(International Print/Online Journal)

SJIF IMPACT FACTOR: 4.617
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume3, Issue 1, Page No: 309-321
January-February 2020

Comparative Evaluation Of Antimicrobial Activity Of Propolis, Neem Leaves, Green Tea, Sodium Hypochlorite and Saline as Root Canal Irrigants By Microbial Culturing And Quantification In Chronically Exposed Anterior Primary Teeth

[1] Dr. Stiya Ann Varghese [2]Dr. Shakuntala Bethur Siddaiah , [3]Dr.Nagarathna C., [4]Dr.S.Prabhakara, [5]Mohan T

[2]Professor, [3]Head of Department, [4]Senior Research Scientist & Incharge, [5]Instrumention Incharge
Department Of Pedodontics and Preventive Dentistry
Rajarajeswari Dental College and Hospital, Ramohalli Cross, Mysore Road
Kumbalgodu, Bangalore. Karnataka-560074

***Corresponding Author:**
Dr. Stiya Ann Varghese
Department Of Pedodontics and Preventive Dentistry
Rajarajeswari Dental College and Hospital, Ramohalli Cross, Mysore Road
Kumbalgodu, Bangalore. Karnataka-560074

Type of Publication: Original Research Paper
Conflicts of Interest: Nil

ABSTRACT

Keywords: Irrigants; propolis; neem; green tea; antimicrobial activity

INTRODUCTION

The main objective of pediatric endodontic therapy is to preserve the primary teeth in their proper form and function and to facilitate the proper eruption of permanent successors. The role of clinician is to maintain strict asepsis in vital pulp situation and to attain antisepsis for nonvital and necrosed pulps.[1] This process mainly revolves around the chemomechanical preparation in which chemically active solutions are used along with mechanical instrumentation of the root canal.[2]

The unique histological features of primary teeth like abundance of accessory and lateral canals, easy communication of the pulp with the furcal region due to highly porous inter-radicular dentin at the pulpal floor, ample of medullary bone spaces, association with the delicate developing permanent tooth bud are the critical areas in determining a successful pulpal treatment.[3] The choice of instrumentation and irrigating solutions plays important role in bacterial neutralization and toxin inactivation without causing interference with the healing process.[4] Chemical treatment of the root canal system can be arbitrarily divided into irrigants, rinses and inter appointment medicaments.[5] Antimicrobial solutions must possess many qualities such as ability to penetrate the infected site, to suppress or destroy microbial growth, and to avoid possible development of resistance to the agent. Sodium hypochlorite [NaOCl] is considered as gold standard. However, there is concern about its possible toxic effect on periapical tissues at higher concentrations.[6] Constant increase in antibiotic resistant strains, side effects, safety concerns and cytotoxic reactions of synthetic irrigants has encouraged researchers to look for herbal alternatives. The use of herbal alternatives in dentistry is an emerging branch and it has been termed as phytodentistry.[7,8]

In India, medicinal plants form the backbone of several indigenous traditional systems of medicine which have been found to have potent therapeutic

effects. Other advantages are its easy availability, safety, cost-effectiveness, and long shelf life. However, these have been widely used for several medicinal purposes in both eastern and western medicinal traditions. [9,10]

METHODOLOGY

The present in vivo study was conducted on children in the age groups of 3 to 6 years visiting the Department of Pedodontics and Preventive Dentistry, Rajarajeswari Dental College and Hospital, Bangalore.

CASE SELECTION

50 infected primary teeth were selected. Teeth included in this study were asymptomatic primary maxillary and mandibular anterior teeth with pulp necrosis and radiographically visible chronic apical infection; Patients with no specific systemic conditions; Patients who have not received any antibiotics for last 3 months before treatment.

We excluded from the study patients who met any of the following criteria: Teeth with external or internal resorption and having excessive mobility; Teeth requiring pulp therapy due to periodontal problems or developmental anomalies; Children with special health care needs.

IRRIGANT PREPARATION

Fresh, raw green tea and neem leaves were collected, thoroughly washed and dried for 15- 20 days at room temperature (25 +/- 20C) and further pulverized to powdered from in a dedicated mixer grinder. The obtained powdered plant forms were stored in 2 beakers separately which was lightly sealed with paraffin sheets.

NEEM LEAF EXTRACT AND GREEN TEA EXTRACT PREPARATION - 40 g of respective powder was mixed with 400 ml of distilled water (1:10) in round bottom flask and heated in a mantle for about 2 hours at low heat (350c). The obtained mixture was cooled to about 30 minutes at room temperature followed by primary filtration using millipore paper. The obtained final irrigant was transferred to respective grade-A borosil screw bottles and stored under 4℃ until further use.

