



## Original Research Article

## Comparison of efficacy of 0.05% sodium hypochlorite with 0.2% chlorhexidine as A pre-procedural mouthrinse in periodontitis patients

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## ABSTRACT

**Aim & Objective:** The objective of the study is to compare the efficacy of 0.05% sodium hypochlorite and 0.2% chlorhexidine as a pre-procedural mouth rinse for routine periodontal procedures to reduce the amount of aerosols containing infectious agents.

**Materials and Methods:** A study was designed to be conducted on patients reporting to the outpatient department of Periodontology at Buddha Institute of Dental Sciences & Hospital, Patna. Patients with generalized severe chronic periodontitis were divided into 3 groups. 15 patients were made to rinse with 0.05 % sodium hypochlorite for 1 minute, (Group A), 15 patients with 0.2% chlorhexidine (Group B), and 15 patients with normal saline (Group C) for 1 minute before routine ultrasonic scaling procedure. A blood agar plate exposed at 20 inches from the patient's oral cavity was used for microbial sampling. It was incubated at 27°C for 24 hours and colony forming units (CFUs) were counted thereafter.

**Result:** There was statistically significant differences in the number of CFUs of the different groups.

**Conclusion:** Both 0.05% sodium hypochlorite and 0.2% chlorhexidine were effective in reducing aerosol contamination during ultrasonic scaling but 0.05% sodium hypochlorite had a significantly better effect than 0.2% chlorhexidine.

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### 1. Introduction

Aerosol production during ultrasonic scaling is a health hazard for patients, operator as well as the support staffs. The problem assumes a huge proportion in dental hospital set-ups, where multiple ultrasonic scalers are at work simultaneously for prolonged periods of time. One of the methods for reducing this health hazard is pre-procedural rinsing with a product containing an antimicrobial agent. Studies have shown that 0.2% chlorhexidine is efficacious in reducing aerosols generated during oral prophylaxis

using ultrasonic scalers.<sup>1</sup> Transmission of microorganisms from person to person may occur by direct contact with contaminated tissues or instruments or by aerosols containing infectious agents. Scaling is a basic periodontal treatment for the periodontal disease where there is removal of the bacterial plaque and calculus deposits from the surface of the teeth generates aerosol if done with ultrasonic scaler. Ultrasonic scalers are driven by generators, which convert electrical energy into ultrasonic waves via piezoelectricity or magnetostriction and are designed to facilitate scaling and root planing process.<sup>1</sup>

But using chlorhexidine as a pre-procedural rinse for all patients in a dental hospital is a financial extravaganza

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in itself. Keeping this in mind the present study has been designed to test the efficacy of diluted sodium hypochlorite as a pre-procedural rinse before ultrasonic instrumentation to reduce the amount of aerosols. Diluted sodium hypochlorite has no contraindication.<sup>2</sup> It does not evoke allergic reaction, it is not a mutagen, carcinogen or teratogen, and has a century long safety record.<sup>2</sup> It has also been designated by the American Dental Association Council on Dental Therapeutics as a mild antiseptic mouthrinse and has been suggested for direct application to mucous membrane.<sup>2</sup>

## 2. Objectives

The objective of the study is to compare the efficacy of 0.05% sodium hypochlorite and 0.2% chlorhexidine as a pre-procedural mouth rinse for routine periodontal procedures to reduce the amount of aerosols containing infectious agents.

## 3. Materials and Methods

### 3.1. Source of data

The study was designed to be conducted on patients reporting to the outpatient department of Periodontology at Buddha Institute of Dental Sciences & Hospital, Patna.

### 3.2. Inclusion criteria

1. Patients with generalized severe chronic periodontitis having at least 20 teeth
2. Systemically healthy patients
3. Patients who have not been on antibiotics in the last one month

### 3.3. Exclusion criteria

Pregnant and lactating females.

### 3.4. Preparation of the operatory

For this clinical study a closed operatory was selected, which was fumigated overnight prior to starting the procedure. Fumigation was performed by using a fumigator machine [GOLEY AEROSOL DISINFECTOR<sup>6</sup>] according to standard procedure.<sup>3</sup> The setup was kept constant for each patient.

### 3.5. Preparation of blood agar plates

Blood agar plates were prepared by technicians in the Department of Microbiology for microbiological analysis, with all the precautions to avoid any possible contamination. All the agar plates were kept in a plastic container which was thoroughly cleaned with a surface disinfectant and preserved in a refrigerator in a separate compartment.

