Public health dentistry Tagore Dental college and hospital Chennai carried out this prospective open-label clinical investigation with the approval of the corresponding institutional review board.This study which is done in compliance with the Declaration of Helsinki (1975) from August 2023 to September 2023.

Patient Selection

Based on power analysis, the current study's sample size (n = 35) was established. In light of potential dropouts in the future, more participants were added to the study. Although 60 patients in all volunteered to be part of the study, only 50 participants between the ages of 19 and 21 were taken into consideration.The study comprised subjects with mild-to-moderate gingivitis caused by plaque and at least 20 permanent teeth. Before the study started, informed consent was acquired from each participant. Participants who had received antibiotics, anti-inflammatory medications, or periodontal therapy during the previous three months, as well as those who were allergic to coconut oil, were not allowed to participate in the trial.

Clinical and Periodontal Examination

Every participant in the research underwent a clinical assessment. Under the supervision of a senior periodontist, a single calibrated examiner conducted the clinical evaluation. The Loe and Silness gingival index is one of the most commonly utilized indices in clinical trials for medicinal medicines.In the current investigation, assessment of clinical findings was conducted using the plaque index by Loe and Sillness[8,7].

Baseline Index Scoring

Gingival index

The Loe and Silness gingival index : a tool for grading gingivitis[7].

The overall score is divided by the number of tested surfaces, then its score for the whole mouth has been calculated. Final grading criteria: There are three types of gingivitis: mild (0.1–1), moderate (1.1–2), and severe (2.1–3).

Plaque index

Plaque buildup was evaluated using theLoeand Silness[8] plaque index. The overall score is divided by the surfaces inspected, then the score for whole mouth has been calculated. Final grading criteria: poor: 2.0–3.0, fair: 1.0–1.9, good: 0.1–0.9, excellent: 0.

Practicing procedures

Before brushing in the morning, participants were told to rinse their mouths empty and one tablespoon (5 ml) of edible coconut oilto be used. They were instructed to swish oil about their mouths for five minutes, lips shut and chin up. The originally viscous oil was instructed to be swished until it became milky white and thin.[9] Participants were instructed to completely rinse their mouths with warm water after spitting out the oil. The process was to be carried out by the subjects once a day in the morning for thirty days in a row.

Scheduled Recall

At the fifteenth and thirtyth day intervals, all research participants were called back to reevaluate clinicalfindings and reiterate guidelinesof oral hygiene.

Analysis of statistics

The mean was displayed for every set of data. The Statistical Package for the Social Sciences (SPSS Software) statistically analysedthe obtained data. The t-test paired by student was used to compare the pre- and postvalues of gingival index and plaque scores. $P < 0.01$ was established as the criterion of significance in the present investigation.

3. RESULTS

In this study 60 participants who are willing to participate are taken butonly 50 participants were included in study which fulfilled all the inclusion criteria.Informed consent is obtained from the participants andat baseline the examination of clinical features was done. The instruction about the tooth brushing method and steps in coconut oil pulling was explained to the participants.The clinical findings of participants was recordedin recall visit at fifteenth day and all the instructions for maintaining proper oral hygiene were given.Again in the next recall visit which is on thirtyth day the clinical findings were noted. But there was 3 participantsdropped out in the end of the study because there was failure in getting the report in the following visits. A statistical software is used to analyse the reports of the data collected for 35 patients. The participants are asked to use the pulling using coconut oil to be continued if there was improvement of oral health.

Table 1: Mean for Gingival index

Follow up	Mean (n=35)	Standard deviation	Standard mean error
Baseline	1.08	0.50	0.06
Fifteenth day	1.0	0.47	0.05
Thirtyth day	0.91	0.45	0.05

Table 2: Scores comparison for gingival index

Time	Mean difference	95% confidence interval		Paired t value	Two tailed P value
Baseline at fifteenth day	0.08	0.07	0.09	15.67	< 0.0001*
Baseline at thirtyth day	0.17	0.16	0.19	20.98	<0.0001*

*statistically significant

Table 3: Mean for plaque index

Follow up	Mean (n=35)	Standard deviation	Standard mean error
Baseline	1.59	0.74	0.09
Fifteenth day	1.48	0.72	0.08
Thirtyth day	1.39	0.71	0.08

Table 4: Scores comparison for plaque index

Time	Mean difference	95% confidence interval		Paired t value	Two tailed P value
Baseline at fifteenth day	0.11	0.08	0.13	9.15	< 0.0001*
Baseline at thirtyth day	0.20	0.17	0.23	14.23	< 0.0001*

*statistically significant

The purpose of this study was to evaluate coconut oil pulling's dental benefits. At the end of the trial, data from just 35 individuals were gathered and considered for analysis, out of the 50 recruited patients, three of whom dropped out because they failed to show up for follow-up visits. At baseline, 15, and 30 days, all subjects' gingival and plaque indices were noted. Clinical parameter changes were noted and contrasted. During the trial, none of the individuals reported experiencing any noticeable negative responses on either the soft or hard tissues

At baseline, the mean gingival index to all of the research participants was 1.08. The mean gingival index thereafter decreased to 1.00 on day 15 and 0.91 on day 30 [Table 1]. By contrast, there was an observed difference of 0.08 between the gingival index score at baseline and the score on day 15, and 0.17 between the scores on day 30 [Table 2].

At baseline, the plaque index for all the researchparticipants averagely was 1.59. The plaque index progressively dropped, reaching 1.39 on the thirty-first day and 1.489 on the fifteenth [Table 3]. Where we can observe difference in plaque index score at day 15 was 0.11 compared to baseline, and at day 30, it was 0.20 [Table 4].

