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RESEARCH ARTICLE

CLINICAL EVALUATION OF COCONUT OIL PULLING PRACTICE VERSUS CURCUMIN BASED MOUTHWASH IN PLAQUE INDUCED GINGIVITIS: AN INTERVENTIONAL STUDY

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Abstract

Introduction: Periodontitis is an inflammatory disease caused by a complex mix of microbes. Effective prevention and management of periodontal disease depend on the regular and thorough removal of bacterial plaque. There are various mechanical and chemical methods available for plaque control. Historically, essential oils have been utilized to treat numerous oral conditions, and many have been studied for their anti-plaque and anti-gingivitis properties. However, the use of coconut oil for these purposes has been explored in only a few studies.

Objectives: The current study was conducted to compare and assess the therapeutic efficacy of Coconut Oil-Pulling and Curcumin-based Mouthwash in patients with plaque and gingivitis. Additionally, we measured the IL-1β levels in the saliva of patients with gingivitis.

Materials and Method:A total of 40 periodontally healthy volunteers with the age range of 20-55 years were randomly divided into two groups: -Group 1: virgin coconut oil mouthrinse (Anveshan Coconut oil) and Group 2: Curcumin mouthrinse(Turmix Mouthwash). Clinical parameters such as Plaque Index (PI), Gingival Index (GI), and Gingival Bleeding Index (GBI) were recorded for all the subjects. An unstimulated salivary sample was collected at baseline and after 1 month for estimation of IL-1β levels.

Results: Curcumin mouthwash was determined to be more effective when compared to coconut oil pulling in cases of mild gingivitis.

Conclusion: Both the study groups showed reductions in PI, GI,GBI scores and IL-1β levels.It was observed that Coconut oil pulling and Curcumin mouthwash both served as a good alternative but curcumin mouthwash was found to be more effective when compared to coconut oil pulling in cases of mild gingivitis.

Introduction:-

Oral health is crucial for overall well-being, with factors such as poor dental hygiene, poor diet, alcohol, and tobacco use contributing to oral health issues. Dental plaque, particularly driven by poor oral hygiene, is a primary cause of gingival and periodontal diseases. This plaque leads to gingivitis, which can progress to periodontitis if untreated. The toxins released by bacteria in plaque trigger the release of pro-inflammatory cytokines like interleukin (IL)-1β and TNF-α, which contribute to tissue destruction and bone resorption.

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To maintain healthy periodontal tissues, a balance between host defenses and oral microbiota is necessary. This balance is maintained by various immune responses, including salivary immunoglobulins and antimicrobial peptides.

Periodontal disease involves tissue loss due to the direct effects of bacterial toxins and the body's inflammatory response, with IL-1β playing a significant role. The most effective preventive strategy for periodontal disease involves regular and effective plaque removal using personal hygiene practices. Mechanical methods, though time-consuming and skill-dependent, are commonly supplemented with chemical methods, which can have drawbacks like unpleasant taste and tooth discoloration.

Recent attention has turned to alternative methods like oil pulling and the use of herbal remedies such as turmeric due to their minimal side effects and multiple health benefits. Curcumin, the active ingredient in turmeric, is particularly noted for its anti-inflammatory and antibacterial properties, which are beneficial in treating periodontal disease. Oil pulling, a traditional Ayurvedic practice, involves swishing oil in the mouth and has been shown to have oral health benefits, though more clinical evidence is needed to fully recommend it.

This study compares the effectiveness of coconut oil pulling and curcumin-based mouthwash in reducing plaque and gingival inflammation, also measuring the levels of IL-1β in patients' saliva to quantify inflammation.

Materials and Method:-

The present interventional study was conducted by selecting 40 subjects from the Out - Patient Department of Periodontology and Implantology of Institute of Dental Sciences, Bareilly. The selected subjects were categorized based on the clinical condition of periodontium according to the classification system given by American academy of periodontology (AAP) for periodontal disease and conditions, in 2017. The research was started after obtaining ethical clearance from the institute. The subjects were selected on the basis of following inclusion and exclusion criteria:

Inclusion Criteria:
• Age - subjects of age 20-55 years
• Individuals with gingivitis that is mild to moderate
• Co-operative patients.