CLINICAL PROCEDURE

An aseptic technique was used throughout the endodontic treatment. Before rubber dam isolation, each tooth showing presence of supragingival biofilms was cleaned by scaling. Local anesthesia was administered prior to rubber dam application. After rubber dam application, the access opening was done with sterile water cooled high speed diamond round bur (#330). On completing access cavity, the pulp was extirpated using barbed broach and the first root canal sample (S1) was taken as follows. A sterile paper point was introduced into the root canal and moved circumferentially along the walls of the canal without being lifted till the apical foramen, it was left for 1 minute in the canal, then with sterile tweezers the paper points was be removed and transferred to vials containing transport media and it was transported to microbiological laboratory for culturing procedure [Figure 1].

After instrumentation the teeth were divided randomly into five groups-

Experimental group 1 [10teeth] - teeth was irrigated with propolis (Natures free alcohol extract of propolis) [Figure 2].

Experimental group II [10 teeth]-teeth was irrigated with neem leaf extract [Figure 3].

Experimental group III [l0 teeth]-teeth was irrigated with green tea extract [Figure 4].

Experimental group IV (Positive control group) **[10 teeth]**- teeth was irrigated with 3% NaOCl [Figure 5].

Experimental group V (negative control group) **[10 teeth]**- teeth was irrigated with 0.9% saline [Figure 6]The Chemomechanical preparation was then done. The working length was established 1mm short of the root apex using the diagnostic radiograph. Canal preparation was done to working length with hand using nickel-titanium files in back and forth alternating rotation motion using step back technique upto #35 to #40, with intermittent use of irrigating solution in the respective groups. The canals were finally irrigated with 5ml of the respective irrigant using a 5 ml syringe with 24 gauge needle. Then, the canals were dried using sterile paper points. Subsequently, the root canals were gently filed and a post instrumentation sample (S2) was taken from the root canals using sterile paper points as described previously. [Figure 7] The paper points were

Volume 3, Issue 1; January-February 2020; Page No.309-321
© 2020 IJMSCR. All Rights Reserved

transferred to transporting medium and were transported to microbiological laboratory for culturing procedure. The canals were then obturated with metapex and access cavity restored with GIC.

RESULTS

The data thus collected were grouped tabulated and statistically analysed using unpaired T test with level of significance at 0.05 and ANOVA test for evaluation of pre and post irrigation counts.

Table I shows the mean and standard deviation of pre irrigation and post irrigation values for all the five groups.

Table II ANOVA test was used to calculate the difference in pre and post irrigation values in all the five groups where Group I (Propolis); Group II (Neem); Group III (Green tea); Group IV (NaOCl); Group V (Saline). The values of pre irrigation showed no statistical significance between groups (ANOVA or f = 1.296) and P value 0.286, whereas the post irrigation values all the five groups showed statistical significance between groups (ANOVA or f = 2.260) and P value 0.042; which means the post irrigation values in each group was different.

Table III unpaired t test was done for intergroup comparison among five groups.

Graph I shows the post irrigation percentage reduction in the microbial counts.

Graph II shows the mean of pre and post irrigation values in all five groups.

DISCUSSION

Microorganisms play a major role in the etiology of pulp and periradicular lesions. Successful root canal therapy depends on the triad of instrumentation, disinfection and obturation.[11] The choice of instrumentation and irrigant selection permit bacterial neutralization and toxin inactivation without interference with the process of healing process which is the key to the success of the treatment.[12]

Several chemicals and therapeutic agents are used to achieve this goal.[8] However, owing to their potential side effect, limited penetrability in complex canal system, constant increase in antibiotic resistant strains and safety concerns an impending need is upon the fraternity of dentistry to find alternatives.[3,13] Herbal products are the answer to this concern.

Propolis (bee glue), also called THE RUSSIAN PENCILLIN is composed of resin and balsams (50-60%), pollen (5-10%), other constituents like amino acids, minerals, vitamins A and B complex, highly active biochemical substance known as bioflavonoids (vitamin P), phenols, and aromatic compounds.[1] It has potent antimicrobial, antioxidant and anti-inflammatory action. The pharmacologically active constituents in propolis ie, diterphenic acids, phenolics, aromatics and diterphenic acids are responsible for biologic action.[14] Its antimicrobial action on microorganism is by the prevention of cell division and also by the breakdown of the bacterial cell wall and cytoplasm.[15]

Alcohol free extract of **propolis** (experimental group I) used in our study showed post irrigation percentage reduction in microbial count to be 96.02% that was statistically significant (p=.001),which was in accordance with other studies done by Tyagi P,[16] Garg P,[4] Daga P,[9] Significant antimicrobial activity against aerobic and anaerobic bacteria was also seen in a study done by Jahromi Z M.[17] Contrary results were seen in some studies with propolis , which showed it to be least effective among other irrigants.[5,12,14] The positive results seen in our study was attributed to differences in propolis origins and compositions.[18]