Another similar plastic container was used to transport the agar plates from the incubator to the operatory and vice versa. Prior to starting the procedure, one blood agar plate was removed from the refrigerator and kept open in an incubator for 20 minutes at 37°C to allow the vaporization of the liquid layer which was formed due to freezing.<sup>3</sup>

### 3.6. Preparation of sodium hypochlorite solution

5% and 0.05% diluted Sodium hypochlorite solutions were prepared from the commercially available 5% solution

0.5% sodium hypochlorite solution was prepared by adding 900 ml of sterile water to 100 ml of 5% sodium hypochlorite solution.

0.05% sodium hypochlorite solution was prepared by adding 990 ml of sterile water to 10 ml of 5% sodium hypochlorite solution.

### 3.7. Sample size

The study group comprised of 45 subjects diagnosed with chronic generalized periodontitis which included 15 patients for each of the following groups:

1. *Group A:* Pre-procedural rinsing with of 0.05% sodium hypochlorite solution for 1 minute.
2. *Group B:* Pre-procedural rinsing with 0.2% chlorhexidine gluconate for 1 minute.
3. *Group C:* Pre-procedural rinsing with normal saline for 1 minute.

### 3.8. Study protocol

The following protocol was used for the study:

1. Using a high volume suction apparatus tube kept as close as possible to the tip of ultrasonic scaler, to prevent aerosol formation.
2. Using sterile water in the water storage container of dental chair which was changed after every patient.
3. Flushing of the entire tubing of dental chair waterline with distilled water for ten minutes every day.
4. 0.5% sodium hypochlorite solution was used for flushing the tubing of dental chair waterline for a period of 5 minutes. The same solution was allowed to stay in the tubing for ten minutes, followed by flushing with sterile water.<sup>3</sup>

### 3.9. Clinical procedure

Mandibular incisors and canines were selected as the area for scaling. A piezoelectric scaler was used for the study. Scaling was performed in the presence of a high-volume evacuator in the above mentioned area. Power and water flow settings of the scaler were kept the same throughout the

procedure for all three groups (0.05% sodium hypochlorite, 0.2% chlorhexidine, and normal saline). A disposable high-volume evacuator tip (with a diameter of 12 mm) was used for each patient. Pre-procedural rinse was advised to all 3 groups of the patients for 1 minute. One blood agar plate was used for microbial sampling. It was exposed at 20 inches from the patient's oral cavity.<sup>3</sup>

The ultrasonic scaling was carried out for 10 minutes and blood agar plates were exposed for a total of 20 minutes. The patient and investigator were still in their positions for 10 minutes after ultrasonic scaling to prevent any air turbulence that could cause dispersion of aerosol particles.<sup>3</sup>

### 3.10. Microbial analysis

After this procedure, blood agar plates were incubated in an incubator at 37°C for 24 hours. The next day, the blood agar plates were examined for colony forming units by a single microbiologist who was unaware of the procedure performed. The readings were then recorded on the designed form and sent for statistical analysis.

## 4. Results

Data regarding CFU counts was entered in Microsoft and were analysed by using statistical analysis software Graphpad Prism (version 5). For comparison of CFU, Kruskal- Wallis test was applied with Dunn's Multiple Comparison Test. 'p' value of less than 0.05 was accepted as indicating significance.

Table 1 A & B and Figure 1 show intergroup comparison of CFU between groups A, B and C. The mean values of CFU show that group C had the maximum number of CFU, followed by Group B and A respectively. This difference between the groups was statistically significant.

Table 1 B shows that there were statistically significant differences in the number of CFUs when group A was compared to group B, group A was compared to Group C and group B was compared to group C.

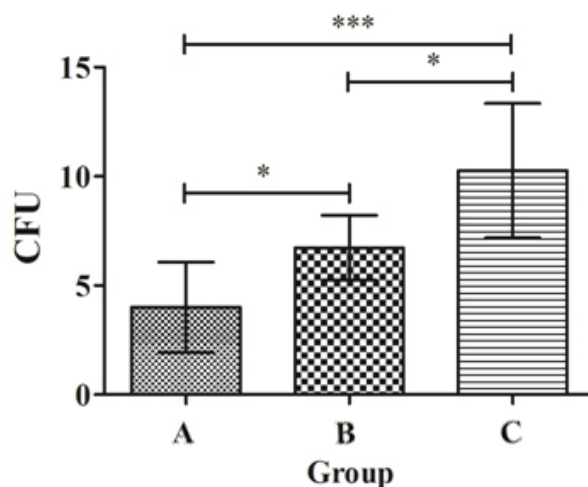
**Table 1:** Comparison of Inter- group CFU between Groups A, B and C.)

