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ORIGINAL ARTICLE

Effectiveness of Mouthrinses and Oral Prophylaxis on Reduction of Microorganisms Count in Irreversible Hydrocolloid Impression: An In Vivo Study

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Abstract Dental impressions, contaminated with saliva, blood, plaque, are potential source of infection. All impressions should be disinfected after their removal from mouth to prevent cross contamination. Different methods have been tried to disinfect the commonly used irreversible hydrocolloid impression material, but they have been shown to influence the dimensional stability and surface detail of the impression which ultimately affects the precision of the final prosthesis. The aim of this study was to evaluate the efficacy of pre-procedural oral prophylaxis and mouthrinses in reducing the overall microbial load intraorally as well as on alginate impression surface. A total of 60 positive cases selected from 100 subjects who were partially edentulous and above 18 years of age and without medical or pharmacotherapy histories were studied over a period of 18 months, from outpatient clinic of Department of Prosthodontics, GNIDSR. Alginate impressions, before and after prophylaxis were examined microbiologically for the persistence of test microorganisms on the untreated (control group) and the impressions made after treatment. The data were statistically analyzed by the Student *t* test to assess the effectiveness of the procedure and also the comparative effectiveness of oral prophylaxis and commonly used mouthrinses. The results showed that the impressions were safer when made after oral prophylaxis and/or mouthrinses

Keywords Cross-contamination · Irreversible hydrocolloid impressions · Disinfection · Mouthrinses · Oral prophylaxis

Introduction

Prevention of cross contamination is the mainstay in clinical dentistry. Various literature and studies proved the transmission of infections via saliva and blood as a potential occupational hazard in prosthetic dental procedures. Impressions made from patient's mouth were often found to be heavily contaminated with microorganisms from saliva and blood [1–4].

Irreversible hydrocolloid or alginate is one of the most widely used baseline impression material. Alginate impressions, because of their composition, texture and hydrophilic setting mechanisms get easily contaminated with microorganisms present in the oral cavity [5]. Also microorganisms in the oral environment can become incorporated into the gelling impression material because of the presence of saliva or other oral fluids [6, 7]. Retention of bacteria is 3–4 times greater in alginate compared to elastomeric impression materials [2, 8]. It was proposed that the matrix of the irreversible hydrocolloid provides a protective microenvironment for bacteria [6]. The increased porosity may allow the organisms to penetrate to levels not reached by the disinfectants. This entrapment limits the efficacy of the water rinse, and the alginate gel structure may inhibit penetration by the disinfectant [6].

Infectious agents may pass from patients to the clinician or the laboratory personnel who handle the patients' work at the various stages of fabrication and thereby may cause cross contamination [9, 10]. To avoid the contamination of dental office staff and dental technicians, it is recommended that

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impression should be disinfected immediately after their removal from mouth. There are several works on different disinfection methods for irreversible hydrocolloid impression materials. Rinsing impression under running tap water was proposed earlier which later turned out to be an ineffective infection control method [1]. It was found that no more than 40 % of the contaminating bacteria were removed from the impression surface by rinsing with water and immersion in a water bath [6]. Immersion of impression in chemical disinfectants (e.g.1 % sodium hypochlorite solution) jeopardized surface details which could affect the final result of dentures [11] and show significant dimensional change [12]. Also the efficacy of the sodium hypochlorite solution was diminished with metal impression trays [13]. Moreover alginate impression necessitates an immediate pour due to the material's dimensional instability. So disinfection should also be carried out with a procedure that requires the minimum amount of time [8, 14].

Some operators were shown to exhibit sensitivity to glutaraldehydes as well as iodine and chlorine containing solutions while handling those agents [15].

The use of disinfectant aerosol sprays did not completely reach the contaminated impression surface, resulting in a less reliable procedure [16–18]. Antimicrobial agents like chlorhexidine etc. were incorporated into the alginate impression material, but the biological acceptance, dimensional stability and compatibility with gypsum have to be tested further before universal acceptance [19]. It was reported that the incorporation of quaternary ammonium compound into an irreversible hydrocolloid impression material resulted in a greater incidence of dermal and mucosal irritation [20].