Najafi *et al.*, confirmed that the water extracts did not affect the biological activity of propolis as most of the flavanoid compounds are retained.[1] Many studies have found that propolis is an effective intracanal irrigant against E. *faecalis* and C. *albicans*, hence it can be a breakthrough to problems like endodontic flare-ups and failures.[19]

Azadrichata indica popularly known is also “Indian lilac”.[14] The leaf extract has several bioactive compounds that has antibacterial capabilities. Nimbidin a major crude extract of neem has been shown to be the key reason for its antibacterial activity. Besides the antimicrobial action, this group of compounds also demonstrates anti-inflammatory function (ability to prevent the production of prostaglandins, especially prostaglandin E1 (PGEI) and 5 hydroxytryptamine) which is a desirable characteristic of the irrigant.[20]

Volume 3, Issue 1; January-February 2020; Page No.309-321
© 2020 IJMSCR. All Rights Reserved

Aqueous extract of **neem leaf** (experimental group II) was used in our study. Study done by Nayak Arati et al., showed aqueous and alcoholic extract of neem leaf had significant antibacterial activity against *Streptococcus mutans* and *Enterococcus faecalis* and significant antifungal activity against *Candida albicans* and no statistical difference between the efficacies of alcoholic over aqueous neem extract.[10]

In our present in vivo study neem leaf extract showed significant reduction in post irrigation value (99.83%) which was statistically significant (p value = 0.35). Intergroup comparison of NaOCl (positive control) and neem, showed insignificant result which indicated that both had equivalent antimicrobial activity (P=0.316). This result was in accordance with other studies done which showed neem to have excellent antimicrobial activity especially against *Streptococcus mutans* and *Enterococcus faecalis and Candida albicans* .[5,6,8,10,14,20]

However, in a study done by Jose J et al., neem was found to be least efficacious in comparison to the other tested irrigants like Green Tea Extract, Garlic Extract, and Sodium Hypochlorite but showed statistically significant result against *Enterococcus faecalis* and *Candida albicans*.[2]

Green tea is a commonly used beverage made solely from the leaves of *Camellia sinensis* belongs to the Theaceae family.[21] The polyphenols present within green tea like catechin, epicatechin and epigallocatechin gallate (EGCG) have useful physiologic effects. The EGCG is the main component which acts as an anti-oxidant and scavenger of free radicals. The antibacterial activity is due to inhibition of the DNA gyrase bacterial enzymes by binding to the ATP binding sites of the ATPB subunit and by disrupting the cell membrane and prevention of DNA supercoil formation, thus destroying the bacteria.[3,22] Various studies have stated that polyphenols can inhibit or kill pathogens such as *Streptococcus aureus*, *Streptococcus sobrinus*, *Streptococcus mutans*, and P. *gingivalis*.[4,23,24] The healing properties such as antioxidant activity, anti-inflammatory, radical scavenging and availability, affordability, low toxicity and long shelf life make green tea an appropriate root canal irrigant.[25]

Studies have shown both aqueous extract & alcoholic extract of **green tea** had antimicrobial activity against S. *mutans*, E. *faecalis* and C. *albicans*.[2,24,25,26] In the present study aqueous green tea extract was used as irrigant. The antimicrobial effect was comparatively less (48.48%) when compared to sodium hypochlorite, neem, propolis and was statically not significant (P=.332). Intergroup comparison with negative control showed it was statically insignificant ie, saline and green tea has similar effect. Analogous result was seen in a study done by Bhargava K et al., however the result was not statistically significant.[27] Studies done by Dhariwal,[3] and Abdulkareem J. Al-Azzawi,[22] was also in accordance with our study which showed green tea had least antibacterial activity amongst the test irrigants.

A study done by Horiba et al., who studied different types of green tea against 24 bacterial strains in vitro concluded that they were effective on most of them, including anaerobes and hence it was chosen as a test irrigant in this study.[21,25] Dhariwal *et al*., demonstrated good but not 100% sensitivity of green tea against S. *mutans*, *Streptococcus. pyogenes*, *Streptococcus. aureus*.[3] This variation of results in our study which showed least effectiveness of green tea among all groups could be explained on the low concentration of the extract. Noormandi and Dabaghzadeh found that the antimicrobial activity of the compound increase by increasing the concentration of green tea.[21] The ineffectiveness could also be attributed because of brewing time for 30 minutes was effective in killing the bacterial cultures, but was not as efficient as the tea brewed for 20 minutes The longer the green tea leaves were infused in the hot water, the greater the breakdown of the antibacterial polyphenolic compounds, rendering the tea less effective.[23]

