Journal of Complementary Medicine Research, ISSN: 2146-8397 Vol. 13, No. 5, 2022 (pp. 55-59)

RESEARCH ARTICLE WWW.JOCMR.COM

Comparative Effect of Various Irrigants with Herbal Formulations in Reducing Enterococcus Faecalis Count

J Deepasakthi [1], R.V.Geetha[2]*, T. Lakshmi[3]

[1]*Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India*

[2]*Professor, Department of Microbiology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India*

[3]*Professor, Department of Pharmacology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India*

ABSTRACT

Background: Enterococcus faecalis is associated with different forms of periradicular diseases, both primary and persistence endodontic infections. Traditional herbals have high antimicrobial, anti-inflammatory, antioxidant and biocompatible properties that make their use in dentistry more extensive. Judicious use of these herbal formulations has been found to mitigate the E.faecalis count.

Aim: To compare the effect of various irrigants with herbal formulations in reducing Enterococcus faecalis count

Materials and methods: Different herbal formulated irrigants were procured commercially. The test organism E.faecalis was isolated and maintained in the Nutrient Agar Slope at 4 degree C. Different concentrations of herbal irrigants were mixed with BHI agar and 50µL of the test organisms were added and poured into sterile petri dishes. Lawn culture of the test bacteria was made on the Plates and incubated at 37 degree C for 24 hrs and the colony forming units(CFU) were counted and recorded.

Result: In this present study, comparing all 3 samples there is a higher reduction of count in Sample 3 (Cardamom and Tulsi mediated) than Sample 1 and Sample 2.

Conclusion: Based on the results presented, it is possible to conclude that the herbal formulations represent a good reduction of Enterococcus faecalis.

Corresponding Author e-mail: geetha@saveetha.com

How to cite this article: Deepasakthi J, Geetha V R, Lakshmi T, Comparative Effect Of Various Irrigants With Herbal Formulations in Reducing Enterococcus Faecalis Count. Journal of Complementary Medicine Research, Vol. 13, No. 5, 2022 (pp. 55-59)

INTRODUCTION

A large number of bacterial species play a major role in the development of pulp and periapical diseases(1). The root canal system can get infested with bacteria because of the privileged anatomic placement, and these germs are immune to the host defence system(2). Enterococcus faecalis is the predominant species that is linked to secondary infection, and the prevalence of this species in persistent endodontic infections ranges from 24% to 77%. E.faecalis is a gram-positive cocci and a facultative anaerobe that can withstand temperatures of 60 °C for 30 minutes as well as pH extremes of 9.6 and salt concentrations(3). In adverse environmental conditions, it can develop a calcified biofilm inside the root canals. Due to the increased antimicrobial resistance of biofilm bacteria, biofilm formation on tissues and biomaterial surfaces can result in biofilm-mediated illnesses that are challenging to cure(4).

KEYWORDS:
Enterococcus faecalis,
Nutrient Agar Slope,
Herbal Irrigants,
BHI agar.

ARTICLE HISTORY:
Received June 11, 2022
Accepted Oct 16, 2022
Published Dec 19, 2022

DOI:
10.5455/jcmr.2022.13.05.10

The use of several irrigants in non-surgical endodontic procedures has been suggested(5). Sodium hypochlorite has been the gold standard as an endodontic irrigant due to its high antimicrobial action and ability to dissolve the organic material(6). However, it has a number of negative side effects, including the potential to cause allergies, tissue toxicity, bad taste and odour, difficulty to completely eradicate germs from infected canals, staining and rusting of tools, and unpleasant taste and odour(7). Herbal medicines are now becoming more popular(8). Due to benefits including fewer side effects, affordability, improved patient tolerance, and renewable nature, natural materials have gained popularity in modern dentistry(9).