Exclusion Criteria:
• Those who are afflicted with systemic disorders
• Pregnant/lactating females
• Smokers, mouth breathing habits.
• Subjects having orthodontic or prosthodontics appliances
• Periodontal treatment done within last 6 months.
• Patients undergoing Analgesic or Antibiotic medication within last 3 months

Gingival bleeding index is based on recordings from all four tooth surfaces of all teeth.

A commercially available Human IL-1β ELISA kit is utilised as an analytical tool for quantitative determination of IL-1β levels in saliva of biological samples. It is originally made in a US based company and was purchased from KRISHGEN BIO SYSTEMS in Mumbai who manufactures the product in India. The product (ELISA KIT) catalogue number was KB1063.

Microwells are first coated with monoclonal antibodies. Samples and standards are then added to these wells, allowing the IL-1β in the samples to bind to these antibodies. Next, a biotin-labeled antibody is introduced, followed by the addition of streptavidin-bound horseradish peroxidase (HRP), forming a complex. This setup is incubated, after which the wells are washed to remove any non-specific bindings. The substrate tetramethylbenzidine (TMB) is added, causing a color change proportional to the IL-1β concentration in the samples. To halt the color development, a stop solution is added, and the absorbance is measured at 450nm to determine the amount of IL-1β.

KIT Components
1. Antibody coated Elisa plate item a 96-well 12 strips in 28 Wells coated with specific capture antibody

2. Human IL-1β Standard Lyophilized,1µl /ml one vial
3. Human IL-1β Biotin Antibody 170µl
4. Streptavidin-HRP 35µl
5. 20x wash buffer 25ml
6. Assay Diluent 50ml
7. TMB Substrate 12ml
8. Stop solution 12 ml

Reagents and equipment that were not given but used in the procedure
1. Microtiter plate reader able to measure absorbents at 450 NM
2. Adjustable fit and multichannel Pipettor to measure volumes ranging from 20 to 25µl to 1000µl
3. Deionized water
4. Wash bottle or automated microplate washer
5. Clean tubes and Eppendorf tubes
6. Precision single and multichannel pipette and disposable tips
7. 37oC incubator
8. Timer

• Reagent preparation The following steps are used:

➢ Wash buffer is prepared (1x) 100ml - 5 ml of (20x) wash-buffer is diluted in 95ml of distilled water.

➢ Assay Diluent was prepared which was ready to use solution.

➢ Human IL-1β Standard was prepared by reconstituting the lyophilized standard in 20µl of distilled water to get a concentration of 1µg/ml. Then 5µl of reconstituted standard solution in 495µl of Assay diluent to prepare 0.5ml of 10ng/ml. Add 25 µl of 10ng/ml to 975 µl Assay diluent to prepare top standard of 250pg/ml.

➢ Biotin Conjugated Detection Antibody was prepared by diluting 83.33µl of Detection Antibody to 4916.67µl of Assay Diluent to make final volume of 5ml.

➢ Concentrated Streptaviridin-HRP was prepared by adding 14.71µl of Streptaviridin-HRP to 4985.29µl of Assay diluent to make final volume of ml.