NaOCl has remained a popular root canal irrigant because of its antimicrobial potential and its ability to dissolve organic matter.[16] It is always considered in cleaning canals due to its high level of antibacterial efficacy and its ability in solving pulp tissue, but it emits a sharp smell, bothers patients while breathing and at high concentrations has a toxic effect on periapical tissue and causes acute inflammation in the area.[21] Instrumentation with NaOCl reduced the number of bacteria in infected root canals by 1000 to 100,000 fold.36 Although NaOCl is highly effective in destroying bacteria, it does not penetrate well into these confined areas of the root canal system. The antibacterial action of sodium hypochlorite depends

Volume 3, Issue 1; January-February 2020; Page No.309-321
© 2020 IJMSCR. All Rights Reserved

on the concentration of undissociated hypochlorous acid (HOCl) which causes irreversible oxidation of SH groups (sulfhydryl group) of essential bacterial enzymes. Also its high pH interferes with the cytoplasmic membrane integrity and also biosynthetic alterations in cellular metabolism and phospholipid degradation.[3,28]

In this present study, 3% NaOCl (positive control group IV) was used as an irrigant and the maximum reduction in the microbial count was seen (99.99%). This was in accordance with other studies which showed NaOCl to have the maximum effect in comparison with the other irrigants like green Tea Extract, Garlic Extract, Neem Leaf Extract, triphala, miswak, propolis, Morinda citrifolia, CHX.[2,12,15,16,21,24] Studies have shown that concentration of 1%, 2.5%, and 5.25% NaOCl have no significant difference in antibacterial effect. The choice of 3% concentration of NaOCl in our study was based on the fact that no significant differences in the intracanal antibacterial effects have been observed when comparing it with the higher concentrations.[28]

Saline is an isotonic solution to body fluids and is being universally used as an irrigating solution in endodontic treatment.[29] Decrease in total viable count of microorganisms using saline as the irrigant could be due to its ability to flush out debris from the root canal rather than having any antimicrobial property. Ingle and Zeldow, Engstrom and Baker et al. claimed that removal of bacteria and debris was a function of the quality of irrigant solution rather than its nature. Byström and Sundqvist showed that saline irrigants significantly reduced the number of bacteria in the root canal but could not entirely eliminate them.[12]

The present study, saline irrigant was used as negative control and it showed 40.92% of reduction post irrigation and this result were statistically insignificant (0.165). Our results was similar to that done by Shingare P who stated that it was least effective among other tested irrigants like miswak, propolis, sodium hypochlorite.[12] Koo *et al.*, and Park *et al.*, stated that reduction in colony counts of Streptococcus group and S. *aureus* after irrigation with saline was attributed to the mechanical action of saline as an irrigant that flushes bacteria from the canals.[1] Dametto et al., concluded that the reduction of debris and bacterial content in almost 95% of the cases was by the flushing action of saline solution. However, its effectiveness is directly related to the volume and frequency of irrigation as well as to the depth of the irrigating needle. Almost 98% bacteria reduction was found using a higher volume of saline associated with the instrumentation.[30] Ohara et al found saline to be completely ineffective as an antimicrobial agent, therefore this study utilized saline as negative control.[12]

CONCLUSION

- Antibacterial activity of neem (group II) was found to be similar to that of NaOCl (group IV)
- Comparison between propolis (group I), neem (group II) and green tea (group III) neem and propolis showed better result than green tea.
- Antibacterial activity of green tea (group III) was found to be closer to saline (group V) i.e. negative control.
- Neem could thus be a good natural substitute for NaOCl.

REFERENCES

1. Verma MK, Pandey RK, Khanna R, Agarwal, Jyotsna. The antimicrobial effectiveness of 25% propolis extract in root canal irrigation of primary teeth. J Indian Soc Pedod Prev Dent. 2014;32(2):120–4.
2. Jose J, Shoba K, Aman S, Tomy N. Comparative Evaluation of Antimicrobial Activity of Green Tea Extract, Garlic Extract, Neem Leaf Extract and Sodium Hypochlorite as Root Canal Irrigants against E. faecalis and C. albicans An In Vitro Study. IntJCurrMicrobiolAppSci. 2015;4:384–91.
3. Dhariwal N, Hugar S, Harakuni S, Sogi S, Assudani H, Mistry L. A comparative evaluation of antibacterial effectiveness of sodium hypochlorite, Curcuma longa, and Camellia sinensis as irrigating solutions on isolated anaerobic bacteria from infected primary teeth. J Indian Soc Pedod Prev Dent. 2016;34:165.
4. Garg P, Tyagi SP, Sinha DJ, Singh UP, Malik V, Maccune ER, et al. Comparison of antimicrobial efficacy of propolis, Morinda

© 2020 IJMSCR. All Rights Reserved

citrifolia, Azadirachta indica, triphala, green tea polyphenols and 5.25% sodium hypochlorite against Enterococcus fecalis biofilm. Saudi Endod J. 2014;4:122.

