Original Article

Recent root canal irrigation protocol followed by endodontists and postgraduate students of endodontics for root canal therapy in Central India: A survey

ABSTRACT

Background: One of the main purposes of root canal treatment is the complete debridement of root canals. Regardless of the instrumentation technique used 35% or more of the root canal surfaces have been observed to remain uninstrumented. To remove debris and address these uninstrumented surfaces, it is necessary to copiously irrigate the root canal. Many adjuncts have also been developed and being used in an effort to improve the delivery and effectiveness of these irrigants. Although much research have been conducted on different root canal treatment regime and irrigants used in dentistry, only a little data can be found on the widespread practice or acceptance of such methods.

Aims and Objectives: The purpose of this survey was therefore to ascertain the current trends in the use of root canal irrigants and irrigation protocol followed by Endodontists and Postgraduate students across Central India (Madhya Pradesh).

Material and Methods: A questionnaire-based survey was conducted and participants were asked to fill in responses to some questions regarding their preferences for root canal irrigation like irrigant selection, irrigant concentration, technique used for delivery and activation of irrigants, etc.

Results: The majority of the respondents considered both irrigations as well as instrumentation to be of equal importance. Also, the majority of respondents prefer full-strength sodium hypochlorite (5.25%) while only a few have been found to use its lower concentration (3%).

Conclusion: It is essential for future prospects to get an awareness of the properties and actions of irrigants and incorporate them into practice for executing a successful endodontic treatment.

Keywords: Endodontics Irrigation, Irrigation, Root Canal

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INTRODUCTION

The success of endodontic treatment depends primarily on eradicating microorganisms from the root canal system and preventing their reinfection. Part of this can be achieved by instrumentation, but it has been found that a considerable percentage (35%) of root canal surfaces were left untouched, regardless of the instrumentation technique used.[1] In addition to this, an irrigant that is liquid in nature can reach beyond the confines of an instrument to these untouched surfaces. Thus, irrigation plays a pivotal role in the debridement of root canals as it allows for cleaning beyond what might be achieved by root canal instrumentation alone.[2] The use of adjuncts to improve the delivery and effectiveness of these irrigants is also advisable.

An ideal root canal irrigant, as described by Zehnder,[3] should be nontoxic, noncaustic to periodontal tissues, have

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little potential to cause an anaphylactic reaction, possess a broad antimicrobial spectrum, capable of dissolving necrotic pulp tissue, inactivating endotoxins, either preventing the formation of a smear layer or dissolving it once it has formed, and at the same time, must be least irritating to the periapical tissues.[4] However, one single irrigant is not sufficient to meet all these requirements. A judicious case-specific selection of irrigant and its adjuncts and the use of various techniques to expedite its action are therefore important.[5]

Although there has been constant improvisation and advancement in material science as well as techniques used to enhance the efficacious cleaning of the root canal environment, it is seen that many clinicians are negligent or not familiar with the recent concepts and approaches in irrigation protocol. The imprudent use of irrigants and the remissness to learn their importance can hamper the successful outcome of endodontic treatment. This survey aimed to obtain data regarding the irrigation protocol followed by endodontists in Central India and its comparative evaluation with established practice trends data obtained from previous similar surveys in other parts of India. This was followed by updating them with the latest materials and techniques that may be incorporated in modern-day endodontics.

MATERIALS AND METHODS

An invitation to participate in a web-based survey was e-mailed to 300 endodontists and postgraduate students from the Department of conservative dentistry and endodontics across Central India. The questionnaire comprised 10 questions and was framed to cover all the information regarding root canal irrigation, including the variables not covered in previous similar surveys are done across other parts of India. Table 1 represents the list of surveys referred for comparison in the present survey. Many aspects critical for the success of root canal treatment were included in the questionnaire, such as the irrigant selection, concentration, the volume of the irrigant, its action on the smear layer, vapor lock effect, and the use of adjuncts for irrigant activation.