So it was obvious that till date impressions were treated to prevent cross-contamination and those disinfection method has been shown to have deleterious effect on the impression material as well as impression itself. There was another relevant aspect of the situation which became prominent from a study conducted in 2010 [21]. They surveyed 54 dental colleges in India, and found that chemical disinfectants were not available always. Forty-one participants (75.9 %) reported that the impressions were simply washed under running water between patients, while 13 participants (24 %) reported that the impressions were disinfected. Considering the above, this study was thus aimed to find out various alternative techniques to control cross contamination through alginate impression without the risk of altering the properties of alginate. The idea was to disinfect the area to be impressed to reduce the source microorganisms. It has been proved that chemical antimicrobial substances are capable of inhibiting bacterial adhesion, colonization and metabolic activity ultimately affecting the bacterial growth and reducing their level in the oral cavity [1, 22]. Oral prophylaxis mechanically removes plaque and biofilm as well as plaque retained microorganisms. It has been established by various researches that a pre-procedural oral prophylaxis and mouth rinsing with chlorhexidine, essential oils and povidone iodine result in reduced intra oral bacterial count. So those methods can reduce the intraoral source bacteria into the gelling impression and thus favors the control of cross contamination. Exploring these above methods that utilize commonly rendered procedures like oral prophylaxis, mouthrinses in addition to the standard disinfection protocols can indeed give a new direction to prevent cross-contamination. The proposed method, if found to be effective, will prevent the impression from getting contaminated without altering the quality of impression, as well as it will improve the oral hygiene status of the patient.

The objective of the present study is to evaluate the efficacy of pre-procedural oral prophylaxis and mouthrinses in reducing the overall microbial load on alginate impression surface without using any external agent on the impression itself. The study will also strive to achieve the objective of comparing methods to prepare the mouth in order to reduce organism loads in impressions taken from them.

The micro-organisms selected for the study included a common prototype bacterial pathogen in the form of *Staphylococcus aureus*, and the commonest fungal intraoral pathogen *Candida albicans*. The specific objective of this study was to evaluate the efficacy of oral prophylaxis (scaling) and commonly used antimicrobial mouthrinses (chlorhexidine gluconate 0.12 %, povidone iodine 2 %, essential oil mouthrinse) in reducing the overall microbial load (*Staphylococcus aureus*, *Candida albicans*) from alginate impression surface.

Methods

This study was conducted entirely in Guru Nanak Institute of Dental Science and Research, 157/F Nilgunge Road, Panihati, Kolkata 700114, over a period of 18 months after necessary approval by the ethics committee of the Institute. A total of 100 subjects who were partially edentulous and above 18 years of age and without medical or pharmacotherapy histories were randomly selected from outpatient clinic of Department of Prosthodontics. Informed consent was obtained from all subjects in accordance with the Informed Consent Form Template for Clinical Studies of World Health Organization Research Ethics Review Committee. After primary screening 60 patients who were positive for both or either of the test organisms were finally selected for the study. Each individual was subjected to oral prophylaxis and three different types of mouthrinse regimen. Impressions were made before any treatment for

the control group and after treatment for other groups in the following manner:

Group A: Impression made without any oral prophylaxis (control group).
Group B: Impression made after full mouth scaling of the subject.
Group C: Impression made after mouth rinse regimen with 10 ml of Chlorhexidine gluconate 0.12 % for 30 s.
Group D: Impression made after mouth rinse regimen for 30 s with 5 ml of povidon iodine 2 % diluted with 5 ml of water.
Group E: Impression made after mouth rinse regimen with 20 ml essential oil mouthrinse for 30 s.

For Group A two impressions, one for each test microorganisms, were made. Depending on the result of the Group A, subsequent impressions were made for Group B to Group E, only for the positive microorganisms.

