

Assessment of Practice of Endodontic Treatment Protocols among Dental Practitioners in Mumbai and Navi Mumbai: A Questionnaire-based Survey

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Abstract

Introduction: Although endodontics is a speciality field, a dental practitioner who is not endodontists also performs endodontic treatment routinely in his practice making it fundamentally essential to follow the APT protocols and keeps himself updated for delivery of efficient treatment.

Aim: The aim of this study was to assess the knowledge and the endodontic treatment protocols followed by dental practitioners.

Materials and Methods: The study design was a cross-sectional questionnaire-based survey. The study was conducted among 386 dental practitioners in Mumbai and Navi Mumbai who were selected through block randomization. Data were collected through a self-designed pretested questionnaire. Descriptive statistical analysis and Chi-square test were conducted.

Results: Of the 386 dental practitioners, 58.29% of practitioners always obtained consent and 76.68% always took a pre-operative radiograph. 53.88% of dental practitioners used digital radiography. 52.95% practitioners used an autoclave to sterilize their endodontic files. 68.65% dental practitioners never used a rubber dam. 87.82% practitioners used a combination of cotton rolls and suction tip for isolation. Working length was determined using apex locator and radiograph by 45.07% practitioners. 63.73% used a combination of hand files and rotary system and step back was the choice of technique by 45.59% practitioners. Sodium hypochlorite was the commonly used irrigant, and zinc oxide eugenol was the commonly used sealer along with gutta-percha for obturation using cold lateral condensation.

Conclusions: The study infers a need for knowledge up gradation and reinforcement of the protocols being followed by dental practitioners.

Key words: Continuing dental education, Dentists, Endodontics, Endodontic skills, Root canal therapy, Treatment protocols

INTRODUCTION

Endodontics is a dynamic field that helps in successfully treating a pulpal or periradicular disease without resorting to an ultimate need for extraction. Several studies have been conducted to evaluate the outcome of an endodontic treatment.¹⁻⁵ It has been concluded as a long lasting and conservative therapy due to its long-term survival.² A

plethora of factors such as age, sex, pre-operative vitality, and periapical pathology determine the prognosis of an endodontically treated tooth.³ Factors governed by the dental practitioner such as method of canal preparation and position of the apical seal also dramatically influence the outcome.⁴ The survival of teeth following an endodontic treatment is higher when performed by specialists as compared to general dentists.⁵ Dental practitioner stumbles across plentiful cases that entail an endodontic treatment, making it vital for him to follow the correct protocols and stay updated with contemporary endodontics for delivering a treatment as efficiently as a specialist in the field.

Aim and Objectives

This study was conducted with an aim to study the attitude and to explore the materials and techniques employed

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during an endodontic treatment by the dental practitioners in Mumbai and Navi Mumbai.

The primary objectives of this study were as follows:

1. To study the attitude of the dental practitioners in Mumbai and Navi Mumbai toward an endodontic treatment.
2. To explore the materials and techniques employed by the dental practitioners during an endodontic treatment in Mumbai and Navi Mumbai.

The secondary objectives of this study were as follows:

1. To come to a conclusion as to how the dental practitioners can upgrade themselves for the provision of a more efficient treatment.

MATERIALS AND METHODS

The present cross-sectional questionnaire-based survey was conducted among 386 dental practitioners in Mumbai and Navi Mumbai who were selected through block randomization by dividing the area into the following four blocks: Central Mumbai, Western Mumbai, South Mumbai, and Harbor Line. Lottery Method was adopted for selection of practitioners from each block to ensure a simple random sampling and equal representation of dental practitioners from each area. The inclusion criterion was set to include the dental practitioners who were willing to participate in the present survey and giving a written informed consent. The study excluded those practitioners who were not present on the day of the survey and up to two rounds of follow-up and those who were qualified specialist in the field of endodontics and quacks. A sample size of minimum 384 dental practitioners was determined using the single proportion formula as follows:

$$N = \left[\frac{Z_{\alpha} p (1-p)}{d} \right]^2$$

In the above formula that was used, N was the sample size that was estimated. Z_{α} was the variant of type one error; p was the proportion of good practice of endodontics assumed at 50% and d was the estimated error in this study fixed at 5%.

Before the start of the study, clearance and permissions were obtained from Institutional Ethics Committee after the study protocol was sent and reviewed by 2 blinded reviewers (letter dated 13th January 2016).