5. Srinidhi SR, Ketaki DB. Antifungal efficacy of azadirachta indica (neem) - An in vitro study. Brazilian J Oral Sci. 2014;13:242–5.
6. Ghonmode WN, Balsaraf OD, Tambe VH, Saujanya KP, Patil AK, Kakde DD. Comparison of the antibacterial efficiency of neem leaf extracts, grape seed extracts and 3% sodium hypochlorite against E. feacalis - An in vitro study. J Int oral Heal. 2013;5:61–6.
7. Arora T, Kang R singh, Mann JS, Khurana NS, Aggarwal R, Walia G. Antimicrobial activity of herbal extracts against recalcitrant endodontic pathogens: An orginal in vitro study. saints Int Dent J. 2015;1:28–32.
8. Podar R, Kulkarni GP, Dadu SS, Singh S, Singh SH. In vivo antimicrobial efficacy of 6% Morinda citrifolia, Azadirachta indica, and 3% sodium hypochlorite as root canal irrigants. Eur J Dent. 2015;9:529–34.
9. Daga P, Asrani H, Farista S, Mishra P. Comparative Evaluation of Antimicrobial Efficacy of Neem , Miswak , Propolis , and Sodium Hypochlorite against Enterococcus faecalis using EndoVac. Int J Prosthodont Restor Dent. 2017;7:60–5.
10. Aarati N, Ranganath N, Soumya G, Kishore B, Mithun K. Evaluation of antibacterial and anticandidal efficacy of aqueous and alcoholic extract of neem (Azadiracgta Indica)- Invitro study. Int J Res Ayurveda Pharmacy. 2011;2:230–5.
11. Nara A, Dhanu, Chandra P, Anandakrishna L, Dhananjaya. Comparative Evaluation of Antimicrobial Efficacy of MTAD , 3 % NaOCl and Propolis Against E Faecalis. Int J Clin Pediatr Dent. 3:21–5.
12. Shingare P, Chaugule V. Comparative evaluation of antimicrobial activity of miswak, propolis, sodium hypochlorite and saline as root canal irrigants by microbial culturing and quantification in chronically exposed primary teeth. Germs. 2011;1:12–21.
13. As A, Bedi S, Almas K. Phytosolutions for Enterococcus faecalis in Endodontics : An Update. OHDM. 2016;15:332–6.
14. Hegde V, Kesaria DP. Comparative evaluation of antimicrobial activity of neem, propolis, turmeric, liquorice and sodium hypochlorite as root canal irrigants against E. Faecalis and C. Albicans - An in vitro study. Endodontology. 2013;25:1563–72.
15. Gupta S, M K, Acharya SR, Ballal V. comparative evaluation of the antibacterial efficacy of propolis , 3.0% sodium hypochlorite and 0.2% chlorhexidine gluvonate against enterococcus faecalis - An in vitro study. Endodontology. 2007.
16. Tyagi SP, Sinha DJ, Garg P, Singh UP, Mishra CC, Nagpal R. Comparison of antimicrobial efficacy of propolis, Morinda citrifolia, Azadirachta indica (Neem) and 5% sodium hypochlorite on Candida albicans biofilm formed on tooth substrate: An in-vitro study. J Conserv Dent. 2013;16:532–5.
17. Jahromi MZ, Tahmourespour A, Foroughi R. Comparison of antimicrobial effect of sodium hypochlorite (5.25%) and Iranian propolis on bacteria isolated from necrotizing single canal tooth with chronic apical periodontitis. African J Pharm Pharmacol. 2012;6:1216–21.
18. Arslan S, Ozbilge H, Kaya EG, Er O. In vitro antimicrobial activity of propolis, BioPure MTAD, sodium hypochlorite, and chlorhexidine on E. faecalis and C. Albicans. Saudi Med J. 2011;32:479–83.
19. Malhotra S, Gupta V. Use of propolis in pediatric dentistry. J Dent Allied Sci. 2014;3:93–8.
20. Dutta A, Kundabala M. Comparative anti?microbial efficacy of Azadirachta indica irrigant with standard endodontic irrigants: A preliminary study. J Conserv Dent. 17:133–7.
21. Sardari F, Hajisadeghi S. Comparison of the Antimicrobial Efficacy of Green Tea Extract With 1 % Sodium Hypochlorite Against

© 2020 IJMSCR. All Rights Reserved

Enterococcus faecalis : An In Vitro Study. J Nat Pharm Prod. 2016;11.