Waiting periods of at least 3 days were allowed between rinsing regimens [23].

Impression Making

Perforated metal tray, rubber bowl, spatula, were sterilized by autoclaving them before the impressions are made. Alginate was mixed with sterile distilled water as per manufacturers' instruction. For each patient same number of upper impression tray was used for each group in order to keep the surface area of the impression constant. All the culture media used were prepared according to manufacturers guideline and were sterilized by being autoclaved and were ready chairside before making impression (Fig. 1).

Isolation and Detection of Microorganisms

Division 1: For *Stapylococcus aureus* : For detection of *Staphylococcus*, alginate impression with the tray was directly placed on culture plate containing mannitol salt agar media for inoculation of specimen. Positive cases showed growth of yellow colonies of *S. aureus* after aerobic incubation at 37 °C. Number of colonies on the Petri dish were counted and noted (Fig. 2). Gram stain smear of the colonies showed Gram positive cocci in clusters under compound microscope (Fig. 3). Coagulase tests (the slide test and tube test) were done for further confirmation. Detection of methicillin sensitive *S. aureus* (MSSA) or methicillin resistant *S. aureus* (MRSA) was done with disc diffusion test using oxacillin impregnated disc.

Division 2 : For *Candida albicans* : For detection of *Candida albicans* impression was directly placed in Sabouraud's dextrose agar medium with antibiotic (tetracycline) and incubated at 37 °C for 1–2 days. Positive cases showed cream coloured, smooth pasty colonies (Fig. 4). Number of colonies are counted. Gram stain smear showed budding yeast cells (Fig. 5) and pseudohyphae. *Candida albicans* was differentiated from other species by germ tube test (Fig. 6).

The results of the study was statistically analyzed. The values of averages of all the Groups for test microorganisms were charted and the standard deviation was calculated. Student *t* test was run and the tables derived are presented. Then for each tables the average values were compared between the various groups and the individual difference of means were subjected to Student paired '*t*' test as per the following equation:

$t_k = \frac{\overline{d}}{s/\sqrt{n}}$ where $\overline{d}$ is the average value of the difference of each sample between groups, s is the standard deviation of the 'd' values, n is the sample size and k is degrees of freedom $= (n - 1)$. 't' value thus computed is compared with the critical value of 't' corresponding to the degree of freedom (k).If it is less than the critical value at 5 % level the result is treated as insignificant ($p > .05$) but if it exceeds the critical value at 5 % or 1 % or .1 % level it is treated as significant at that level (i.e. $p < .05$ or $p < .01$ or p .001 as the case may be).

Results

Staphylococcus aureus, specially the MSSA variety was detected in large numbers among the study population. 47 out of 60 subjects tested positive for MSSA while MRSA was found in 4 subjects. *Candida albicans* were detected in eight subjects which is very less in number as compared to the presence of *S. aureus*.

Staphylococcus aureus (Methicllin Sensitive) (Tables 1 and 2)

The effect of various treatment protocols on the colony counts of MSSA obtained from cultures of saliva from irreversible hydrocolloid impressions is shown in Table 1. The colony count displayed a high variability of the samples corresponding to the high variability of oral hygiene of the source patients. Thus the standard deviation values are all greater than the average values. Also it can be noted that with various treatment protocols subjected to the impressions, the averages of the samples of the independent groups (i.e., Group B, Group C, Group D, Group E) show a decrease in value with the lowest mean with Group C and