Data were collected using the self-designed, pre-tested questionnaire by hand delivery. It comprised of two sections; Section A comprised questions to extract

demographic details, and Section B comprised 17 questions to evaluate the attitude and the protocols adopted by the dental practitioner during endodontic treatment. The questionnaire was collected on completion with minimum two rounds of follow-up. Data collected by questionnaire was coded and entered onto a M.S. Office Excel Sheet (V. 2010). Descriptive statistics in the form of frequency and percentage were calculated using Statistical Package for Social Sciences (SPSS, V.22.0, IBM). Comparison of responses which varied based on years of practice, age, and gender of the dental practitioners was done using Chi-square test where $P < 0.05$ was considered to be statistically significant.

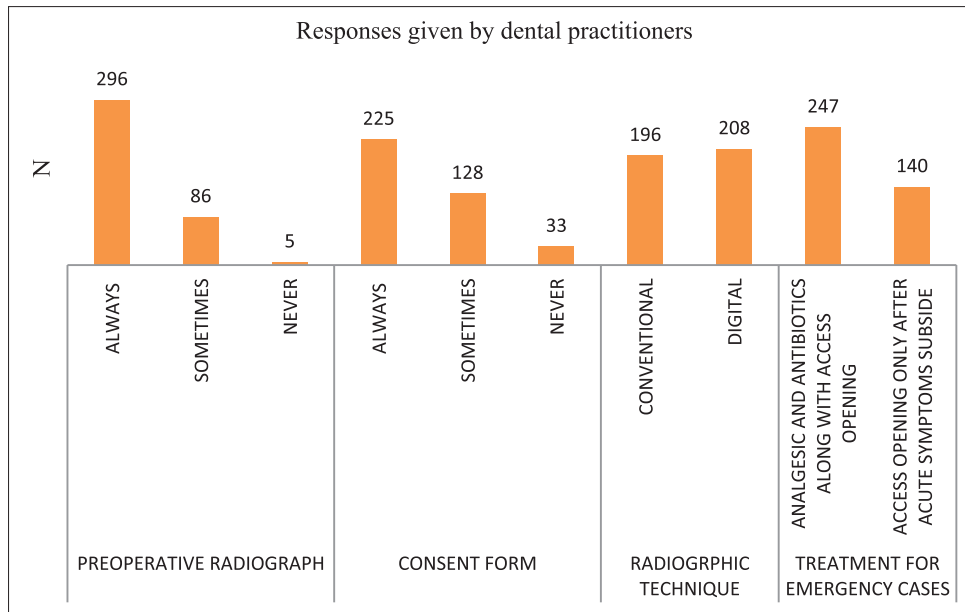
RESULTS

The result obtained through a descriptive statistical analysis of the collected data was formulated in the form of frequency and percentage. Of the 386 participating dental practitioners, 38.6% practitioners were male and 61.4% of the practitioners were female. 78% of the practitioners were in the age group of <34 years, 16.1% practitioners were between 35 and 44 years and 6% of the participants aged more than 44 years. The participants were also grouped according to the years of experience. 57.8% of the participants had an experience of 1-5 years, 22.8% of the participants had an experience of 5-10 years, 8.3% of the participants had an experience of 10-15 years, and 11.1% possessed an experience of more than 15 years of practice in the dental field.