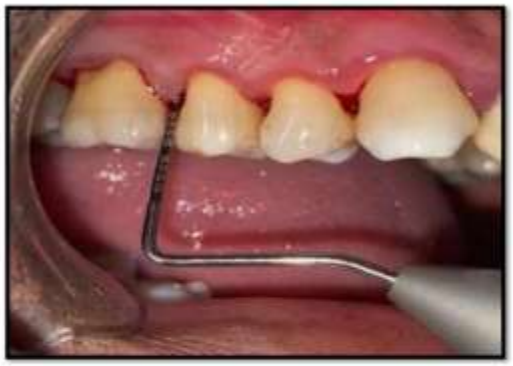


FIGURE 1: RECORDING INDICES

FIGURE 2: AFTER 1- MONTH FOLLOW UP

Interpretation:

The average absorbance for each set of standards and duplicate samples was plotted on graph paper with the mean on the y-axis, extending a horizontal line to intersect with the standard curve. A vertical line was then drawn from this intersection point to the x-axis to determine the IL-1β levels. These values were recorded in an Excel sheet and statistically analyzed using the appropriate test.

Statistical Analysis

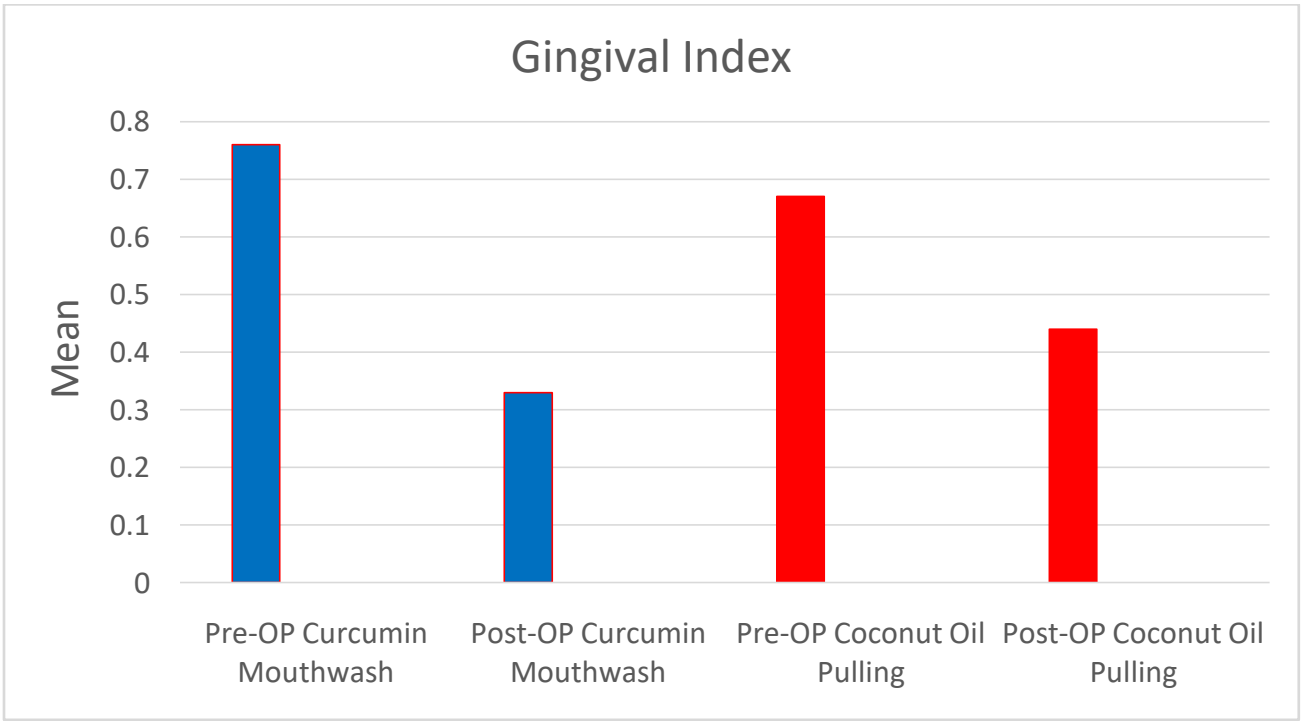
The Statistical software SPSS 19.0 was used for analysis of the data and Microsoft word and Excel are used to generate graphs, tables etc. Descriptive and Inferential statistical analysis are carried in present study. Results on Continuous measurements are presented in Mean and Standard Deviation. Significance is assessed at 5 % level ofsignificance. Paired t test is applied to collate all the variables across clinical variables.