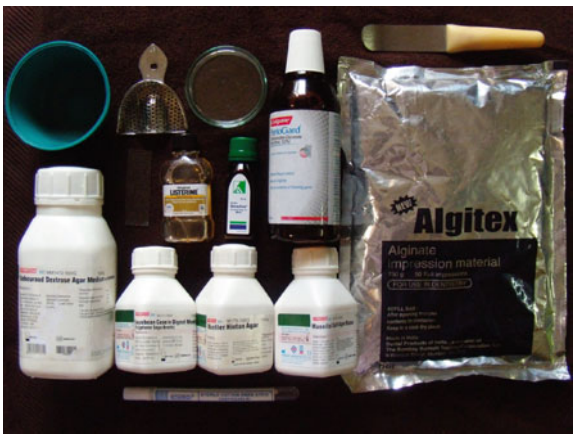

Fig. 1 Armamentarium required for the study

List of materials and instruments

Material	Manufacturer
Irreversible hydrocolloid impression material (Algitex)	Dental products of India (Mumbai)
Mouthrinses	
Chlorhexine gluconate 0.12 % (PerioGard)	Colgate
Povidone iodine 2 % (betadine)	Win—Medicare
Essential oil (listerine)	Johnson and Johnson
Ultrasonic scaler	Satelec
Culture media	
Mannitol salt agar	HiMedia Laboratories Pvt Ltd (Mumbai)
Muller Hinton agar	
Soyabean Casein digest medium (tryptone soya broth)	
Sabouraud dextrose agar with antibiotic (tetracycline/chloramphenicol)	
Lowenstein–Jensen media	
Oxacillin disc (1 mcg)	HiMedia Laboratories Pvt Ltd (Mumbai)
Cotton swab tube (sterile)	Nova Biotech (Kolkata)
Autoclave	Labquip (Kolkata)
Hot air oven	Tempstar (Kolkata)
Weighing machine	Dhona (Kolkata)
Incubator	Tempstar (Kolkata)
Compound microscope CH 21	Olympus (Japan)

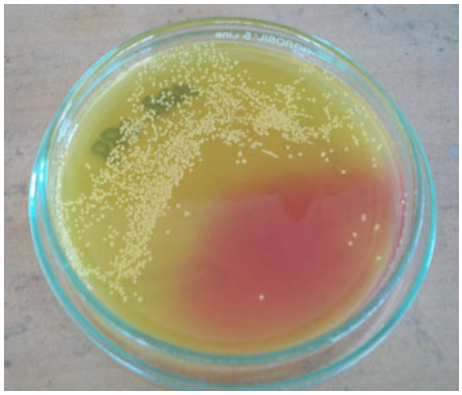

Fig. 2 *Staphylococcus aureus* colony on mannitol salt agar

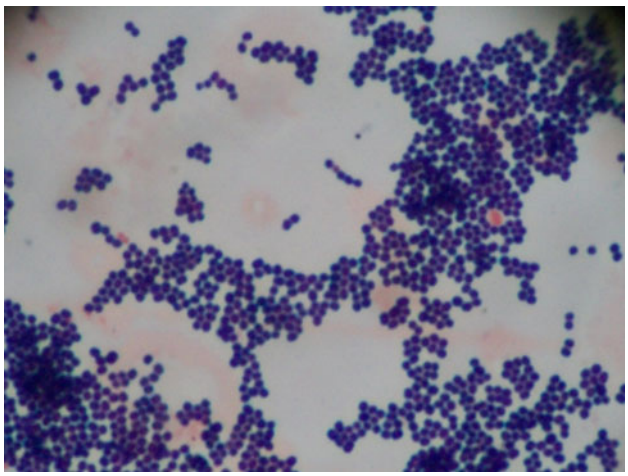

Fig. 3 Gram positive cocci in clusters (*S. aureus*)

Fig. 4 Colony of *Candida albicans* on SDA medium

the highest mean with Group B. In Table 2 below the average values are compared between the various groups and the individual difference of means are subjected to Student paired '*t*' test. It was found that the average value of Group B has decreased by 41.08 colonies which appears to be highly significant (as '*t*' value = 7.08, '*p*' value < .001 at degrees of freedom = 46). Also the mean