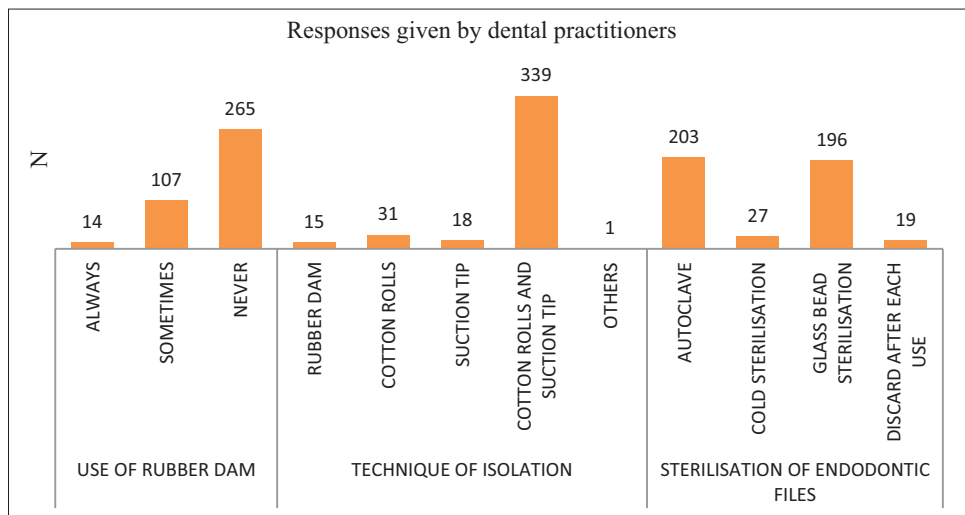
Section B revealed that a majority of the practitioners responded positively for obtaining a pre-operative radiograph and for routinely getting a signed consent from the patient (Graph 1). The use of digital technique surpassed the use of conventional radiography (Graph 1). The choice of treatment for an emergency case differed among the practitioners where 63.98% of the participants favored access opening along with a prescription of analgesics and antibiotics while 36.26% favored access opening only once acute symptoms subsided following the use of analgesics and antibiotics (Graph 1).

The evaluation of isolation protocols revealed that alarming 68.65% practitioners never adopted the use of rubber dam (Graph 2), and combination of the use of cotton rolls along with suction tip was the technique of isolation adopted by 87.82% practitioners (Graph 2). The results revealed that autoclave was the most commonly used technique by 52.95% for sterilization of endodontic files (Graph 2).

The results inferred that apex locator followed by radiographic confirmation was used by 45.07% of the participants to determine working length (Graph 3). The



Graph 1: Protocols regarding radiograph, consent form and emergency cases



Graph 2: Isolation and sterilization protocols

use of Gates-Glidden drill was sometimes adopted during an endodontic treatment by 68.13% of the practitioners (Graph 3). Among the many available instruments, the use of a combination of hand file and rotary system was favored by a majority of 63.73% of the practitioners (Graph 3), and step back technique was followed by a majority of 45.59% of the practitioners for the biomechanical preparation of canals (Graph 3).

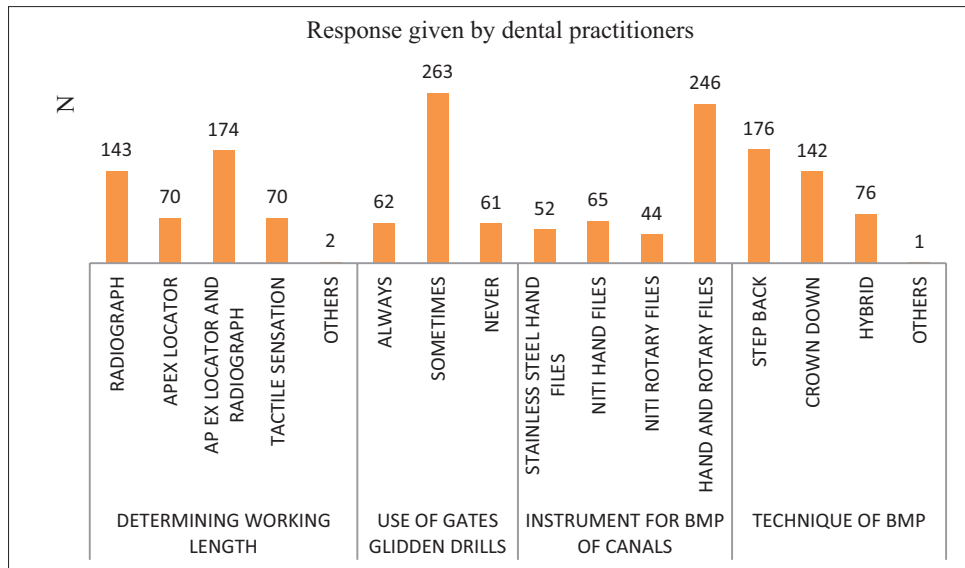
Assessment of the protocols followed for irrigation of canals revealed that sodium hypochlorite was the most commonly used irrigant by 88.34% practitioners and only 32.90% reported warming sodium hypochlorite sometimes for the purpose of irrigation (Graph 4). The majority used sodium hypochlorite within the concentration range of 0.5-2.5% and activated the irrigant by hand files (Graph 4).