22. Al-azzawi AJ. The antibacterial effect of herbal alternative , green tea and Salvadora Persica (Siwak) extracts on Entercoccus faecalis. Restorative Dent. 2015;27:1–5.
23. Yassin HN, Al-Dahan ZAA, Hamod MA. Evaluation of antibacterial effect of irrigant solutions (titanium tetra fluoride , green tea , sodium hypochlorite , normal saline) using real-time quantitative – polymerase chain reaction. J Bagh Coll Dent. 2015;27:140–5.
24. Ramezanali F, Samimi S, Kharazifard M, Afkhami F. The in vitro antibacterial efficacy of persian green tea extract as an intracanal irrigant on enterococcus faecalis biofilm. Iran Endod J. 2016;11:304–8.
25. Mollashahi NF, Bokaeian M, Mollashahi LF, Afrougheh A. Antifungal Efficacy of Green Tea Extract against Candida Albicans Biofilm on Tooth Substrate. J Dent. 2015;12:592–8.
26. Martina LP, Ebnezer AVR, Ghani MF, Narayanan A, Sundaram M, Mohan AG. An in vitro comparative antibacterial study of different concentrations of green tea extracts and 2% chlorhexidine on Enterococcus faecalis. Saudi Endod J. 2013;3:120–4.
27. Bhargava K, Kumar T, Aggarwal S, Zinzarde S, Sanap A, Patil P. Comparative evaluation of the antimicrobial efficacy of neem, green tea, triphala and sodium hypochlorite: An in vitro study. J Dent Res Rev. 2015;2:13–6.
28. Siqueria J, Rocas I, Favieri A, Lima K. Chemomechanical Reduction of the Bacterial Population in the Root Canal after Instrumentation and Irrigation with 1%, 2.5%, and 5.25% Sodium Hypochlorite. J Endod. 2000;26:331–4.
29. Qazi SS, Manzoor MA, Qureshi R, Khan H. Comparison of postoperative pain — normal saline vs sodium hypochlorite as irrigants. Pakistan Oral Dent Jr. 2005;25:177–82.
30. Berber VB, Gomes BPFA, Sena NT, Vianna ME, Ferraz CCR, Zaia AA, et al. Efficacy of various concentrations of NaOCl and instrumentation techniques in reducing Enterococcus faecalis within root canals and dentinal tubules. Int Endod J. 2006;39:10–7.

Volume 3, Issue 1; January-February 2020; Page No.309-321
© 2020 IJMSCR. All Rights Reserved

TABLES AND GRAPHS:

TABLE I - Mean and standard deviation in pre-irrigation and post-irrigation values

GROUP 1 (Propolis)	MEAN	$7.2\ 1 \times 10^4$	2.71×10^3	**.001***
	SD	4.49×10^4	3.85×10^3	
GROUP II (Neem)	MEAN	1.25×10^5	5	**.035***
	SD	3.09×10^5	5.27	
GROUP III (Green tea)	MEAN	1.07×10^4	5.19×10^3	**.332**
	SD	3.13×10^4	3.01×10^3	
GROUP IV (NaOCl)	MEAN	2.33×10^4	1	**.031***
	SD	4.06×10^4	3.16	
GROUP V (Saline)	MEAN	4.42×10^3	2.61×10^3	**.165**
	SD	4.81×10^3	3.91×10^3	

Volume 3, Issue 1; January-February 2020; Page No.309-321
© 2020 IJMSCR. All Rights Reserved

TABLE II - ANOVA test of variance

ANOVA

		Sum of Squares	df	Mean Square	F	P VALUE
PRE IRRIGATION	Between Groups	1.044E11	4	2.609E10	1.296	.286
	Within Groups	9.059E11	45	2.013E10		
	Total	1.010E12	49			
POST IRRIGATION	Between Groups	7.096E7	4	1.774E7	2.260	.042*
	Within Groups	3.533E8	45	7850257.556		
	Total	4.242E8	49			

*Statistically significant (P<.05).

TABLE III – statistics showing intergroup comparison.

