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EFFECT OF VIRGIN COCONUT OIL PULLING ON SALIVARY BACTERIAL COUNT VERSUS FLUORIDE MOUTH WASH IN A GROUP OF EGYPTIAN ADULTS – RANDOMIZED CONTROLLED TRIAL (RCT)

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ABSTRACT

Background: With increasing public interest in complementary natural health practices, oil pulling, an ancient Ayurvedic practice, has re-emerged as a possible alternative oral antiseptic to fluoride mouthwash. Anecdotal endorsement abounds, but scientific support is lacking.

Objective: This study evaluated and compared the effectiveness of virgin coconut oil (VCO) pulling and fluoride mouthwash in reducing salivary bacterial counts in a sample of healthy Egyptian adults.

Methods: Seventy-two adult participants (aged 18–60) were randomly allocated into two equal groups: Group A1 used fluoride mouthwash, and Group A2 practiced oil pulling with virgin coconut oil. Salivary samples were collected at baseline (T0), after 2 weeks (T1), and after 4 weeks (T2). Bacterial counts were quantified as colony-forming units per milliliter (CFU/ml) using Mitis Salivarius agar plates.

Results: The interventions both led to a continuous decrease in counts of bacteria. However, statistical evaluation by independent t-tests found no noteworthy differences between groups at all time points (p-values: T0 = 0.543, T1 = 0.266, T2 = 0.204).

Conclusion: Virgin coconut oil pulling is as effective as fluoride mouthwash in decreasing salivary bacterial loads in a period of four weeks, and it can serve as a useful natural alternative for oral hygiene.

KEYWORD: Virgin coconut oil, Fluoride mouthwash, Salivary bacteria

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INTRODUCTION

Mouth health is closely related to general health, yet it is overlooked until discomfort is experienced. While brushing and flossing are staples, antimicrobial agents like fluoride mouthwash have become common in holding down bacteria load, notably *Streptococcus mutans*, which is key in caries of the teeth.

However, questions concerning fluoride overexposure and a movement towards holistic medicine have brought renewed attention to time-honored cures like oil pulling. Also, from the field of Ayurvedic medicine, oil pulling involves swishing oral-compatible oils in the mouth in a manner to "pull" out bacteria and toxins. Virgin coconut oil (VCO), in particular, has received much attention due to its high lauric acid content, which possesses characteristic antimicrobial properties.

While long used and increasing in popularity, scientifically valid evidence for oil pulling continues to be meager. In Egypt, where deference for natural medicine is profound, it is both timely and relevant empirically to test the efficacy of VCO against control fluoride-based mouthwash.

Statement of the problem

Caries caused by the proliferation of harmful bacteria in the oral cavity. Fluoride mouthwash is widely used to reduce salivary bacterial counts and prevent dental caries, but there is growing interest in natural alternatives like virgin coconut oil pulling. Despite the traditional use of oil pulling and its increasing popularity, scientific evidence supporting its efficacy is limited and inconclusive.

In the Egyptian context, where cultural preferences for natural remedies are strong, understanding the comparative effectiveness of these two methods is particularly relevant. However, no comprehensive studies have been conducted to directly compare the impact of virgin coconut oil pulling and fluoride mouthwash on salivary bacterial counts in this population. This gap in research creates uncertainty regarding the best practices for oral hygiene, particularly for individuals seeking natural alternatives (**LNU et al., 2016**).

This randomized controlled trial (RCT) was conducted to assess whether virgin coconut oil pulling is as effective as fluoride mouthwash in reducing salivary bacterial counts among healthy Egyptian adults.

METHODOLOGY

Study Design and Setting

This study was structured as a parallel-arm randomized controlled trial, carried out at the Faculty of Dentistry, Cairo University. All procedures and reporting followed the CONSORT guidelines for clinical trials.