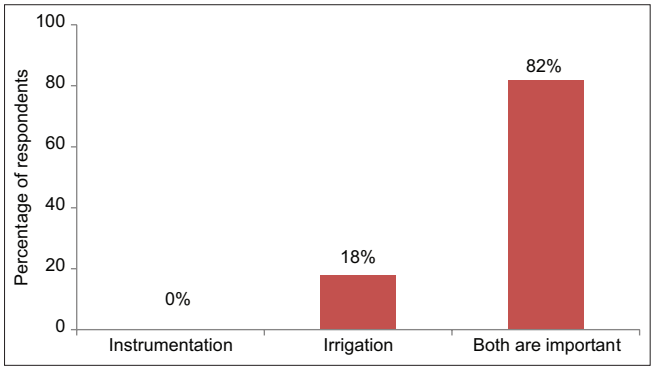
A multiple-choice questionnaire was formed along with options for write-in answers wherever appropriate. The survey duration was of 6 weeks. Table 2 represents a sample of the survey questionnaire given to the participants. The data were compiled by a single assessor and analyzed using IBM SPSS Statistics for Windows, Version 17.0. Chicago.

RESULTS

Of 300 invitations, 220 candidates responded, thus achieving a response rate of 73%. The average clinical experience of most of the endodontists surveyed was between 5 and 10 years. Graphs 1-5 display the results of the critical questions from the survey.

Table 1: List of previous surveys compared with the present study

Study year	Location	Number of dentists surveyed	Information gathered in the survey
Madhusudhana Koppolu *et al.* (2016)[23]	Andra Pradesh, India	144, by hand	Irrigant routinely used Primary irrigant Irrigant concentration Adjuncts used Gauge of needle used Volume of irrigant used
Damanpreet *et al.* (2014)[24]	Himachal Pradesh, India	544, web-based	Primary irrigant or choice Irrigant concentration Adjuncts used
Dr Mohd Sajad *et al.* (2019)[25]	Jammu and Kashmir, India	261, By hand	Irrigant concentration Irrigant volume Gauge of needle used Adjunct to irrigation
Shrestha *et al.* (2013)[26]	Nepal, India	120, by hand	Primary choice of irrigant
Anil Kohli *et al.* (2014)[27]	Mumbai, India	455, by hand	Primary choice of irrigant Conc of NaOCl
Present study	Madhya Pradesh, India	220, web-based	Mechanical Instrumentation or irrigation or both Irrigant selection Irrigant concentration Volume of irrigant Biofilm removal Needle gauge Vapor lock removal Adjunt to irrigation



Graph 1: Most important step for long-term success of root canal treatment

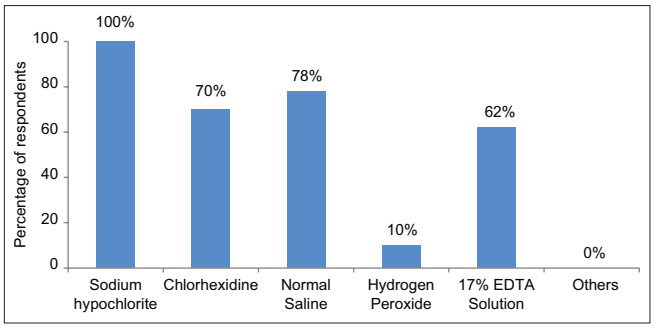
DISCUSSION

There has been an ongoing debate about an ideal root canal treatment protocol for centuries. Different practitioners have different views regarding the mechanical preparation of the root canal system, appropriate irrigation use, and its activation method. Over time, there has been a revolutionary change from giving more importance to the instrumentation of the root canal to the realization that irrigation plays an essential role in disinfecting the root canal.[6,7] Clinicians are now more inclined to choose an appropriate irrigant according to the periapical condition of the tooth rather than following a routine of using the same irrigant irrespective of the treatment