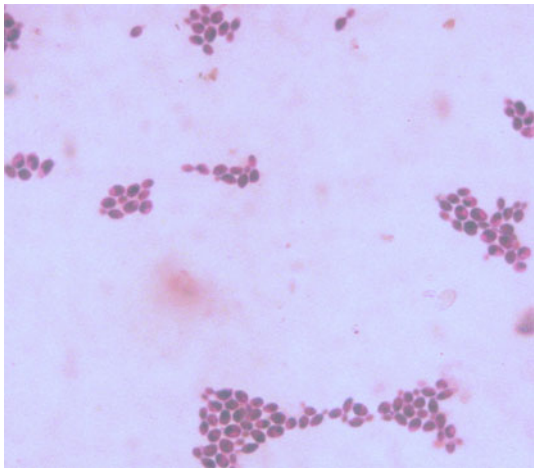

Fig. 5 Colonies of budding *C. albicans*

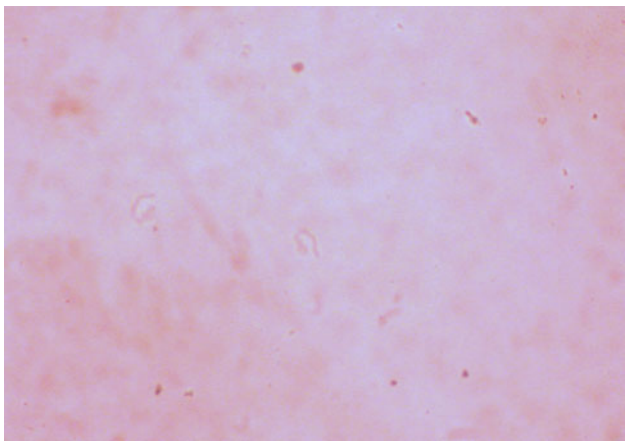

Fig. 6 Germ tubes of *C. albicans*

for Group C is less by 33.06 colonies and this difference in average of Group C and Group B are also highly significant ($t = 5.68$, 'p' value < .001 at d.f = 46). Again the mean value for Group C is greater than the mean value of Group D and the difference (4.68) is significant ('t' = 4.06, $p < .001$ at degrees of freedom = 46). As the average value for Group E is next in order of magnitude to that of Group B, we compare theses two values and find the decrease significant ('t' = 4.88, $p < .001$ at d.f = 46).

On a clinical perspective these statistically significant decreases in colony counts of MSSA over various independent groups of treatment protocols over the interval of the study gives a comparison of the efficacy of these treatment protocols. In Table 2 the large decrease in colony counts at the selected degree of freedom (d.f = 46) is with Group B and Group C where Groups D and E show less decrease in the values of mean colony counts. Thus it is statistically derived that the efficacy of scaling and chlorhexidine gluconate (0.12 %) in reducing the colony counts in saliva is more in comparison to povidone iodine

Table 1 Mean values of colony counts (number of colonies per culture plate) of MSSA in individual groups and their SD and range of values

	Group A	Group B	Group C	Group D	Group E
Average ($\bar{x}$)	82.35	41.27	8.23	12.21	16.9
SD	87.96	50.84	19.10	26.22	31.21
Range	3–300	0–215	0–75	0–109	0–115

(2 %) and essential oils. However Group E when compared to Group B alone shows significant decrease in colony counts which proves that in comparison to scaling alone essential oil is efficacious.

Methicillin Resistant *Staphylococcus aureus* (Tables 3 and 4)

Unlike MSSA, samples of MRSA was limited (4) in number, rare and hence the sample size was small that is an accepted limitation of this part of analysis. Here, compared to Group A (control) the average value of MRSA colonies in Group B is significantly lower (difference = 18.75; $t = 3.26$, d.f = 3, $p < .05$). The average value of Group E is next to that of Group B and the difference is 10.75 colonies which is significant ($t = 5.98$, d.f = 3, $p < .01$). All other differences, viz., between E and D, E and C, D and C are not significant at 5 % level ($p > .05$).

However the average value of Group D is significantly lower compared to Group E at 10 % level (difference = 2.50; $t = 1.89$, $p < .10$) Also the average of Group C is less than of Group E by 3.25 colonies which is though insignificant at 5 % level ($p > .05$) but significant at 10 % level ($p < .10$).

