



# Effectiveness Of Pre-Procedural Rinse During Periodontal Prophylaxis In Reducing Dental Aerosols: A Clinico-Microbial Study

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## Abstract

**Background:** The aerosol generated by an ultrasonic scaler contains microorganisms that can penetrate into the body of dental surgeons and patients through the respiratory system. The aim of this study is to evaluate and compare the efficacy of commercially available preprocedural mouthrinse containing 0.2% chlorhexidine gluconate (CHX) and water in reducing the levels of viable bacteria in aerosols.

**Methods:** This single-center, double-masked, placebo-controlled, randomized, two-group parallel design was conducted over a period of three months. Twenty chronic periodontitis patients were divided randomly into two groups (Group I & II) of ten patients each to receive 0.2% chlorhexidine gluconate and water respectively, as a preprocedural rinse. The aerosol produced by the ultrasonic unit was collected at patient's chest area on blood agar plates in the two groups. The blood agar plates were incubated at 37°C for 48 hours, and the total number of colony-forming units (CFUs) was counted and statistically analyzed.

**Results:** The results showed that CFUs in CHX group was significantly reduced compared with group-II <0.001.

**Conclusion:** This study suggests that a routine 0.2% chlorhexidine gluconate (CHX) preprocedural mouthrinse could eliminate the majority of bacterial aerosols generated by the use of an ultrasonic unit.

**Key Words:** dental aerosols; chlorhexidine mouth wash; ultrasonic scaling

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**Introduction:** The oral cavity harbors numerous bacteria and viruses from the respiratory tract, dental plaque, and oral fluids. Any dental procedure that has a potential to aerosolize saliva will cause airborne contamination with organisms. Dental handpieces, air polishing devices, ultrasonic scalers, and air abrasion units produce airborne particles by the combined action of water sprays, compressed

air, organic particles such as tissue and tooth dust, and organic fluids such as blood and saliva from the site where the instrument is used.<sup>1</sup> Miller<sup>2</sup> found that aerosols generated from patients' mouths contained up to a million bacteria per cubic foot of air. Current research suggests that having patients use an antimicrobial rinse before treatment may decrease microbial aerosols.<sup>3-5</sup> Chlorhexidine is



considered the gold standard of antimicrobial rinses because of broadspectrum antibacterial activity and substantivity of upto 12 hours.<sup>6</sup> Thus, the aim of this study is to evaluate the efficacy of bacterial aerosol contamination generated by ultrasonic scalers following 0.2% chlorhexidine gluconate (CHX), and water as pre-procedural rinse.

**Materials and Methods**

This single-center, double-masked, placebo-controlled, randomized, two-group parallel design was conducted over a period of 90 days in the department of periodontology of Rama Dental College, Kanpur. 20 severe, generalized chronic periodontitis patients (12 males and 8 females) of age range Of 34-50years were finalized for the study after meeting after checking for the inclusion criteria.

Inclusion criteria included:

- 1) a minimum of 20 permanent teeth
- 2) five or more sites with pocket probing depth of ≥4 mm
- 3) nontobacco
- 4) mean plaque score of 2.0 to 3.0 on the plaque index (PI); and
- 5) systemically healthy patients.

Exclusion criteria for the study were:

- 1) patients on systemic or topical antibiotics
- 2) oral prophylaxis within last 3-6 months
- 3) requiring other dental procedures prior to scaling
- 4) women who were pregnant or lactating.

Blood agar plates were used to collect airborne microorganisms and were kept at patient’s chest area. Johnston et al.<sup>7</sup> proved that blood

agar plates are a valid medium for culturing airborne bacteria. The same closed operatory was used for all treatment procedures which was disinfected for each patient before each appointment. Only one patient was treated per day to allow the room to be free of aerosols. Prophylaxis was carried out with a piezoelectric ultrasonic scaler during each treatment, and motorized suction was used. The patients were randomly allocated to one of the two groups (group I: 0.2% CHX; group II: water) after explaining the procedure and obtaining a written informed consent from them. The examiner recorded the PI score and transferred the patient to the operator who was not a part of the study. The preprocedural rinse was given to participants, and once the patients performed the rinse, the operator performed scaling. Ten minutes before treatment, patients rinsed for 1 minute with 10 ml of 0.2% CHX, or water followed by 30 minutes of ultrasonic scaling. During and 30 minutes after the treatment, the coded blood agar plates were left uncovered at the sites to collect samples of any aerosolized bacteria and then incubated at 37°C for 48 hours, and the total number of colony-forming units (CFUs) was counted and statistically analyzed. For statistical analyses, individual measurements were summarized within each individual and then analyzed. Average scores were calculated for age, number of teeth, and PI by summing the values and dividing by the number of participants in each group. Statistical analysis was performed using statistical software. P values < 0.05 was considered statistically significant.