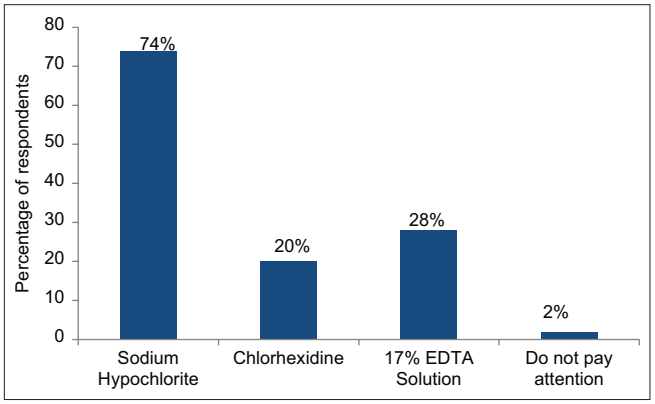
Table 2: A sample of survey questionnaire given to the participants

Kindly mark your designation
Endodontist
Postgraduate student pursuing Endodontics
Which irrigant (s) do you use? (Please select all that apply)
Sodium hypochlorite
Chlorhexidine
Normal saline
H_2O_2
17% EDTA solution
Others (specify)
Which one of these is your primary choice as a root canal irrigant?
Sodium hypochlorite (regardless of its percentage)
Chlorhexidine
Normal saline
H_2O_2
17% EDTA solution
Others (specify)
Tick against the option which according to you is the primary reason for the choice of irrigant (Please select all that apply)
Antibacterial capability
Tissue dissolution
Substantivity
Expense
Smear layer removal
What concentration of sodium hypochlorite do you use?
0.5%
3.0%
5.25%
6%
I do not pay attention to the concentration of sodium hypochlorite
What volume of sodium hypochlorite do you use per canal for a multi-rooted tooth?
5 ml
4 ml
3 ml
I do not pay attention to the volume
How do you manage smear layer removal?
17% EDTA solution
Any other irrigant (specify)
No special methodology
Which irrigant (s) would you prefer for the effective removal of biofilm
Sodium hypochlorite
Chlorhexidine
17% EDTA solution
I do not pay attention to the removal of biofilm
How do you manage to remove the vapor lock? (Please select all that apply)
Using side vented needle for irrigation
Using manual dynamic agitation of irrigant technique
Sonic/Ultrasonic activation of irrigant
No idea about the concept
Which, if any, adjuncts to irrigate do you utilize? (Please select all that apply)
Ultrasonic activation
Sonic activation
Subsonic activation (example endoactivator)
Negative pressure (example endovac)
Others (specify)