Thus inspite of limitation of findings due to small sample size, statistically significant reduction of colony counts were found in various groups and more so in Group B (with scaling) and Group C (with essential oils).

Candida albicans (Tables 5 and 6)

Compared to Group A the average value of Group B is less by 7.875 which is significant at 1 % level ($t = 4.41$, d.f = 7, $p < .01$). Next to Group B is the average value of Group E and their difference is 1.375 which is significant at 5 % level ($t = 2.76$, d.f = 7, $p < .05$). It can be seen that

Table 3 Average values of colony counts of MRSA in various groups

	Group A	Group B	Group C	Group D	Group E
Average ($\bar{x}$)	33.00	14.25	.25	1.00	3.50
SD (s)	16.79	6.08	.50	1.15	2.65
Range	12–53	7–21	0–1	0–2	1–7

the average value of Group D does not differ significantly from either Group E or Group C ($t = 1.16$ and .80 respectively; $p > .05$). However Group C has significantly lower average value compared to Group E ($t = 2.38$, d.f = 7, $p < .05$). Thus clinical perspective of this finding is that chlorhexidine gluconate (Group C) is statistically more efficacious compared to essential oils (Group E) in reducing the colony counts on alginate impression surface.

Finally, it can be summarized from Tables 1, 2, 3, 4, 5 and 6 that:

1. Chlorhexidine gluconate mouthrinse 0.12 % is effective in reducing overall count of methicillin sensitive *S. aureus*, methicillin resistant *S. aureus* and *C. albicans*.
2. Povidone iodine 2 % mouthrinse is also beneficial for reduction of all test organisms
3. Chlorhexidine gluconate 0.12 % is more effective than povidone iodine 2 % on reduction of test organisms. Here the '*p*' value is statistically significant for MSSA, but for MRSA and *C. albicans* the '*p*' values are not statistically significant.
4. Essential Oil Mouthrinse is less effective than the other two test mouthrinses on reducing MSSA ('*p*' value is statistically significant), MRSA ('*p*' value is not statistically significant) and *C. albicans* ('*p*' value is statistically significant when compared with chlorhexidine, but not so when compared with povidone iodine), but it is more effective than the scaling alone ("*p*" value is statistically significant).
5. Use of scaling and mouthrinses are more effective than using scaling alone.

Discussion

Irreversible hydrocolloid impressions can very well retain and transfer intraoral microorganisms and thus can cause cross contamination. From the results of the statistical

Table 2 Difference in means of colony counts in various groups, their standard deviation, *t* value and *p* value

	Group A–Group B	Group B–Group C	Group C–Group D	Group D–Group E	Group B–Group E
Difference in the means ($\bar{d}$)	41.08	33.06	−4.00	−4.68	24.37
SD	39.79	39.87	8.33	7.89	34.25
t Value	7.08	5.68	3.29	4.06	4.88
p Value	<.001	<.001	<.001	<.001	<.001

Table 4 Comparison of averages between groups

	Group A–Group B	Group B–Group E	Group E–Group D	Group D–Group C	Group E–Group C
Average difference ($\bar{d}$)	18.75	10.75	2.50	.75	3.25
SD (s)	11.50	3.59	1.73	.96	2.63
t Value	3.26	5.98	2.89	1.57	2.47
p Value	<.05	<.01	Not significant ($p > .05$)	Not significant ($p > .05$)	Not significant ($p > .05$)

Table 5 Average values of colony counts of *C. albicans* in various groups

	Group A	Group B	Group C	Group D	Group E
Average ($\bar{x}$)	10.25	2.375	.375	.625	1.0
SD (s)	6.09	2.20	.744	1.061	1.2
Range	3–19	0–6	0–2	0–3	0–3

analysis it can be summarized that the averages of the colony counts of the various groups show a decline in value for all the organisms studied. This proves the general efficacy of all pre-procedural protocols to reduce colony counts from the mouth before impression registration.

