

**A COMPARATIVE EVALUATION OF KIDODENT MOUTHWASH AND
CORIANDRUM SATIVUM OIL MOUTHWASH IN REDUCING STREPTOCOCCUS
MUTANS COUNT- A PARALLEL DOUBLE BLINDED RANDOMIZED CONTROL
TRIAL**

1. Dr RaghavendraHavale_{MDS}

Professor

Department of Pediatric and Preventive Dentistry

AME's Dental College and Hospital

Raichur – 584103

Email: raghavendrahavale@yahoo.co.in

Phone Number: +919448407300

2. Dr Dhanu G Ra_{MDS}

Professor and Head

Department of Pediatric and Preventive Dentistry

AME's Dental College and Hospital

Raichur – 584103

Email: drdhanu74@yahoo.co.in

Phone Number: +919845031755

3. Dr.Shrutha S.P

Reader

Department of Pediatric and Preventive Dentistry

AME's Dental College and Hospital

Raichur – 584103

Email: shruthavinit@gmail.com

Phone Number: +919483329406

4. Dr.BadarOmera Fatima

Post Graduate Student

Department of Pediatric and Preventive Dentistry

AME's Dental College and Hospital

Raichur – 584103

Email: omerfatima93@gmail.com

Phone Number: +917330658540

5. Dr SyedaSubia Sara

Post Graduate Student

Department of Pediatric and Preventive Dentistry

AME's Dental College and Hospital

Raichur – 584103

Email: subiasyeda6@gmail.com

Phone Number: +917338670802

6. Dr.NehaBemalgi

Post Graduate Student

Department of Pediatric and Preventive Dentistry

AME's Dental College and Hospital

Raichur – 584103

Email: shreya.bemalgi@gmail.com

Phone Number: +917989966383

Corresponding Author:

Dr RaghavendraHavale_{MDS}

Professor

Department of Pediatric and Preventive Dentistry

AME's Dental College and Hospital

Raichur – 584103

Email: raghavendrahavale@yahoo.co.in

Phone Number: +919448407300

Abstract

Background :The study aimed to evaluate the antibacterial efficacy of coriander seed oil mouthwash and Kidodentmouthwash against Streptococcus mutans.

Methods:After approval from institutional review board and institutional informed consent, 45 children who met the inclusion criteria were divided into three groups .The trial design included 15 healthy children in each group namely Group I(Kidodent), Group II(Coriander) & Group

III(Distilled water) aged between 6-8 years for 15 days. Streptococcus mutans was isolated from saliva sample using selective media Salivariusmitis agar and Type I Agar agar at 38°C for 24 hours. Serial dilution method was followed for screening the activity of *C. sativum* extract and Kidodent mouthwash in reducing the *S. mutans* count and calculated using manual colony counter. Statistical analysis was performed with one-way ANOVA and *t*-test using Graph Pad Prism V.5 software.

Results: Coriander seed oil mouthwash showed equivalent and significant reduction in CFU/ml when compared to Kidodent mouthwash ($p < 0.05$)

Conclusion: The results of the study indicate that coriander seed oil mouthwash may prove to be an effective mouthwash owing to its ability in reducing *S. mutans*.

Keywords: Keywords: Children, Kidodent, Mouthwash, Herbal, Coriander seed oil

Introduction

The most common diseases of oral cavity seen worldwide are dental caries and periodontal diseases. Hence removal of the causative agent is necessary that is, reduction of Streptococcus mutans count from the oral cavity have to be achieved. Streptococcus mutans are viewed as the primary causative microorganism related with dental caries.¹

From the day there has been torment related with caries, researchers from everywhere have been discovering ways not exclusively to fix the effectively settled caries, yet in addition to forestall it as soon as possible.²

The different caries preventive measures have been extensively ordered into mechanical, chemical, and dietary control measures. Among the mechanical means, tooth brushing is the most common device used for oral hygiene maintenance.³ It has been found that mouthwashes is one of the successful agent in reducing the microbial count and the plaque content. These mouthwashes are effective for hindering bacterial attachment, colonization and metabolic action which eventually influences bacterial development.⁴ Kidodent which contains chlorhexidine is as gold standard chemotherapeutic agent for the reduction of *S. mutans* count even in pediatric population. Chlorhexidine is a powerful antimicrobial agent. It has the ability of binding to a

variety of substrates and at the same time maintains its antibacterial activity for a long period of time.⁵ There have been many interests for a herbal mouthwash as it can reduce the side effects of chlorhexidine.