The questionnaire concluded with the assessment of protocols followed during obturation of canals. Cold lateral condensation of gutta-percha with zinc oxide eugenol as the sealant was most commonly used by the practitioners (Graph 5).

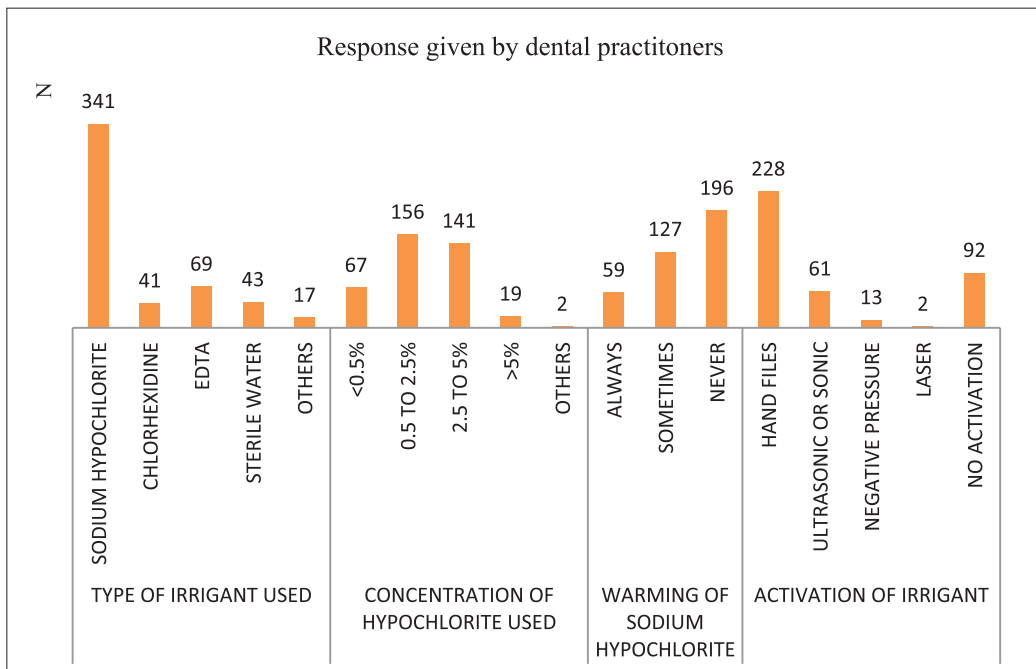
There was no statistically significant difference seen with gender ($P > 0.05$), but a statistically significant difference was seen when age and experience were compared with responses ($P < 0.05$) (Tables 1 and 2).

DISCUSSION

In this study, 76.68% of the practitioners obtained a pre-operative radiograph which is in accordance to the study conducted by Mehta *et al.* which states that 81%



Graph 3: Working length and instrumentation protocols



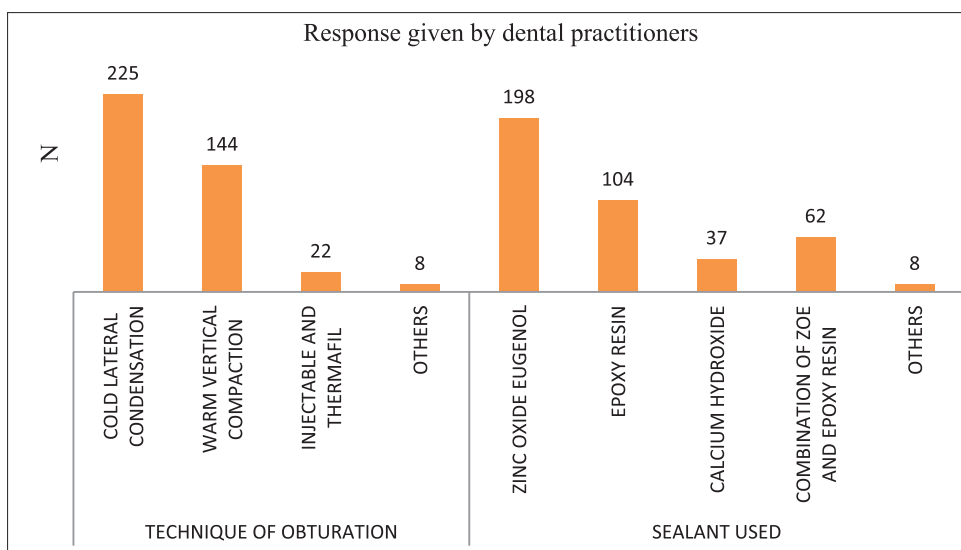
Graph 4: Irrigation protocols

practitioners always obtained pre-operative radiograph.⁶ Iqbal *et al.* in their study also mention that 51% of the practitioners always obtained a pre-operative radiograph.⁷ Thus, the fundamental necessity of obtaining a pre-operative radiograph cannot be ignored for appropriate case selection, studying the number of canals and canal morphology and also for maintaining the dental record.