In Table 1 the study involving MSSA displayed a high variability of the samples corresponding to the high variability of oral hygiene of the source subjects. Also it can be noted from Supplementary Figs. S1, S2 and Table 1, that with various treatment protocols the averages of the samples of the independent groups (i.e., Group B, Group C, Group D, Group E) show a decrease in value with the lowest mean with Group C (impressions after mechanical plaque control and chlorhexidine mouthrinse) and the highest mean with Group B (impressions from subjects after mechanical plaque control). This substantiates the fact that chlorhexidine along with mechanical plaque control is more efficacious in comparison to mechanical plaque control alone to remove *Staphylococcus* colonies from patient's mouth.

Table 2 compares the decline in colony counts of MSSA in various groups in relation to one another to find out the relative efficacy of the various protocols. In this analysis the large decrease in colony counts at the selected degree of freedom (d.f = 46) is with Group B and Group C whereas Groups D and E show less decrease in the values of mean colony counts. Also in Supplementary Fig. S1, it can be well appreciated that in the comparison of relative efficacy of the different protocols Group C is the most effective followed by Groups B, E, D and finally the control Group A. Thus it is statistically derived that the efficacy of scaling with chlorhexidine gluconate (0.12 %) rinse in reducing the colony counts in saliva is more in comparison to scaling along with povidone iodine (2 %) and essential oils rinse. Similar results were obtained in a study by [24] that compared the effect of polyhexamethylenebiguanide mouthrinse to an essential oil rinse and a chlorhexidine rinse on bacterial counts and 4-day plaque regrowth. Here chlorhexidine was found to be more effective than the placebo and essential oil (EO) rinses. On the mucosa, 4 h after a single rinse with the respective treatments, the chlorhexidine rinse was found by the investigators to be most effective, producing significantly greater mean reductions in bacterial counts than the placebo, EO. In another study similar observations were made by investigators [25] who compared in vivo and in vitro antibacterial properties of povidone iodine and chlorhexidine gluconate mouthrinses. Here in a group of ten subjects after a single rinse with 1 % povidone iodine, an immediate mean fall in total salivary aerobes and anaerobes occurred, followed by a return to normal levels by 1-h post rinsing. With chlorhexidine gluconate 0.2 % a similar but greater reduction in salivary bacterial counts was observed, which was still present up to the 7-h postrinsing period. The results suggest that povidone iodine, as a mouthwash, exerts only an immediate antibacterial effect and unlike chlorhexidine is not retained at antibacterial levels within the oral cavity after expectoration. Thus this study substantiates the superior efficacy of chlorhexidine compared to povidone iodine mouthrinse in reducing microbial loads.

However in our study Group E when compared to Group B alone shows significant decrease in colony counts which proves that in comparison to scaling alone essential oil is efficacious.

In this study samples of MRSA was limited in number, rare and hence the sample size was small. Paired Student '*t*' test was performed and the tables show a comparison of various groups. As compared to Group A (control) the average value of MRSA colonies in Group B is significantly lower (difference = 18.75; $t = 3.26$, d.f = 3, $p < .05$). Thus inspite of limitation of findings due to small sample size, statistically significant reduction of colony counts were found in various groups and more so in Group B (with scaling) and Group C (with essential oils). Also in Supplementary Fig. S2, we find a comparative efficacy of various protocols in combating MRSA shows that Group C is most effective followed by Groups D, E, B and finally