Coriandrum sativum is a therapeutic plant, which belongs to the species *Umbelliferae*. *C. sativum* have been used in Indian culinary as fresh leaves or powdered form as it helps in reducing cholesterol levels, and digests the food.

Therefore an attempt was made to prepare a mouthwash with a commonly available herb in India that is, coriander. Hence, this study aims to evaluate the effectiveness of coriander seed oil mouthwash as an anti-bacterial agent against *S. Mutans* in children.

Materials and methods

Source of the data

After obtaining institutional ethical clearance (AME/DC/216/19-20) as per the code of ethics of the world medical association and declaration of Helsinki and residential school consent form, children aged 8-12 years were selected and the study is conducted from 21st August 2019 to 1st October 2019.

Trial design

The present study is a three-arm, parallel design, pragmatic, effectiveness, fixed-size double-blinded placebo-controlled randomized control trial.

Settings

The study is conducted in the Morarji Desai Residential School of Raichur district, Karnataka selected by lottery method of simple random probability sampling technique in collaboration with the Department of Pharmaceutics, V.L College of Pharmacy, Raichur District, Karnataka and Department of Microbiology, LVD College, Raichur District, Karnataka.

Participants

Children age 8-12 years who are willing to participate, free from systemic illness were included whereas children who cannot expectorate and who have been under antibiotics from the past one month being the exclusion criteria.

Sample size determination

A power analysis was established by G*power, version 3.0.1(Franz Fauluniversitat, Kiel, Germany). A sample size of 45 subjects (15 in each group) would yield 95% power to detect significant differences, with effect size of 0.25 and significance level at 0.05

Interventions

After obtaining the ethical clearance from the institutional ethical committee and the Parent consent. The children who met the inclusion criteria were divided into three groups by block randomization with 15 children in each group.

Group I – Kidodent mouthwash (KM)

Group II – Coriander seed oil mouthwash (CSOM)

Group III – Distilled water (DM)

Before the start of the study, all the participant's oral prophylaxis is performed. One hour after the morning meal, under the supervision of teacher, participants were advised to administer 10 ml of mouthwash and instructed to swish for 30 seconds and spit. Unstimulated saliva samples were collected in disposable sterile containers at baseline, 7th day, 10th day and 15th day within 30 minutes after the administration of mouthwash and subjected to microbiological analysis of S.mutans

Preparation of Coriander Seed Oil Mouthwash

Commercially available Coriander seed oil (Globatic herbs) of 0.5 ml was added to 25 ml of 90 % ethyl alcohol to this 1ml of food grade coloring agent was added & the resultant was a broth solution.

2ml of broth solution was added to 400ml of distilled water and the mouthwash was prepared.

The trial design included 15 healthy children in each group namely Group I(Kidodent, Indoco Remedies Ltd.), Group II(Coriander) & Group III(Distilled water) aged between 6-8 years for 15 days. Participants were asked to rinse with mouthwashes for 30sec once daily hour after breakfast. Saliva samples were collected on Baseline 7th& 15th day for inoculation on to the media.

Microbiological Procedure

The selective media for Streptococcus media is Salivariusmitis agar. The media is prepared by taking 90grams of salivariusmitis and 32grams of agar (Type I agar agar for solidification) adding to 1000ml of distilled water and autoclaved (121⁰c 15 lbs 15 min). The resultant sterile media was poured into the Petri dishes (100X15mm) in a laminar airflow cabinet under UV light. Further, 1 ml of collected unstimulated saliva samples were diluted by serial dilution method and inoculated onto the media using standard inoculating loop by streak method. These Petri dishes were incubated for a period of 24hours. The Petri dishes were opened after 24 hours and colonies were counted using manual colony counter units and expressed as colony-forming units per milliliter.