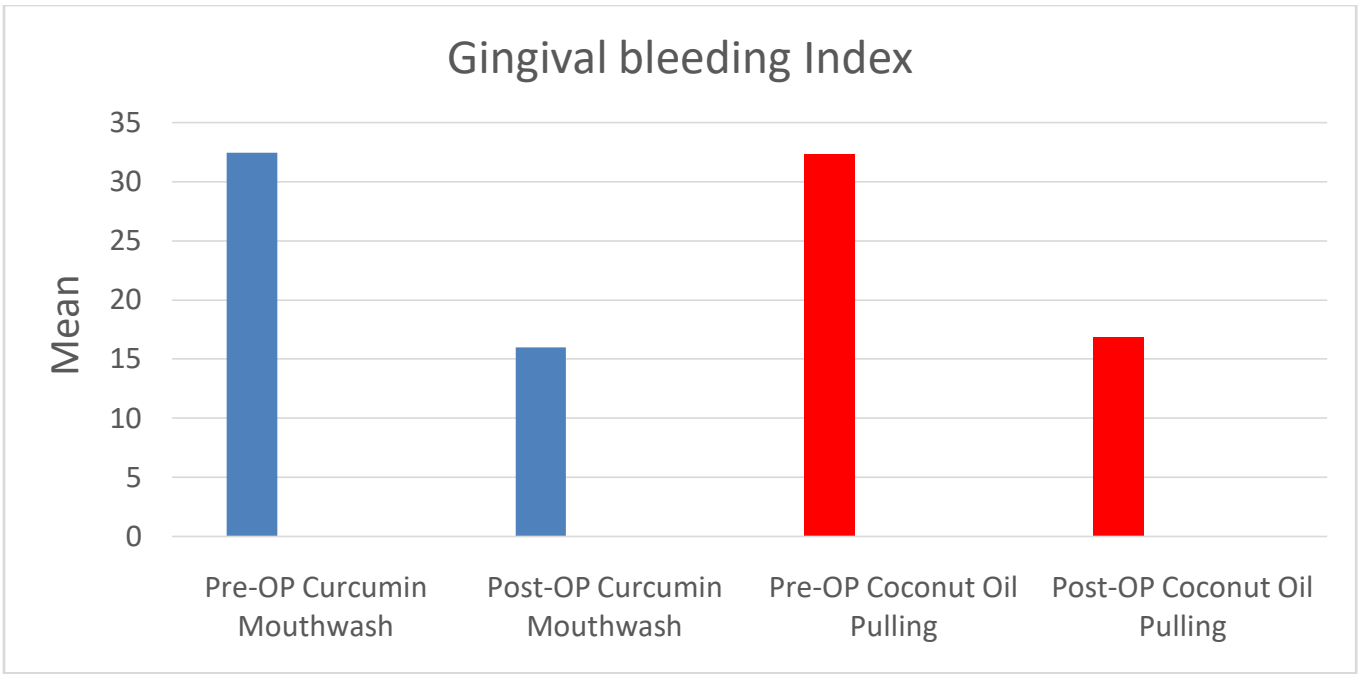
The paired t-test is used to test the hypothesis that there is a significant difference between the means of two related groups in a sample with approximately normal distributions. This test typically involves subjects in similar conditions or with closely matched characteristics.