Table 6 Comparison of averages between groups

	Group A–Group B	Group B–Group E	Group E–Group D	Group D–Group C	Group E–Group C
Average difference ($\bar{d}$)	7.875	1.375	.375	.25	.625
SD (s)	5.055	1.408	.916	.89	.744
t Value	4.41	2.76	1.16	.80	2.38
p Value	<.01	<.05	Not significant ($p > .05$)	Not significant ($p > .05$)	<.05

the control Group A. Regarding *Candida albicans* few colonies could be isolated and the decline of colony counts of *Candida* in various groups was studied and the comparative efficacy of various protocols in reducing the colony counts was analysed. In Fig. S3, a comparative efficacy of various protocols in combating *Candida albicans* depicts that Group C is most effective followed by Groups D, E, B and finally the control Group A. Also from Table 6 it can be seen that the average value of Group D do not differ significantly from either Group E or Group C ($t = 1.16$ and 0.80 respectively; $p > .05$). However Group C has significantly lower average value compared to Group E ($t = 2.38$, d.f = 7, $p < .05$). Clinical perspective of this finding is that chlorhexidine gluconate (Group C) is statistically more efficacious compared to essential oils (Group E) in reducing the colony counts of *Candida albicans* in saliva. Similar results were also found by investigators Pizzo G., Giuliana G et al. (2001) [26] while comparing effect of antimicrobial mouthrinses on the in vitro adhesion of *Candida albicans* to human buccal epithelial cells. In this study they found that Candidal adhesion appeared to be significantly reduced by oral rinsing with the 0.2 % chlorhexidine-containing mouthrinse ($p < 0.0001$) as compared to other mouthrinses. Also Tomas I, Caballero L Garcia, Cousido MC et al. [27] studied the effect of chlorhexidine on various oral microflora in their study (2009) and have concluded that, the prevalence of viable bacteria was significantly lower at 30 s after the chlorhexidine mouthrinse ($p < 0.001$) and showed a significant antibacterial effect up to 7 h after the mouthrinse ($p < 0.001$). Reduction of counts of *Staphylococcus* (both MRSA AND MSSA) and *Candida albicans* was also noted after oral prophylaxis (scaling) alone when compared with the control group (Group A–Group B) which is statistically significant. Similar findings are there in earlier studies where it has been proved that the salivary bacterial count dropped immediately after removal of all visible plaque [28]. A similar results were observed by Ximénez-Fyvie LA, Haffajee AD, et. al. in 2000 [29], that weekly professional supragingival plaque removal profoundly diminished counts of both supra- and subgingival microflora.

Summary and Conclusion

Thus from the above discussion of the results and the relevant studies it is now evident that impressions are safer when pre-procedural prophylaxis or mouthrinses are carried out and the comparative efficacy of various protocols have provided us a direction towards adopting a pre-procedural regime to combat cross contamination and provide asepsis. This is as per the Guidelines for Infection Control in Dental Health-Care Settings, 2003, Centres for Disease Control and Prevention, U.S. [30], which stated that preprocedural mouth rinses with antimicrobial mouth rinses used by patients before a dental procedure are intended to reduce the number of microorganisms the patient might release in the form of aerosols or spatter that subsequently can contaminate dental health-care personnel, equipments operatory surfaces. No scientific evidence indicates that preprocedural mouth rinsing prevents clinical infections among dental health-care personnel or patients, but studies have demonstrated that a preprocedural rinse with an antimicrobial product (e.g., chlorhexidine gluconate, essential oils, or povidone-iodine) can reduce the level of oral microorganisms in aerosols and spatter generated during routine dental procedures with rotary instruments (e.g., dental handpieces or ultrasonic scalers).

Investigations regarding viruses (viz. HIV, hepatitis B, C) was not included in this preliminary study. Viruses, because of their diversity in nature, modes of transmission, identification methods and isolation require a critical approach and necessitate a full scale study on its own. More investigations involving other relevant impression materials (viz., silicone, impression paste) and their response to the protocols used needs to be pursued. Newer protocols of preprocedural treatments in the form of an array of mouthrinses or measures as also studies to investigate counteractive measures to newer plausible routes of cross-contamination should be investigated. The present study is thus a small but significant effort to elucidate the basic principles of such a study model which may be used as a framework for future work in investigating newer protocols in the dental operatory to prevent cross-contamination and fulfill the visions of transmission free prosthetic procedures in the future.

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