It has been demonstrated that conventional plants are a better source when looking for a novel antibacterial component(10). They are used more frequently in dentistry because of their potent antimicrobial, anti-inflammatory, antioxidant (thanks to the wide variety of active phytochemicals present, including flavonoids, terpenoids, lignans, sulphides, polyphenolics, carotenoids, coumarins, saponins, plant sterols, curcumins, and phthalides), and biocompatible properties(11). These herbal preparations can be used wisely to lower the E. faecalis count, which could lower infections that develop after therapy. Hence, it can be considered as one of the possible alternatives or a replacement for the synthetic chemical formulations(12). The aim of the study is to compare the effect of various irrigants with herbal formulations in reducing Enterococcus faecalis count.

MATERIALS AND METHODS

For the study, three different herbal irrigants were obtained commercially from local market and used for the study. Sample 1 herbal irrigant prepared by standardised preparation method using Clove (Syzygium aromaticum), Sample 2 herbal irrigant was prepared using Betel (Piper betle) and Sample 3 was prepared using Cardamom (Elettaria cardamomum) and Tulsi (Ocimum tenuiflorum).

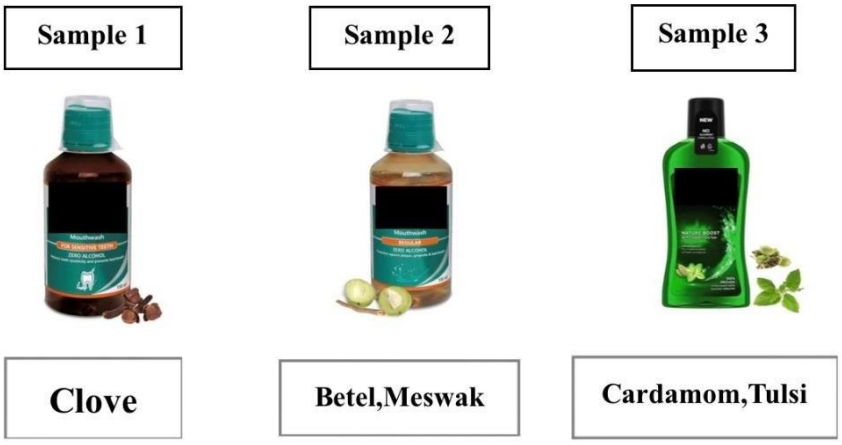

Fig.1: This figure shows the 3 different herbal irrigants collected from the market.

The test organism used was Enterococcus faecalis. The organism was isolated from clinical samples using selective media Mutans-Sanguis Agar (HiMedia M977) and maintained in Nutrient Agar Slope at 4°C. Agar plate dilution technique was followed to screen the activity of herbal irrigants in reducing the Enterococcus faecalis count. Different concentrations of herbal irrigants (50µL, 100µL, 200µL) were mixed with BHI agar and 50µL of the test organisms were added to the BHI agar and poured into sterile petri dishes. The plate was incubated overnight at 37°C and the colony forming unit per millilitre was calculated.

RESULT

The table below depicts the bacterial count of E.faecalis at different concentrations of each sample. There is significant reduction in count with increase in concentration. The findings reveal that Sample 1 (Clove mediated) showed 400 CFU/ml against E.faecalis at concentration of 50µL, 70 CFU/ml at 100µL which then subsequently reduced with increasing concentration. In Sample 2 (Betel and Meswak mediated), 550 CFU/ml at 50µL, 95 CFU/ml at 100µL. In Sample 3 (Cardamom and Tulsi mediated), showed 300 CFU/ml at concentration of 50µL, 25 CFU/ml at 100µL which then subsequently reduced with increasing concentration. Comparing all 3 samples there is a higher reduction of count in Sample 3 (Cardamom and Tulsi mediated).

Table 1: Bacterial count of E.faecalis (CFUs) at different concentrations of each sample is given

	50µL	100µL	200µL
Sample 1	400 CFU/ml	70 CFU/ml	No growth
Sample 2	550 CFU/ml	95 CFU/ml	No growth
Sample 3	300 CFU/ml	25 CFU/ml	No growth
Control	Confluent growth		

Fig 2: Growth of E. faecalis before irrigation with Control.