Statistical Analysis

The Data was tabulated and statistically analyzed using Graph Pad Prism V.5. The quantitative data is analyzed by a one-way ANOVA test for intergroup comparisons whereas intragroup analysis performed by Repeated measures ANOVA. Finally, the Bonferroni test was used to assess the significance of changes for comparisons. The level of significance is set at 0.05 ($p<0.05$).

Results:

Intragroup analysis

Coriander seed oil mouthwash

When analyzed at different time intervals, the efficiency of CSOM in the reduction of S Mutans count is as 15th day greater than 7th day followed by 10th day with means scores 1.82±0.255, 1.93±0.113, 2.13±0.412 respectively, which is more statistically significant ($p=0.002$) (Table 1)(Figure 1).

Distilled Water and Kidodent Mouthwash

When baseline to 15th day is compared, both KM and DWM, the reduction in a mean score of streptococcus mutans is highest on 15th day (1.51±0.292 & 4.06±0.260) followed by 7th day with mean 1.74±0.110 and 4.48±0.150 respectively, and 10th day, the mean reduction of S Mutans

being 1.90 ± 0.275 and 4.78 ± 0.150 respectively. The difference between the means score was found to be highly significant ($p < 0.001$)(Table 1)(Figure 1).

Intergroup analysis

At baseline, the mean colony count of Streptococcus Mutans is 2.05 ± 0.420 for CSOM whereas for DWM and KM is 6.75 ± 0.45 and 2.06 ± 0.549 respectively. On the 7th day, the mean score of CSOM, DWM, and KM are reduced to 1.93 ± 0.113 , 4.78 ± 150 , and 1.74 ± 0.110 respectively. Similarly, the mean score on 10th and 15th day are 2.13 ± 0.412 , 6.46 ± 0.785 , 1.90 ± 0.275 , 1.82 ± 0.255 , 4.06 ± 0.260 , and 1.51 ± 0.292 respectively. The difference between the three groups at baseline, 7th day, 10th day and 15th day is highly significant ($p < 0.001$) when analyzed statistically by Anova (Table 2)(Figure 2).

Furthermore, when analyzed through post hoc Bonferroni test, CSOM and KM compared with DW, at all-time intervals, CSOM and KM were found to be superior to DW which is highly significant ($p < 0.001$). But, when CSOM and KM were compared, the efficacy of both the mouthwashes was almost equal at three intervals whereas, on the 15th day, KM is superior to CSOM ($p = 0.006$) which is more statistically significant (Table 3).

Discussion:

Streptococcus mutans is the key factor for causing dental caries. The risk of caries in an individual is directly proportional to the colony forming units of S.mutans. These microbes gather in plaque and are profoundly acidogenic. They produce lactic acid and demineralize the tooth structure.⁶ Increase in the level of S.mutans count in the oral cavity, leads to the increase in the aggregation of plaque levels which in turn shows a higher caries risk. S.mutans levels is one of the significant focuses for caries anticipation and control.⁷Chlorhexidine is a broad spectrum antiseptic agent and has shown promising results in reduction of S.mutans.

In the present study, the residential school was selected to prevent bias from differences in the diet as all the participants will be on the same diet as the count of the S Mutans will be influenced by the diet and also there will be no follow up loss of the participants. Furthermore, the trial is considered as three-arm trial, as the experiment group is compared with one inactive placebo group and other active intervention.