This study indicated that 58.29% of the practitioners always got a consent form signed from the patient, whereas only 8.54% did not do so which contradict the values stated by Mehta *et al.* where 52% of the practitioners did not get a

consent form signed.⁶ Every patient before undergoing any procedure must be made aware of the success rates and drawbacks of it thus making a signed consent of utmost importance.

The key to the success of an endodontic treatment lies solely in the accurate appraisal of the pulpal disease. Thus the conventional radiographic technique evolved to a more proficient digital radiographic technique that allows accurate detection of caries and assessment of the health of periarticular tissue.⁸ This study indicated that majority of the practitioners used digital radiography while in a



Graph 5: Obturation protocols

Table 1: Comparison of responses to questions with age groups

Age groups (years):

1: <34

2: 35-44

3: >44

Questions	Response						P value of Chi-square test
Getting a consent form signed	Age groups	A	B	C			0.000
A: Always	1	191	89	21			
B: Sometimes	2	26	30	6			
C: Never	3	8	9	6			
Treatment of emergency cases	Age groups	A	B			0.001	
A: Access opening along with analgesics and antibiotics	1	191	110				
B: Access opening once acute symptoms subside	2	42	19				
	3	12	10				
Technique of biomechanical preparation of canals	Age groups	A	B	C	D	0.004	
A: Step back	1	150	95	49	0		
B: Crown down	2	13	31	16	1		
C: Hybrid	3	8	9	5	0		
D: Others							
Concentration of sodium hypochlorite used	Age groups	A	B	C	D	0.000	
A: <0.5%	1	60	123	98	15		
B: 0.5-2.5%	2	0	25	30	4		
C: 2.5-5%	3	5	6	11	0		
D: >5%							
Technique to activate irrigant	Age groups	A	B	C	D	E	0.000
A: Hand files							
B: Ultrasound or sonic activation	1	180	42	7	0	68	
C: Negative pressure	2	29	10	3	0	15	
D: Laser	3	9	2	0	2	9	
E: No activation							

study conducted by Mehta *et al.*, 89% practitioners follow the conventional technique of radiography and only 11% took real time images.⁶

In this study, 63.98% of the practitioners performed access opening along with prescription of analgesics and antibiotics during an emergency case. However, 36.26% practitioners

performed access opening after the acute symptoms subsided. These values are in agreement to those in the study by Mehta *et al.* where 80% practitioners preferred root canal opening with analgesics and antibiotics.⁶ Local anesthesia takes longer to act when the tissues are inflamed.⁹ This could be the reason why some practitioners preferred carrying out the access opening after the acute symptoms subsided.

Table 2: Comparison of responses to questions with years of experience

Experience groups (years):