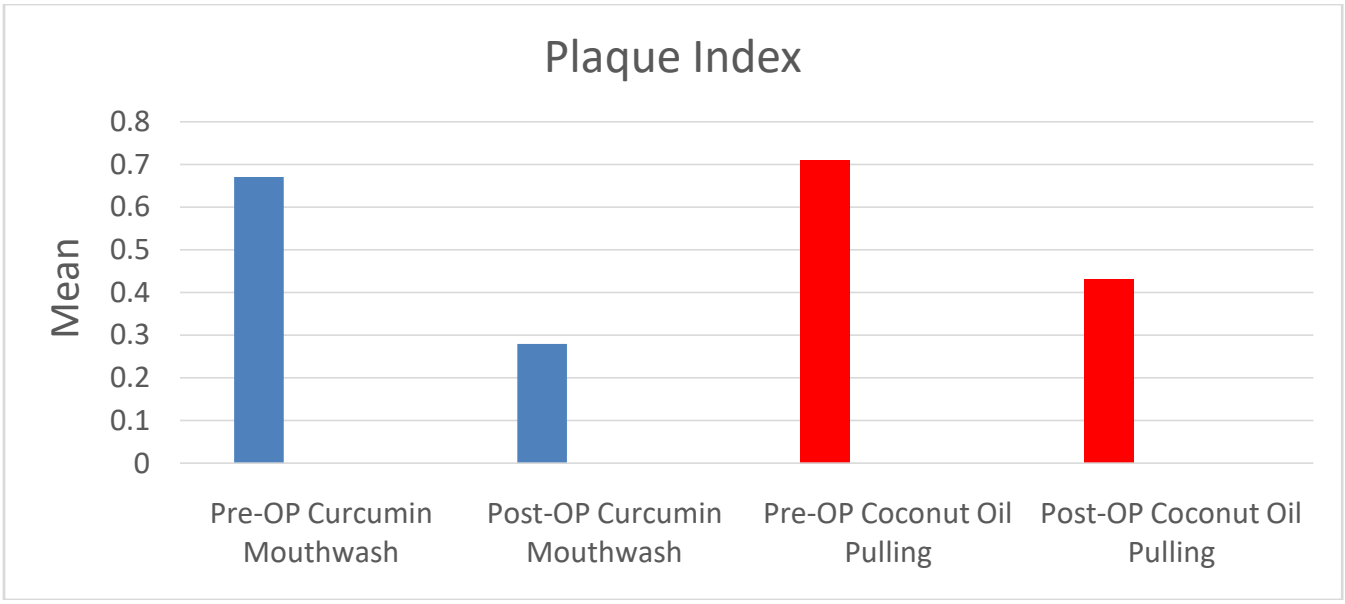
Results:-

Gingival Index<Gingival Bleeding Index And Plaqueindex:

		N	Mean	Std. Deviation	p-value
Gingival Index Pre-OP	Curcumin Mouthwash	20	0.76	0.18	0.238#
	Coconut Oil Pulling	20	0.67	0.26	
Gingival Index Post-OP	Curcumin Mouthwash	20	0.33	0.10	0.012*
	Coconut Oil Pulling	20	0.44	0.17	
Gingival Bleeding Index Pre-OP	Curcumin Mouthwash	20	32.45	2.09	0.867#
	Coconut Oil Pulling	20	32.35	1.63	
Gingival Bleeding Index Post-OP	Curcumin Mouthwash	20	16.00	1.26	0.025*
	Coconut Oil Pulling	20	16.85	1.04	
Plaque Index Pre-OP	Curcumin Mouthwash	20	0.67	0.15	0.302#
	Coconut Oil Pulling	20	0.71	0.09	
Plaque Index Post-OP	Curcumin Mouthwash	20	0.28	0.07	0.000*
	Coconut Oil Pulling	20	0.43	0.07	







On the inter group comparison of the GI between both the groups that is group I (Cucumin mouthwash) and in group II (Coconut oil pulling) non-statistical significance difference was found between both the groups at baseline. The comparative results of group I mouthwash with group II showed significant reduction in mean GI scores from baseline to day 30th was 0.76 ± 0.18, 0.33 ± 0.10, 0.67 ± 0.26 and 0.44 ± 0.17 respectively.