GROUP COMPARISON	T TEST VALUE	df	P VALUE
GROUP I GROUP II	0.564	18	0.099
GROUP I GROUP III	-3.650	18	0.029*
GROUP I GROUP IV	-2.224	18	0.025*
GROUP I GROUP V	-4.858	18	0.001*

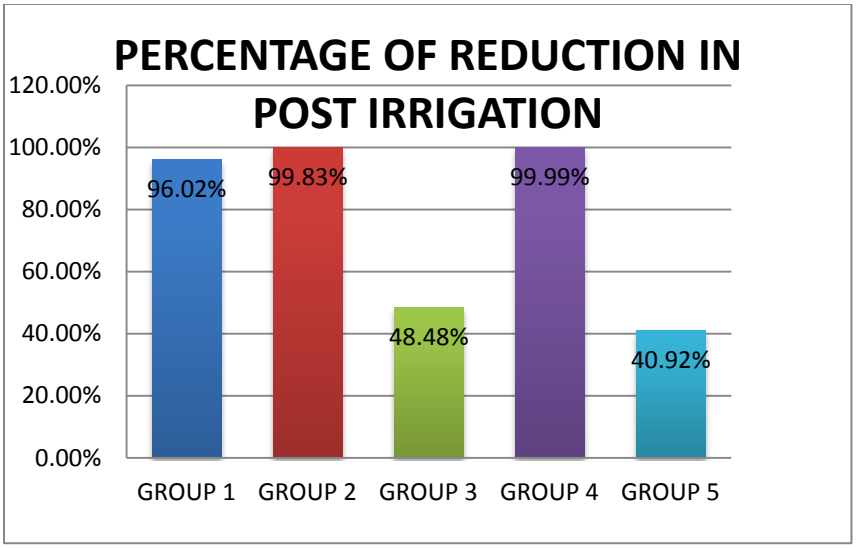
Volume 3, Issue 1; January-February 2020; Page No.309-321
© 2020 IJMSCR. All Rights Reserved

GROUP II GROUP III	-1.179	18	0.050*
GROUP II GROUP IV	-1.031	18	0.316
GROUP II GROUP V	-1.259	18	0.022*
GROUP III GROUP IV	0.901	18	0.038*
GROUP III GROUP V	-.867	18	0.425
GROUP IV GROUP V	-1.666	18	0.021*

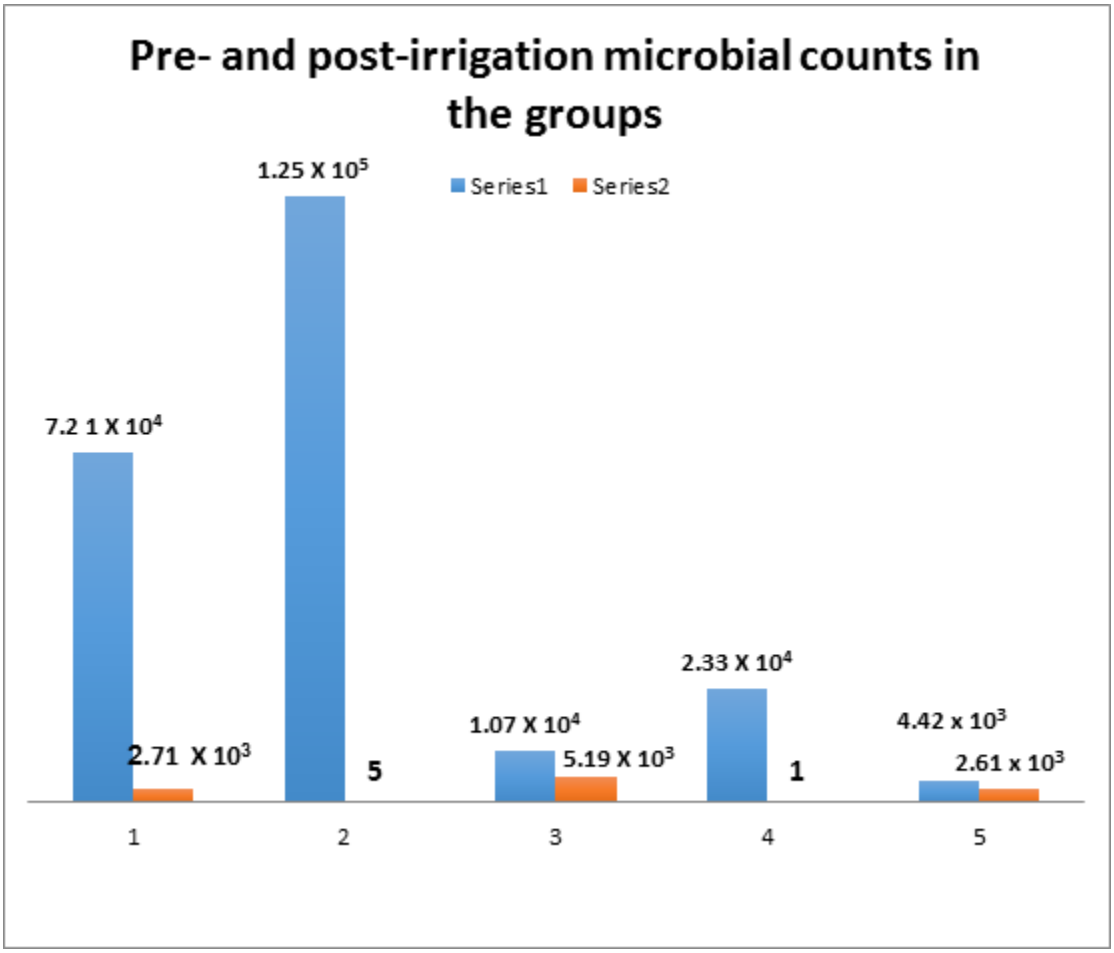
*Statistically significant (P<.05).