Group	Mean±SD	P Value
A	4.00±2.07	
B	6.73±1.49	<0.0001
C	10.27±3.08	

Kruskal-wallis test, significant (s), non-significant (ns)

## 5. Discussion

Aerosols are defined as the suspension of liquid or solid particles which may contain viruses and bacteria which are suspended in gas for few seconds. The size of the particle may vary from 0.001 mm to more than 100 μm.<sup>4</sup> Periodontal therapy requires the use of ultrasonic scalers,



**Fig. 1:** Inter- group comparison of CFU between Groups A, B, & C.

Table 1 B (Comparison of CFU between Groups A & B, A & C and B & C.)

Group	P value	Significant
A vs B	P < 0.05	s
A vs C	P < 0.05	s
B vs C	P < 0.05	s

Dunn's multiple comparison test, significant (s), Non-significant (ns)

which have the propensity of generating numerous air borne particles, (derived from blood, saliva or dental plaque and/or calculus) which in turn have detrimental effects on both the clinician and the patient. In the present study, the efficacy of pre-procedural rinsing for 1 minute with 0.05% sodium hypochlorite was compared with 0.2% chlorhexidine which is usually considered as a gold standard for limiting the splatter of aerosols. The results of the present study showed that bacterial CFU were found in all the three groups, but the mean number of CFU was greatest in group C (normal saline), followed by group B (0.2% chlorhexidine) and minimum in group A (0.05% sodium hypochlorite). The intergroup comparisons between groups A vs B, A vs C and B vs C were all highly significant, showing that group A (0.05% sodium hypochlorite) was most effective as a preprocedural mouthrinse for reduction of aerosol. Group C (normal saline) was used as a control and had the maximum number of CFUs.

The findings regarding 0.2% chlorhexidine are in accordance with data recorded by Rajiv Saini, (2015), Rao and others (2015), Narayana et al. (2016), Yadav et al. (2017), and Rani et al (2018), all of whom have used 0.2% chlorhexidine as a preprocedural mouthrinse to combat aerosol production and found it to be effective in reducing aerosol contamination during ultrasonic scaling.

Studies regarding sodium hypochlorite as a pre-procedural mouthrinse could not be found in the literature but there are studies which have concluded that 0.05% sodium hypochlorite constitutes an efficacious mouth rinse in periodontal health care (Nardo et al. 2012).<sup>2</sup>

According to Nardo et al. dilute sodium hypochlorite can serve as a useful antimicrobial agent in the prevention and treatment of most types of periodontal disease.<sup>2</sup> Jorgen Slots in 2012 presented sodium hypochlorite as an efficacious, highly safe, minimally invasive, practical and inexpensive therapy for the prevention and treatment of periodontitis. Since then, sodium hypochlorite has been tested as a mouthwash. According to Rich S K et al. 2015 sodium hypochlorite constitutes a valuable adjunct to current methods of plaque removal.<sup>5</sup> This has also been validated by Gonzalez et al 2015.<sup>6</sup> However studies regarding the use of sodium hypochlorite as a preprocedural mouthrinse could not be found.

Although 0.2% chlorhexidine represents the gold standard of preprocedural mouthrinse it was thought that the use of 0.05% sodium hypochlorite would be more cost effective in a hospital based set up, where a large numbers of patients undergo ultrasonic scaling everyday as a part of their periodontal therapy. In the quest to procure a more cost effective preprocedural mouthrinse than chlorhexidine in the present study, the results showed that 0.05% sodium hypochlorite is more effective as a preprocedural rinse than 0.02% chlorhexidine (the number of colony forming units in group A is much less than that in group B and the difference is highly significant statistically).

## 6. Conclusion

The present study concludes that aerosol production cannot be totally eliminated during ultrasonic scaling but can be minimized by preprocedural mouthrinsing. Both 0.05% sodium hypochlorite and 0.2% chlorhexidine were effective in reducing aerosol contamination during ultrasonic scaling but 0.05% sodium hypochlorite had a significantly better effect than 0.2% chlorhexidine. Being cheaper than chlorhexidine at the same time, 0.05% sodium hypochlorite can be recommended as a pre procedural mouthrinse especially for hospital set-ups.

## 7. Source of Funding

None.

## 8. Conflict of Interest

None.

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