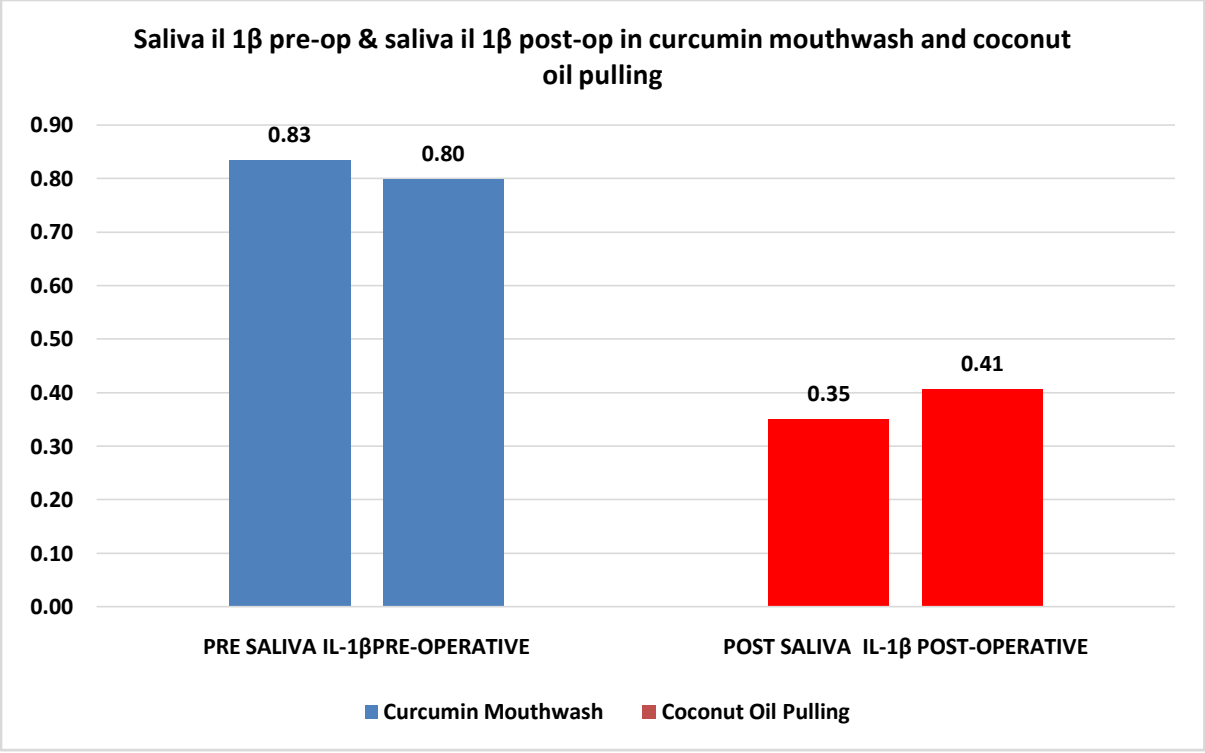
On the inter group comparison of the GBI between both the groups that is group I (Cucumin mouthwash) and in group II (Coconut oil pulling) non-statistical significance difference was found between both the groups at baseline. The comparative results of group I mouthwash with group II showed significant reduction in mean GBI scores from baseline to day 30th was 32.45 ± 2.09, 16.00 ± 1.26, 32.35 ± 1.63and 16.85 ± 1.04 respectively.

On the inter group comparison of the PI between both the groups that is group I (Cucumin mouthwash) and in group II (Coconut oil pulling) non-statistical significance difference was found between both the groups at baseline. The

comparative results of group I mouthwash with group II showed significant reduction in mean PI scores from baseline to day 30th was 0.67 ± 0.15, 0.28 ± 0.07, 0.71 ± 0.09and 0.43 ± 0.07 respectively.