**Results**

Group	Mean CFU	SD
Water	118.4	11.4
0.2% CHX mouthwash	32.9	9.3

Table:1- Evaluation of preprocedural-rinse bacterial colony forming unit count among the two groups

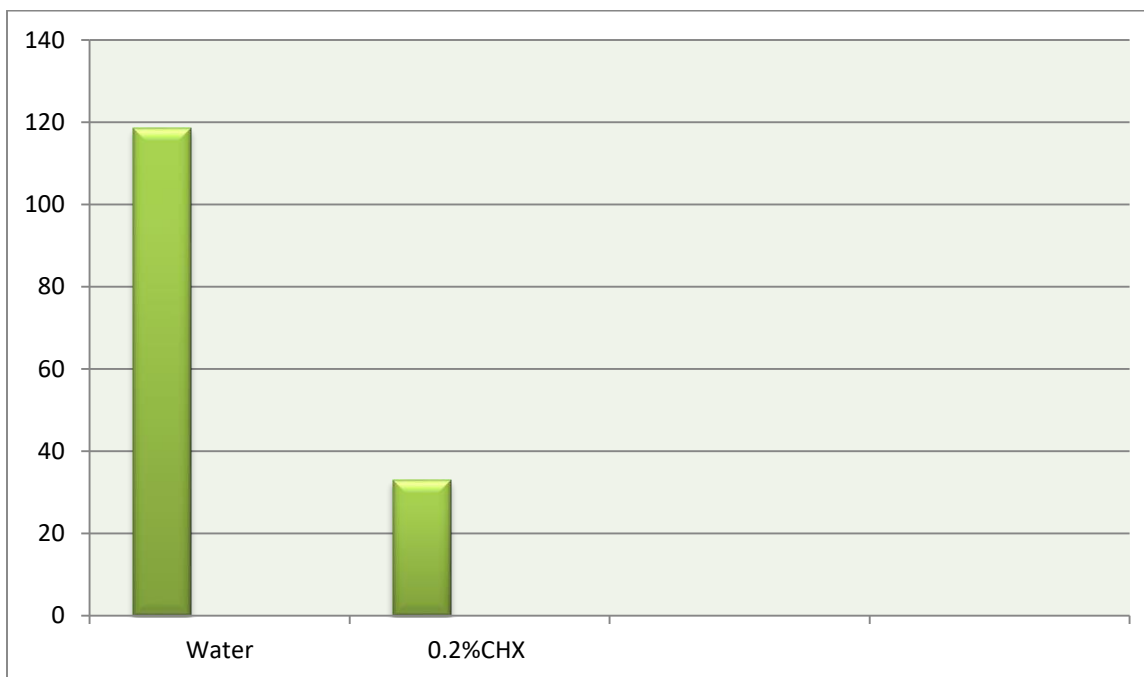
This table evaluates the post-rinse bacterial colony-forming unit counts among the groups. Post-rinsing, the maximum bacterial colony-forming unit count was seen in water group (118.4 ± 11.4) followed by the 0.2%CHX group (32.9 ± 9.3).



Group	Mean difference in CFU	p-value
Water vs 0.2% CHX	85.50	<0.001*

Table:2-Intergroup comparison of preprocedural-rinse bacterial colony forming unit count

This table presents the intergroup comparison of preprocedural-rinse bacterial colony-forming unit counts among the groups. The CHX group showed significantly lesser post-rinse bacterial colony-forming unit counts as compared to the water group.



Graph showing post-rinse CFU in water and CHX pre-procedural rinse group

Thus, the result of our study shows that there was a statistically significant difference in the bacterial colony forming unit count among the two groups after pre-procedural rinse prior to the routine ultrasonic scaling procedure in chronic periodontitis patients. The study demonstrates the superiority of 0.2% CHX mouthwash as a pre-procedural rinse. Result of our study also proves that pre-procedural rinse is an efficient method for decreasing aerosol cross contamination during normal ultrasonic procedures.

**Discussion**

Aerosol is a suspension of solid or liquid particles containing bacteria or viruses, suspended (for at least a few seconds) in a gas. Particle size may vary from 0.001 to >100 mm.<sup>8</sup> The smaller particles of an aerosol (0.5 to 10

mm in diameter) have the potential to penetrate and lodge in the smaller passages of the lungs and are thought to carry the greatest potential for transmitting infections.<sup>1</sup>

Pre-procedural rinsing for clinical dental procedures has long been advocated for and, during the current pandemic, its importance to practice is more relevant than ever. A range of different pre-procedural mouth rinses have been tested (mostly chlorhexidine), of varying concentrations and amounts, and for dental procedures of different durations and using different techniques with and without additional means. This also supports the need to include the pre-rinsing procedure for dental patients as one of the mandatory SOP in current practice.<sup>9</sup>



Research by Larato, Ruskin, and Martin has demonstrated that when an ultrasonic scaler is used to scale teeth, a significant amount of organisms are released into the surrounding air. The most frequent microorganisms found in aerosols that might lead to diseases include Legionella, M. tuberculosis, Bacillus anthracis, Staphylococci species, Streptococci species, and endotoxins produced by gram-negative bacteria.<sup>10</sup> Kosutic et al. discovered a statistically significant decrease in oral bacterial counts in saliva samples collected at the end of the surgical operation and five minutes after rinsing. Comparing 0.2% chlorhexidine to 2% povidone-iodine and saline solutions revealed that the former had a greater impact and a longer duration of action.<sup>11</sup>

In a study by Muir and colleagues, it was discovered that a two-minute pre-rinse with chlorhexidine (Peridex, Procter and Gamble) greatly decreased the amount of aerosols made by ultrasonic scalers. The microbiological content of the aerosols created during treatment with an ultrasonic scaler was shown to be reduced, according to data from Fine and colleagues, when patients rinsed their mouths with an antiseptic mouthwash.<sup>12</sup>

Our study too provides additional evidence to the importance of usage of pre-procedural mouthrinse in reducing the levels of bacteria in aerosols produced during a routine dental procedure.

### Conclusion

This study suggests that a routine 0.2% chlorhexidine gluconate (CHX) preprocedural mouthrinse could eliminate the majority of bacterial aerosols generated by the use of an ultrasonic unit.

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