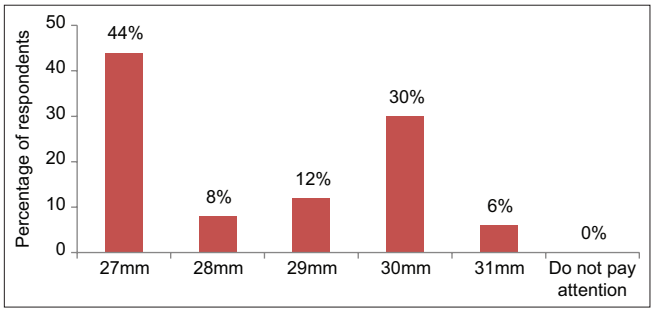
EDTA: Ethylenediaminetetraacetic acid



Graph 2: Irrigant utilized



Graph 3: Irrigants preferred for the effective removal of biofilm

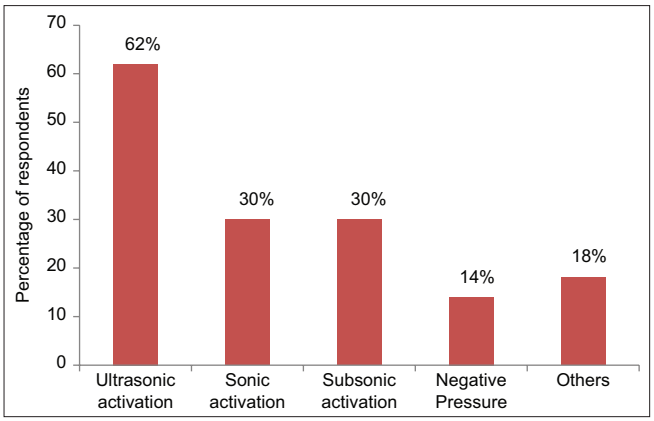


Graph 4: Gauge of needle used

plan.[8,9] Practitioners are also keen to learn about different modes of activating irrigation and incorporate them into their practice to improve root canal treatment outcomes.

This survey aimed to collect data from practicing endodontists and postgraduate trainees in endodontics registered with the State Dental Council of Madhya Pradesh, India. The questionnaire was so framed as to ascertain the root canal irrigation trends being followed by them and compare the ongoing trends of this region with similar studies conducted in other parts of India. Such surveys provide a simple means for collecting data, but they are often weakened by poor rates of responses. The present survey offered a response rate of 73%.

The present survey indicated that for the long-term success of root canal treatment, most respondents considered both



Graph 5: Any adjuncts to irrigation utilized

irrigation and instrumentation to be of equal importance. Sodium hypochlorite was selected as an irrigant of primary choice by all the respondents in the present survey and all the other previous surveys done in India. The probable reason for such a popularity of NaOCl can be attributed to its high tissue dissolving capacity and antibacterial property, as later was also found to be the highest-ranked reason for the irrigant selection in the present study.[10,11]

In the present study, it was found that the majority of respondents prefer full-strength sodium hypochlorite (5.25%), while only a few have been found to use it's lower concentration (3%). These results were comparable to most of the surveys conducted in different parts of India, where the majority of respondents from those using sodium hypochlorite as an irrigant preferred its full strength for effective action.[5,12-14]

According to the literature,[15-17] volume is more important then the type of the solution due to the mechanical action created by the flux and reflux of the solution inside the canal, removing debris left in suspension after biomechanical procedures. However, in the present survey, almost half of the respondents were found to use less volume, i.e., only 3 ml of irrigant per canal, and only 28% considered the use of higher volume, i.e., 5 ml per canal, to be significant to ensure a successful root canal treatment. The results of the present study were different from a survey conducted in Andhra Pradesh[18] and Jammu and Kashmir,[19] where a majority of respondents (55.6% and 37.2%, respectively) were using an even higher volume of irrigant, i.e.,5–10 ml per canal.

In the present survey, the majority of the respondents believe that sodium hypochlorite and ethylenediaminetetraacetic acid are indeed important for biofilm eradication. However, it was also found in the present study that 20% of respondents rely on chlorhexidine for biofilm removal. This was also an exclusive finding of this such as the removal of biofilm was not incorporated as a question in previous similar surveys across the country.

It has been demonstrated that air bubbles may be entrapped in the apical part of the root canal during syringe irrigation and totally block irrigant penetration in that area, a phenomenon precisely known as apical vapor lock. In the current survey, it was observed that to overcome the vapor lock effect, most endodontists prefer either side vent needles, manual dynamic agitation, or even ultrasonics. However, 12% of the responders were unaware of the concept of a vapor lock system and did not incorporate any unique adjunct to overcome it.

In the present study, only 50% of the participants have given importance to the activation of irrigants. Among them, 62% use ultrasonic activation, 30% sonic activation, and 14% use a negative pressure system. Eighteen percent of the respondents use other modes of activation, such as manual dynamic agitation, which is the most readily available and cost-effective method of the activation of root canal irrigation.[20-22]

CONCLUSION

These varieties of responses may highlight that some of the respondents have a deficit of knowledge of the properties of irrigants and their association with root canal outcomes. Thus, it becomes essential for future prospects to get an awareness of the properties and actions of irrigants and incorporate them into practice for executing a successful endodontic treatment.

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Conflicts of interest

There are no conflicts of interest.

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