Fig.3: Reduction of E. faecalis count after irrigation at 50µL.

Fig.4: Reduction of E. faecalis count after irrigation at 100µL.

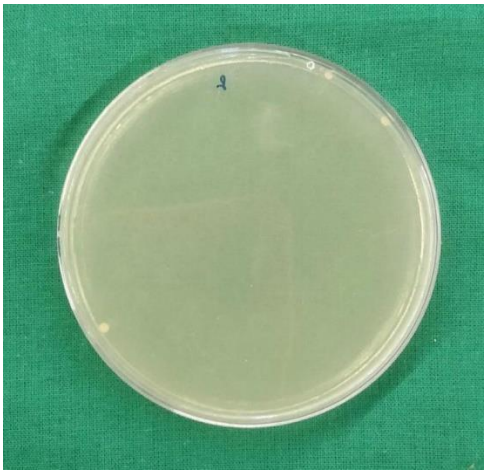

Fig.5: Reduction of E. faecalis count after irrigation at 200µL.

DISCUSSION

All around the world, medicinal plants are a source of significant economic value. About 75–80% of the population still relies heavily on herbal medicine, and the utilisation of plant extracts and their active ingredients still makes up a large portion of traditional therapy(13). A preliminary study concluded that the extracts of O. sanctum, C. zeylanicum, S. aromaticum showed antimicrobial activity against E.faecalis, NaOCI was shown to be the best among all the groups, both in planktonic and biofilm forms (14). Another study showed that Cinnamon is more effective than turmeric but less effective than garlic at killing Candida albicans and least effective at killing Enterococcus faecalis. Compared to cinnamon, garlic had less colonies, making it more antibacterial when it comes to the antimicrobial action of herbal extracts (15).

In our study, Clove mediated sample (Sample 1) showed 400 CFU/ml against E.faecalis at concentration of 50µL, 70 CFU/ml at 100µL which then subsequently reduced to No growth with increasing concentration to 200µL. Likewise for Sample 2 (Betel and Meswak mediated), 550 CFU/ml at 50µL, 95 CFU/ml at 100µL. In Sample 3, which is Cardamom and Tulsi-mediated, there was a decrease in count to 300 CFU/ml at concentrations of 50µL, 25 CFU/ml at 100µL and at 200µL there was No growth of E.faecalis. When comparing the counts of the three samples, Sample 3 shows a greater reduction (Cardamom and Tulsi mediated). Therefore, the Cardamom and Tulasi Mediated Irrigant was the best among the 3 Samples. The main benefits of utilising herbal substitutes are their accessibility, affordability, longer shelf life, low toxicity, and absence of microbial resistance as of yet(16). This might be because herbal irrigants produce a wide range of biologically active substances that are chemically varied and reduce

bacterial viability by blocking the respiratory chain(17). In comparison to the conventional root canal irrigants, this provides an added benefit(18). The undesirable odour and taste, limited shelf life, and need for fresh solutions to be created each time are drawbacks of using herbal irrigants that must be overcome(19). More research can be done with different Samples and with different concentrations so that these irrigants are more widely accepted(20–29)

CONCLUSION

Based on the results presented, it is possible to conclude that the herbal formulations represent a good reduction of Enterococcus faecalis. These herbal preparations can be used wisely to lower the E. faecalis count, which could lower infections that develop after therapy. Hence, it can be considered as one of the possible alternatives or a replacement for the synthetic chemical formulations.

ACKNOWLEDGEMENT

The author would like to thank all the participants for their valuable support and Saveetha

Dental College for their support to conduct the study.

Funding Source

The present project was funded by, Saveetha Institute of Medical and Technical Sciences, Saveetha Dental College and Hospital, Saveetha University, Transking medical academy private limited.

Conflict Of Interest

All the authors declare that there was no conflict of interest in the present study.
Ethical approval-NA
Conflict of interest-NA
Informed Consent- None declared

Authors Contribution

DSJ: Literature search, data collection,analysis,manuscript drafting, RVG Data verification, manuscript drafting, TL designed the study

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