Participants

A total of 72 adults, aged between 18 and 60, were selected from the outpatient clinic of the Conservative Dentistry Department. To qualify, individuals needed to be in good general health, free from recent antibiotic or antiseptic use (within the past month), and have no known allergies to either coconut or fluoride. Exclusion criteria included pregnancy, breastfeeding, active oral infections, or any systemic medical conditions.

Ethical Considerations

All participants provided informed consent before taking part. The study received approval from the Research Ethics Committee (REC) of the Faculty of Oral and Dental Medicine, Cairo University.

Randomization and Group Allocation

Participants were randomly assigned using a simple random number method. Group A1 (n=36) was assigned to use fluoride mouthwash, while Group A2 (n=36) used virgin coconut oil. The group

assignments were kept confidential using sealed opaque envelopes.

Interventions

- Group A1 (Fluoride): Rinsed with 10 ml of fluoride mouthwash once daily for 2 minutes, before breakfast.
- Group A2 (VCO): Practiced oil pulling with 10 ml of virgin coconut oil each morning for 15 minutes, before breakfast.

Both regimens lasted for a total of 4 weeks. Participants were advised not to use any other oral antiseptics or new oral hygiene products during the study period.

Outcome Measures

Saliva samples were collected at three points:

- **T0 (Baseline)**
- **T1 (After 2 Weeks)**
- **T2 (After 4 Weeks)**

The samples were cultured on Mitis Salivarius agar, and bacterial concentrations were measured in colony-forming units per milliliter (CFU/ml).

Data collection methods:

- **Baseline Assessment:**
  - Saliva samples were collected from all participants at baseline (before the start of the intervention) to measure initial salivary bacterial counts.
  - A questionnaire will be administered to assess baseline oral hygiene habits and preferences.
- **Follow-up Assessments:**
  - Saliva samples were collected at the end of weeks 2 and 4 to assess changes in bacterial counts.
  - A follow-up questionnaire was administered at the end of the study to evaluate participant satisfaction, preferences, and any side effects experienced during the intervention.

17b. Laboratory Procedures:

- **Saliva Collection:**
  - Participants were providing saliva samples in sterile containers in the morning before any oral hygiene activities.
- **Bacterial Count Measurement:**
  - Saliva samples were cultured on agar plates in a laboratory, and colony-forming units (CFUs) will be counted to quantify bacterial load.

Statistical Analysis

All data were analyzed using R software (version 4.3.2). Independent sample t-tests were conducted to compare bacterial reductions between the two groups. A p-value of 0.05 or below was considered statistically significant.

Descriptive Statistics

Below is a summary of the mean bacterial counts (CFU/ml) and standard deviations across the three testing points:

Group	Timepoint	Mean CFU/ml	SD CFU/ml
A1 (Fluoride)	T0 (Baseline)	317,909	20,217
	T1 (2 weeks)	278,903	26,687
	T2 (4 weeks)	235,283	27,758
A2 (VCO)	T0 (Baseline)	320,862	20,722
	T1 (2 weeks)	285,643	24,269
	T2 (4 weeks)	243,496	26,608

Within-Group Comparisons (Paired T-tests)

Each group showed significant reductions in bacterial counts over time

Group	Comparison	t-statistic	p-value	Significance
A1 (Fluoride)	T0 vs. T1	20.18	< 0.00001	× Significant
A1 (Fluoride)	T0 vs. T2	34.32	< 0.00001	× Significant
A1 (Fluoride)	T1 vs. T2	32.51	< 0.00001	× Significant
A2 (VCO)	T0 vs. T1	18.85	< 0.00001	× Significant
A2 (VCO)	T0 vs. T2	31.54	< 0.00001	× Significant
A2 (VCO)	T1 vs. T2	28.08	< 0.00001	× Significant

Between-Group Comparisons (Independent T-tests)

At all timepoints, differences between the groups were statistically insignificant

Timepoint	t-statistic	p-value	Interpretation
T0	-0.61	0.543	× No difference at baseline
T1	-1.12	0.266	× No significant difference
T2	-1.28	0.204	× No significant difference

Both **virgin coconut oil (VCO)** and **fluoride mouthwash** resulted in a **statistically significant reduction** in salivary bacterial counts over time. However, **no significant differences were found between the two groups** at any timepoint (T0, T1, T2), indicating **comparable efficacy** in reducing bacterial load.