1: 1-5

2: 5-10

3: 10-15

4: More than 15

Questions	Responses						P value of Chi-square test
Getting a consent form signed	Experience group	A	B	C			0.008
A: Always	1	137	69	17			
B: Sometimes	2	54	30	4			
C: Never	3	16	14	2			
	4	18	15	10			
Treatment of emergency cases	Experience group	A	B			0.012	
A: Access opening along with analgesics and antibiotics	1	139	84				
B: Access opening once acute symptoms subside	2	58	30				
	3	23	8				
	4	25	17				
Sterilization of endodontic files	Experience group	A	B	C	D	0.000	
A: Autoclave	1	95	3	102	4		
B: Cold sterilization	2	27	3	28	4		
C: Glass bead sterilization	3	10	2	11	3		
D: Discard after each use	4	25	3	8	3		
Determining the working length	Experience group	A	B	C	D	A,E	0.001
A: Radiograph	1	70	27	87	13	0	
B: Apex locator	2	18	12	33	7	1	
C: Apex locator followed by radiograph	3	4	3	14	1	1	
D: Tactile sensation	4	9	8	14	4	0	
E: Others							
Technique of biomechanical preparation of canals	Experience group	A	B	C	D	0.001	
A: Step back	1	120	69	29	0		
B: Crown down	2	33	30	23	0		
C: Hybrid	3	6	15	10	0		
D: Others	4	12	21	8	1		
Concentration of sodium hypochlorite used	Experience group	A	B	C	D	0.000	
A: <0.5%	1	49	101	61	8		
B: 0.5-2.5%	2	11	27	41	8		
C: 2.5-5%	3	0	14	14	2		
D: >5%	4	5	12	23	1		
Technique to activate irrigant	Experience group	A	B	C	D	E	0.000
A: Hand files	1	129	33	4	0	54	
B: Ultrasound or sonic activation	2	57	8	5	0	17	
C: Negative pressure	3	15	5	1	0	7	
D: Laser	4	17	8	0	2	14	
E: No activation							
Sealer used	Experience group	A	B	C	D	E	0.000
A: Zinc oxide eugenol	1	122	44	23	21	0	
B: Epoxy resin	2	30	21	3	24	2	
C: Calcium hydroxide	3	10	9	5	7	0	
D: Combination of ZOE and Epoxy resin	4	17	13	2	4	1	
E: Others							

In this study, 52.9% practitioners sterilized their files by autoclave and 50.77% used a glass bead sterilizer. Very few practiced cold sterilization or discarding the file after each use. Similar results were concluded by Shrestha *et al.*, in their study where 48.18% practitioners autoclaved their endodontic files, 50% used a glass bead sterilizer and 20.9% preferred chemical sterilization.¹⁰ Similar results were observed by Mehta *et al.* while studying the endodontic trends.⁶ Studies have been carried out to weigh the efficiency of various sterilization techniques in killing microorganisms which have concluded that files sterilized

by autoclave were completely sterile.^{11,12} Sterilization of endodontic files is indispensable as it reduces the chances of cross infection making it necessary to adopt a technique that efficiently sterilizes the files.

Every dental procedure requires an isolated environment in which it can be efficiently carried out. 68.65% of the practitioners in the present study never used a rubber dam and 87.82% preferred the use of a combination of cotton rolls and suction tip. The study conducted by Mehta *et al.* had similar results and stated that only 4.33% of the

dentists reported using rubber dam.⁶ Similar response was observed in a study conducted by Iqbal *et al.* where 9% of practitioners used rubber dam and 91% opted for cotton rolls for isolation.⁷ These values were also in accordance with a study conducted by Shrestha *et al.*¹⁰

The results state that 45.07% practitioners use apex locator followed by radiographic confirmation for determining working length while 18.13% relied on tactile sensation and 37.04% used only a radiograph. In contrast to the present study, Mehta *et al.* state in their study that only 38% use radiograph along with apex locator but majority rely on radiograph for determining the working length and only 8% rely on tactile sensation.⁶ The study conducted by Shrestha *et al.* also gave contrasting results. Their study stated that 80% of general dental practitioners in Kathmandu used radiograph with the instrument in the canal for determining the working length and only 40% of the practitioners use an apex locator.¹⁰ Iqbal *et al.* in their study also state that 86.5% of the dental practitioners use only radiographs to determine the working length and only 13.5% of them adopted a combination of apex locator and radiograph.⁷ Accurate determination of working length is fundamental in the success of an endodontic treatment. Shanmugaraj *et al.* evaluated the different techniques to determine the working length and concluded that electronic apex locators gave the most accurate working lengths followed by radiographic technique and the least accurate being tactile sensation.¹³

The use of Gates-Glidden drill during an endodontic treatment is fundamental for widening the canal orifice so as to obtain a straight line access. The study revealed that 68.13% of the practitioners incorporated its use only sometimes during an endodontic treatment and 1.8% never did so which is in contrast to the values mentioned in the study conducted by Mehta *et al.* where 66% of practitioners never used Gates-Glidden drill.⁶

In this study, 63.73% dental practitioners used a combination of hand and rotary files and 13.47% practitioners use only stainless steel hand file for canal preparation. In contrast to these values, Mehta *et al.* in their study stated that 56% of the practitioners use stainless steel hand files and only 15% opted for the use of rotary nickel titanium (NiTi) instruments.⁶ Iqbal *et al.* in their study also stated that 82.5% of the dental practitioners in North of Saudi Arabia use stainless steel hand files and only 17.5% used NiTi hand and rotary instruments.⁷ Shrestha *et al.* also mentioned that 88.18% of the dental practitioners in Kathmandu use stainless steel hand files and only 12.72% use rotary NiTi hand files.¹⁰ NiTi files have proven to be highly efficient especially when preparing a canal with a complex anatomy.