Volume 3, Issue 1; January-February 2020; Page No.309-321
© 2020 IJMSCR. All Rights Reserved

GRAPH I– Percentage reduction in post irrigation of all the five group.



GRAPH II - Difference in mean pre and post irrigation values in all five groups.



Volume 3, Issue 1; January-February 2020; Page No.309-321
© 2020 IJMSCR. All Rights Reserved

FIGURES AND IMAGES

Figure 1– Pre irrigation sample collection (S1)

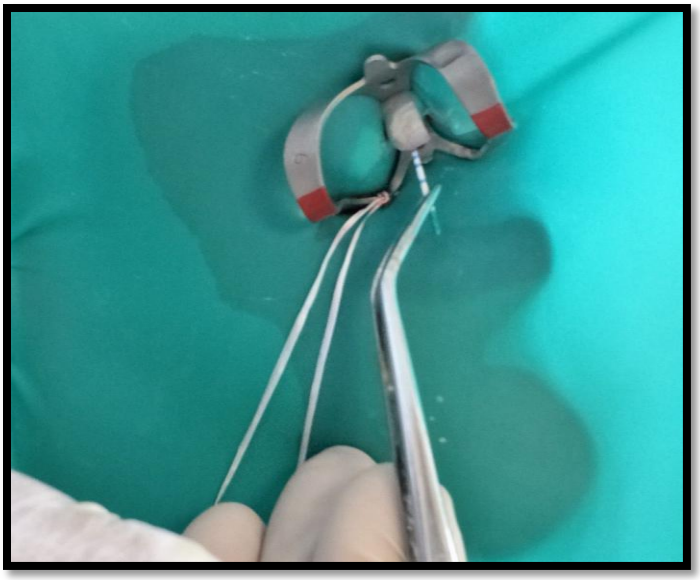


Figure 2- Irrigation with propolis.

Figure 3- Irrigation neem leaf extract.

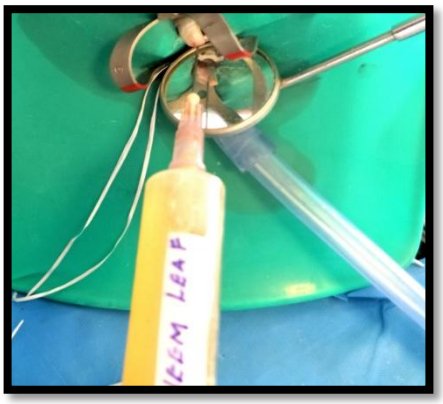


Figure 4- Irrigation with green tea extract.

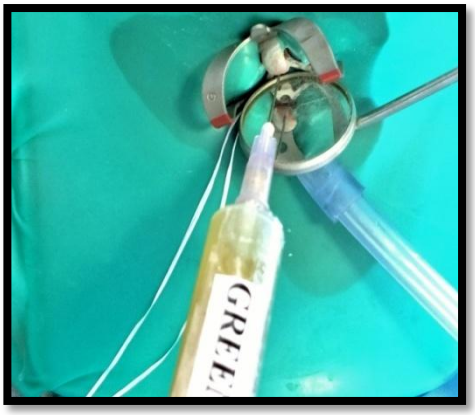


Figure 5- Irrigation with NaOCl.

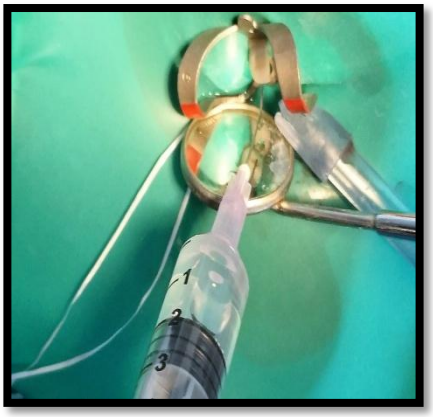


Figure 6- Irrigation with saline.

Volume 3, Issue 1; January-February 2020; Page No.309-321
© 2020 IJMSCR. All Rights Reserved

Figure 7 – Post irrigation sample collection (S2)

Volume 3, Issue 1; January-February 2020; Page No.309-321
© 2020 IJMSCR. All Rights Reserved