The statistical significance ($P < 0.0001$) was observed by the use of the gingival and plaque index scores at baseline, 15^{th}, 30^{th} days [Tables 2 and 4].

4. DISCUSSION

Because of the connections between overall health and dental health, maintaining oral health is crucial.[10] The inflammatory process known as gingivitis results in gingiva discomfort, swelling, and redness. The supragingival plaque control techniques is thought to be the most successful in preserving oral health and preventing gingivitis and its subsequent progression to periodontitis. Chemomechanical techniques lower the risk of plaque buildup and, thus, the risk of diseases linked to plaque.[11] The purpose of our study was to determine whether using pulling using coconut oil can be used additional to theroutine oral cavity hygiene practices can effectively reduce plaque and plaque-induced gingivitis

In the current study, there were no reported taste changes or obvious discoloration after using coconut oil for oil pulling, in contrast to usual negative effects linked to cationic chemical mouthwashes. Additionally, the results for the gingival and plaque indices significantly decreased as a result. These findings concur with a study carried out by Peedikayil and colleagues.[12]

There is uncertainty regarding the precise action of mechanism of pulling therapy using coconut oil .Its therapeutic qualities of coconut oil are responsible for the advantageous outcomes which reduces the development of plaque and gingivitis induced by plaque.

Because of its strong saponification value,coconut oil is frequently utilised in soap industry asone of the oils. It is suggested that the coconut oil can react with the salivawhich contains alkalis, forming a soap-like material and causing saponification, which would decrease plaque adherence.[6]

Antibacterial, Antifungal, and Antiviral Activity

As byproducts of their metabolism, oral bacteria are known to produce a large number of medium-chain fatty acids (MCFAs). These fatty acids may have a role in the ecologicaland biological interactions amongst thebacteria of oral cavity present in biofilm.

Both periodontitis and dental caries are caused by the fatty acid-secreting bacteria. The synthesis of fatty acids may be involved in the formation of a "nutrient reservoir" that oral biofilms naturally have, leading to mutualistic interactions with other bacteria in the oral cavity. Because the coconut oil has free fatty acids (FFAs) which compete with the fatty acids that pathogens make, they impair oral organisms' ability to compete.[13]

By inhibiting the enzymes and damaging their lipid membranes responsible for production of energy and transfer of nutrient, monoglycerides which are medium chain—particularly the monolaurin which is present in the coconut oilare effective in eliminating broad range of microorganisms including Gram-positivewhich is lipid coated and Gram-negative, ultimately resulting in the death of the bacteria. It has been discovered that coconut oil is successful as chlorhexidine by lowering the counts of Streptococcus mutans and Lactobacillus.[14–16] As a result, it might be crucial in preventing tooth cavities.

It is found that coconut oil has significant antifungal activity against a number of Candida spp. Strains in astudy. That is similar to what ketoconazole does.[17] An excellent weapon against a various typesof virus which is lipid-coated are coconut oil, such as those which cause hepatitis, influenza, CMV, Epstein-Barr, leukemia, and pneumonia. The ability of monolaurin to solubilize lipids andphospholipids in the envelope of virus is thought to have a virucidal impact on viruses, causing the virus particles to disintegrate and preventing further growth.[18]

Anti-inflammatory, Antioxidant,Anti-ulcer Activity and Antinociceptive

Virgin coconut oil (VCO), which has antinociceptive properties, likely prevents chronic inflammation at its proliferative stage. Phagocytic cells produce lysosomal enzymes that harm neighboring cells during an inflammatory response. The inhibitory influence on inflammatory cell activity or the stability of the lysosomal membrane maybe acause of VCO's anti-inflammatory effects. VCO prevents the production

and/or release of inflammatory mediators that cause pain and edema, such as bradykinin, histamine, and prostaglandins.[19] The coconut oil which have anti-inflammatory properties is shown ina recent study. The authors observed a noteworthy decrease in inflammation of gingivadue to the anti-inflammatory property outlined earlier, moisturizing properties of coconut oil and reduced plaque formation.[12]

VCO has antiulcer activity which may relateto the FFAs they contain. According to reports, some FFAs—including myristic acidand palmitic acid—have antioxidant and anti-inflammatory properties. Anti-Inflammatory and antioxidant properties of the oils as well as the FFA content may be linked to their antiulcer properties. This practice may help to shorten the period of time it takes for oral ulcerative lesions to heal and lessen gingival bleeding.[20-22]

Pulling using coconut oil can be a useful supplementary tool for oral hygiene. Although it could not be used in place of cleaning teeth, even though it has reduced the plaque and gingival index scores. There is a fact that this treatment must be done earlier in the morning and without consuming anything to eat which is its major disagreeable aspect. The most remarkable aspect of oil pulling is edible coconut oil can be used, which is widely accessible in most Indian homes.If this affordable therapy is used at home, it will have a plethora of advantages

Limitations

The follow up was for short termof the research participants,also there was absence of supporting microbiological data to corroborate the oral findings were limitations of the current investigation.

Future Prospective

To confirm the usefulness of coconut oil is an efficient tool of oral hygiene for preserving and enhancing health of oral cavity, more large-scale clinical research and microbiological investigations are needed.

5. CONCLUSION

It was determined, within the parameters of the current investigation, that pulling coconut oil significantly reduced the formation of plaque and gingivitis caused by plaque. Therefore, pulling coconut oil can be utilized as a simple, affordable, and safe oral hygiene supplement to regular teeth brushing.

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