Gluskin *et al.* stated that when canals were prepared using NiTi rotary files; there were lesser canal transportations and greater conservation of tooth structure with minimum time required to prepare canals.¹⁴ Pettiette *et al.* reported a higher success value when NiTi files were used for they were able to maintain the canal's original shape.¹⁵ Since no two canals ever share a similar morphology, the appropriate selection of the instrument used for canal preparation can significantly affect the treatment outcome.

Adopting an APT technique for canal preparation is as important as selecting an APT instrument. This study states that 45.59% dental practitioners followed the step back technique and only 19.68% used the hybrid technique for biomechanical preparation of canals. Mehta *et al.* similarly stated that 59.66% practitioners followed the step back technique and 23.66% followed the crown down technique.⁶ Similar results were concluded by Iqbal *et al.*, where 41% of the dental practitioners followed step back technique and 12.5% followed the crown down technique.⁷ In a study conducted by Shrestha *et al.*, 90.9% practitioners followed the step back technique.¹⁰

The presence of microorganisms and accessory canals makes it imperative to irrigate the canals. The majority of the practitioners in the present study reported using sodium hypochlorite of concentration in the range of 0.5-2.5%, whereas only 4.92% practitioners use a concentration of more than 5% in their routine practice. Due to its high efficiency in dissolving pulpal tissue and due to its microbial activity, its use has gained popularity worldwide.¹⁶ Sodium hypochlorite of 0.5% concentration is a more effective irrigant than saline.¹⁷ The efficacy of sodium hypochlorite solution can be maximized by increasing its concentration, temperature, flow and surface tension.¹⁸ Sodium hypochlorite of 5.25% concentration has superior antimicrobial activity when compared to other irrigants and decreasing its concentration concomitantly decreases its antimicrobial efficacy.¹⁹ In this study, 32.9% of dental practitioners warmed hypochlorite solution only sometimes and very few adopted irrigation techniques such as negative pressure ultrasonic and sonic. These values contradict the results obtained in a study conducted among the endodontists in America by Dutner *et al.*, where the endodontists were well versed with various techniques of activating the irrigants.²⁰ Although direct comparison was not possible, these were the differences in irrigation protocols seen among the endodontists in America and dental practitioners in India.

In this study, 58.29% of the practitioners used cold lateral condensation and 51.29% used zinc oxide eugenol as the sealer. Similar values were obtained in the study by

Mehta *et al.* where 91% obturated canals using cold/warm lateral condensation with a root canal sealer and only 9% opted for techniques like silverpoint system Thermafil, Obtura II injectable. Zinc oxide eugenol was the choice of sealer by 55% of the practitioners and resin based sealer was used by 13%⁶ as compared to 26.94% in the present study. Similarly, lateral condensation was the most popular technique among 81% practitioners in North of Saudi Arabia.⁷ The study conducted in Kathmandu also gave similar results where lateral condensation was most popular among 91.81% general dental practitioners and ZOE was the most commonly used sealer by 63.63% of the practitioners.¹⁰ Canal obturations performed using cold lateral condensation of Gutta-percha and within 2 mm of radiographic apex of tooth gave the best outcomes.²¹ A well condensed obturation with an excellent apical seal concludes an efficiently performed endodontic treatment.

One possible limitation of this study is that the data collected is from a single geographical area, which may be further improved by inclusion of a larger area for future comparisons, also the comparison of protocols between endodontists and dental practitioners may be included in future studies, but taking into consideration the sources of information, the participants gather to update their knowledge and the contemporary technologies available. We hence assume the extrapolation of the results of this study to be generalized to all the dental practitioners of the country.

CONCLUSION

This study thus concludes that there are certain protocols that have been religiously followed by the dental practitioners of Mumbai and Navi Mumbai but yet the knowledge of the advanced techniques has been over shadowed. Many of the dental practitioners are aware of the protocols followed at the institutional levels but have not inculcated them in their routine practice. This knowledge can be best upgraded through continuing dental education for the benefit of both the practitioner and the patient.

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