DISCUSSION

This randomized controlled trial aimed to evaluate how effective virgin coconut oil (VCO) pulling is compared to fluoride mouthwash in lowering salivary bacterial levels over a four-week period in a group of Egyptian adults. The results showed that both groups experienced a statistically significant drop in bacterial colony-forming units (CFU/ml) from the beginning of the study to the second and fourth weeks ($p < 0.00001$ in all within-group tests). However, when comparing the two groups directly at any of the measured points (T0, T1, T2), there were no statistically significant differences. This indicates that, at least in the short term, VCO pulling could be just as effective as fluoride mouthwash in reducing salivary bacterial load.

These findings are consistent with earlier research suggesting that VCO—largely due to its high lauric acid content—has natural antimicrobial effects. Lauric acid, a medium-chain fatty acid, disrupts the outer membranes of bacteria, ultimately killing them (Haron et al., 2018). Both lab-based and real-world studies have shown that VCO can inhibit the growth of *Streptococcus mutans*, one of the main bacteria responsible for dental cavities (Kaushik et al., 2016; Ahmed et al., 2020).

Fluoride mouthwash, on the other hand, has long been a staple in dental care. It helps strengthen tooth enamel and reduce demineralization, while also curbing bacterial activity and acid production (Cate, 1999). The significant drop in CFU levels in the fluoride group reaffirms its status as a gold standard in cavity prevention.

Interestingly, the pattern of bacterial reduction in the VCO group closely mirrored that of the fluoride group, though the decline was slightly less steep. This suggests that VCO could serve as a promising natural alternative—especially appealing for individuals looking to avoid fluoride due to allergies, personal preference, or concerns about long-term exposure. In Egypt, where natural and herbal remedies are widely accepted, VCO pulling may offer a culturally appropriate and accessible oral hygiene practice.

The similar results seen in both groups hint at the possibility that VCO is not inferior to fluoride in this context. However, future research specifically designed to test this with larger participant numbers and longer study durations is needed. This study used a superiority framework, and while both treatments significantly improved outcomes, neither was statistically superior to the other.

The study's strengths include a well-structured design, randomized group assignment, an adequate sample size (n=72), and consistent laboratory methods for measuring bacteria. The inclusion of both male and female participants across a wide age range also enhances how broadly these findings may apply to the general adult population in Egypt.

That said, several limitations must be noted. First, the four-week duration may not capture long-term outcomes or whether bacterial suppression is sustainable. Second, although participants were instructed to follow uniform oral hygiene routines, their compliance was self-reported, and unintentional crossover between groups (such as sharing products or habits) couldn't be fully ruled out. Finally, while CFU/ml offers a numerical snapshot of bacterial

presence, it doesn't distinguish between harmful and harmless bacteria or capture the full complexity of changes to the oral microbiome.

Future research should aim to:

- Use molecular methods (e.g., qPCR, 16S rRNA sequencing) to assess changes in bacterial diversity.
- Include longer follow-up periods to test for sustained benefits.
- Examine clinical outcomes such as plaque buildup, gum inflammation, and cavity formation alongside microbial data.
- Collect patient feedback on factors like taste, comfort, and ease of long-term use.

CONCLUSION

This study shows that virgin coconut oil (VCO) pulling is just as effective as fluoride mouthwash in lowering salivary bacterial levels over a four-week period among Egyptian adults. Thanks to its natural ingredients, cultural relevance, and proven antimicrobial properties, VCO pulling could serve as a useful complement—or even an alternative—to conventional dental hygiene practices. However, to fully validate its benefits and guide future recommendations, more extensive and longer-term research is still needed.

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