Salivary IL-1β:

		N	Mean	Standard Deviation	p-value
Saliva IL 1β Pre-OP	Curcumin Mouthwash	20	0.83	0.41	0.821#
	Coconut Oil Pulling	20	0.80	0.57	
Saliva IL 1β Post-OP	Curcumin Mouthwash	20	0.35	0.15	0.495#
	Coconut Oil Pulling	20	0.41	0.36	



On the inter group comparison of the Salivary IL-1β between both the groups that is group I (Cucumin mouthwash) and in group II (Coconut oil pulling) nonstatistical significance difference was found between both the groups. The comparative results of group I mouthwash with group II showed non-significant reduction in mean Salivary IL-1β from the baseline to day 30th was 0.83 ± 0.41, 0.35 ± 0.15, 0.80 ± 0.57and 0.40 ± 0.36 respectively.

Discussion:-

In 1961, WHO defined Dental Plaque as a complex formation of microorganisms on teeth and restorations, comprising bacterial metabolic products and saliva elements. Research confirms its pivotal role in oral diseases like dental caries, gingivitis, and periodontitis. Plaque control, emphasized since the 1998 European Workshop on Mechanical Plaque Control, is crucial for long-term dental and periodontal health. Effective removal of plaque is essential, enabling individuals to maintain good oral health and prevent associated diseases throughout life.

Mechanical plaque removal with toothbrushes and dentifrices is the primary method for preventing dental diseases. However, recent advancements in understanding dental diseases have sparked interest in chemical plaque control methods. Chlorhexidine digluconate, despite its effectiveness in reducing plaque and gingivitis, has notable side effects like tooth staining and mucosal erosion. This has prompted the search for alternative options with fewer side effects. Patients are increasingly interested in herbal alternatives due to their perceived lack of side effects, although scientific evidence supporting their efficacy is often lacking. Natural compounds like curcumin, found in turmeric, have shown promise in offering therapeutic benefits for oral health with minimal side effects.

Curcumin mouthwash from Cotech Healthcare Pvt. Ltd contains curcuma longa dry extract IP, tetrahydrocurcumin, thymol IP, eucalyptol IP, clove oil IP, mentha oil IP, and tea tree oil IP in an aqueous base with a pleasant flavor and brilliant blue FCF color.

Coconut oil was chosen for oil pulling due to its availability and affordability, containing primarily saturated fatty acids, with about 50% being lauric acid known for its antibacterial and antifungal properties.

The study aimed to assess the therapeutic potential of Coconut Oil-Pulling and Curcumin based Mouthwash in preventing plaque and gingivitis, along with evaluating IL-1β levels in saliva. Conducted in Bareilly city among adults aged 20-55, the study involved 40 participants divided into treatment groups, with assessments performed by a single examiner. Blinding of participants was not feasible due to product packaging.

The study revealed significant reductions in plaque index (PI), gingival index (GI), and bleeding index (GBI) in both treatment groups. Group I, using curcumin mouthwash, showed a marked decrease in PI from baseline to day 30, as did Group II, employing coconut oil pulling. Similarly, significant reductions in GI and GBI were observed in both groups. However, no significant difference in salivary IL-1β levels was found between the two groups. This suggests that while both interventions effectively reduced oral inflammation and plaque, their impact on salivary IL-1β levels did not significantly differ.

Summary and Conclusion:-

The present study concluded that oil pulling with coconut oil has the ability to reduce plaque, gingivitis. In the present study, plaque-induced gingivitis was significantly reduced as evident with clinical and microbiological parameters.

Although both the study groups showed reductions in PI, GI, and GBI scores, higher reductions were seen in the Curcumin group. It was observed that Curcumin and Coconut oil pulling were effective, thus causing a reduction in Salivary IL-1β.

However, Curcumin mouthwash demonstrated superior efficacy compared to coconut oil pulling. While Chlorhexidine is effective, its side effects led to the exploration of alternative options, with Curcumin mouthwash and coconut oil proving biocompatible and effective. Further research with larger sample sizes and standardized techniques is recommended to enhance understanding and application in clinical settings.

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