Due to the awareness of the general population about herbal mouthwashes, the present study analyzed the effectiveness of *C. sativum* oil in reduction of *S. mutans* count. The coriander oil and its concentrates have promising antibacterial, antifungal, and antioxidative properties as different concoction segments, which hence assume an extraordinary part in keeping up the timeframe of realistic usability of nourishments by forestalling their decay.⁸ In an invitro study conducted by Sarojini Ramya Pillay and R. V. Geetha concluded that *C. sativum* showed a reduction of the activity of the *S. mutans*.⁹ Many plant extracts show a remarkable reduction in *S. mutans* count. Aloe vera and tea tree oil¹⁰, pomegranate and grape seed extract¹¹ and cranberry¹² showed a great reduction in bacterial count.

Mahesh R et al¹³ carried out a study on individuals aged 18-20 years to check the effectiveness of cranberry mouthwash when compared with chlorhexidine. The sample size was estimated to be 50, and the samples were randomly selected and divided into two groups named Group A and Group B. The subjects were asked to rinse twice daily for 14 days with 10 ml of the mouthwash. Chlorhexidine mouthwash demonstrated 69% decrease though Cranberry mouthwash indicated 68% decrease in colony forming units of *S. mutans*. Similarly, in the present study, the CSOM is better than CHX when analyzed on the 7th and 10th day but the 15th day, CHX mouth wash is better than CSOM.

Although the antimicrobial capacity of CSOM is comparable to chlorhexidine, long term trials with cross over study design and larger sample size would be needed further to completely evaluate the efficacy of CSOM.

Conclusion:

Coriander seed oil mouthwash was greatly useful in the reduction of *Streptococcus mutans* count to a degree equal to Kidodent mouthwash. The conclusions of the present study are as follows:

1. The antimicrobial efficacy of CSOM is comparable to CHX. Hence, CSOM can be an alternative to CHX
2. As CSOM is prepared from a plant extract, it will be a cost-effective approach in preventing dental caries, especially in low socioeconomic strata.

Acknowledgments:

We would like to thank Mrs. Kamala, Head of the department, Department of Microbiology, L.V.D Degree college, Raichur, Karnataka, for microbiological procedure assistance and Principal and HOD of Department of Pharmaceutics, V.L College of Pharmacy, Raichur, Karnataka.

Conflicts of Interest:

There are no conflicts of interest.

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TABLE 1: COMPARISON AMONG THE GROUPS AT DIFFERENT TIME INTERVALS USING ANOVA

		N	Minimum	Maximum	Mean	Std. Deviation	F value	P value
15 th day	Coriander seed	15	1.42	2.30	1.82	.255	397.48	0.00*
	Distilled water	15	3.62	4.53	4.06	.260		

Received 15 December 2020; Accepted 05 January 2021.

	Kidodent	15	1.20	2.11	1.51	.292		
7 th day	Coriander seed	15	1.76	2.13	1.93	.113	2746.93	0.00*
	Distilled water	15	4.51	4.98	4.78	.150		
	Kidodent	15	1.54	1.92	1.74	.110		
10 th day	Coriander seed	15	1.76	2.80	2.13	.412	343.74	0.00*
	Distilled water	15	5.38	7.82	6.46	.785		
	Kidodent	15	1.43	2.56	1.90	.275		
Baseline	Coriander seed	15	1.61	2.93	2.05	.420	513.48	0.00*
	Distilled water	15	6.11	7.92	6.75	.405		
	Kidodent	15	1.43	2.91	2.06	.549		

FIGURE 1

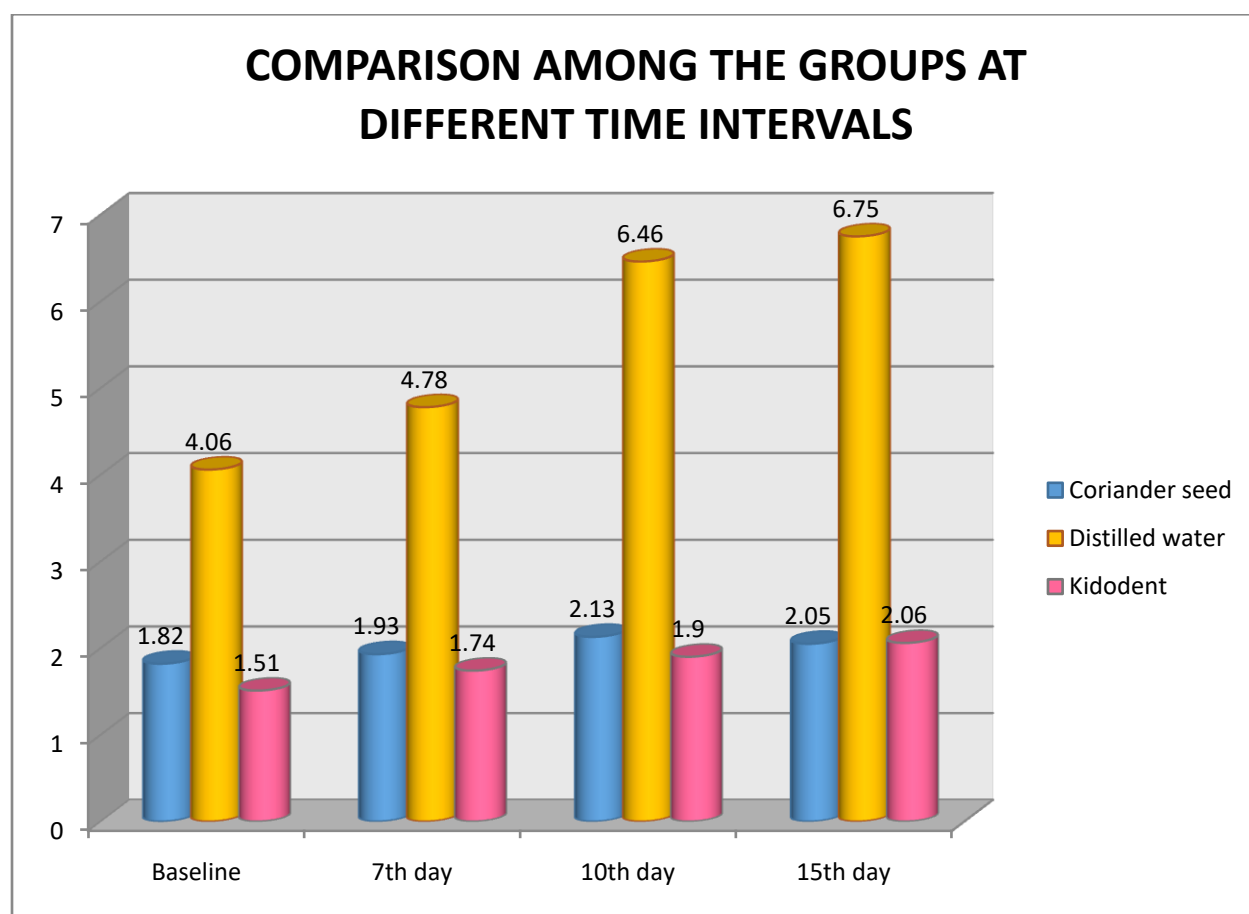
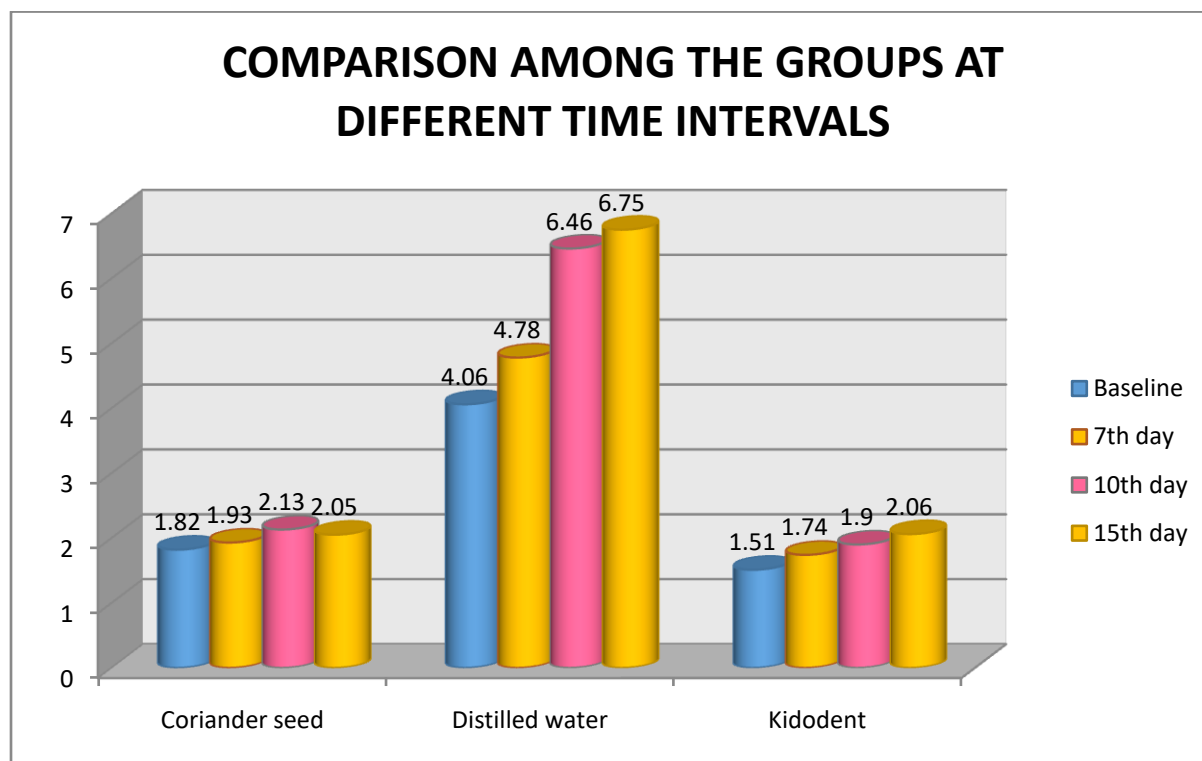


TABLE 2: COMPARISON WITHIN THE GROUP AT DIFFERENT TIME INTERVALS USING REPEATED MEASURES ANOVA

		N	Minimum	Maximum	Mean	Std. Deviation	F value	P value
Coriander seed	15 th day	15	1.42	2.30	1.82	.255	2.96	0.07
	7 th day	15	1.76	2.13	1.90	.113		
	10 th day	15	1.76	2.80	2.13	.412		
	Baseline	15	1.61	2.93	2.05	.420		
Distilled water	15 th day	15	3.62	4.53	4.06	.260	116.30	0.00*
	7 th day	15	4.51	4.98	4.78	.150		
	10 th day	15	5.38	7.82	6.46	.785		
	Baseline	15	6.11	7.92	6.75	.405		
Kidodent	15 th day	15	1.20	2.11	1.51	.292	7.41	0.003*
	7 th day	15	1.54	1.92	1.74	.110		
	10 th day	15	1.43	2.56	1.90	.275		
	Baseline	15	1.43	2.91	2.06	.549		

*significant

FIGURE 2**TABLE 3: POST-HOC BONFERRONI**

		Coriander seed		Distilled water		Kidodent	
		Mean diff	P value	Mean diff	P value	Mean diff	P value
15 th day	7 th day	-0.113	0.65	-0.72	0.00*	-0.22	0.10
	10 th day	-0.307	0.25	-2.40	0.00*	-0.39	0.022*
	Baseline	-0.232	0.69	-2.69	0.00*	-0.54	0.023*
7 th day	10 th day	-0.19	0.68	-1.67	0.00*	-0.16	0.17
	Baseline	-0.11	1.00	-1.96	0.00*	-0.32	0.24
10 th day	Baseline	0.075	1.00	-0.29	1.00	-0.15	1.00

*significant