



## A Survey of Endodontic Practices among Dentists in Nigeria

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### ABSTRACT

**Aim:** To investigate the pattern of routine endodontic practices among Nigerian dentists.

**Materials and methods:** This study was a questionnaire-based survey of samples of dentists in the Nigerian cities of Enugu and Benin. The self-administered questionnaire contained 25 close-ended questions with multiple choice options. The data collected included demographic details of respondents, root canal preparation techniques, irrigants and intracanal medicaments used, the number of appointments, method of working length determination, root filling techniques, cements used, and the scope of treatment performed.

**Results:** Most respondents used sodium hypochlorite as the irrigant, the step back technique for canal preparation, and lateral condensation with a zinc oxide-eugenol-based sealer for obturation. Most respondents did root canal treatment on all types of teeth and used radiographs to determine the working length 70% of the time. Most respondents followed up their patients for less than 12 months and most treated teeth with periapical areas larger than 10 mm by root canal therapy combined with apical surgery.

**Conclusion:** Most Nigerian dentists use step back technique for canal preparation and lateral condensation for obturation.

**Clinical significance:** Endodontic practice by Nigerian dentists differs from some established practice quality guidelines in many other countries, particularly in nonperfusion of modern techniques into practice, popularity of antibiotic use for endodontic emergencies and a high rate of perforations.

**Keywords:** Endodontic practice, Survey study, Dentistry.

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### INTRODUCTION

Endodontic treatment includes all clinical procedures designed to maintain the teeth in a functional state in the dental arch. The challenges of preserving the dental arch

free of pulp and periapical diseases have contributed to numerous innovations in contemporary endodontic practice. These include changes in concepts, techniques, instruments and materials.<sup>1</sup> Changes in the field of endodontics have been so rapid in recent years that current instruction in root canal treatment (RCT) bears little resemblance to that of 10 years ago.<sup>2</sup> The consequence is that dentists are faced with numerous materials and techniques, while dental schools try to tailor their curriculum accordingly.<sup>1</sup>

In order to ensure acceptable treatment outcomes, quality guidelines for endodontic practice have been published.<sup>3</sup> Various investigations have been carried out to explore the standards of RCT carried out by general dental practitioners in Europe.<sup>4-7</sup> In Nigeria, the level of compliance with the guidelines is unknown.

Existing literature reveals variability in compliance with standard endodontic guidelines among practitioners throughout the world. Chan et al<sup>1</sup> reported that the majority of respondents used periapical radiographs to determine working length (WL) and also noted a preference for nonrotary manual endodontic files in Hong Kong. Similarly, a study among general dental practitioners in America showed that they favored sodium hypochlorite as an irrigant over distilled water, normal saline and local anesthetic solutions, while 59% always used rubber dam (RD) compared to more than 60% who did not routinely use RD.<sup>8</sup> The trend was toward single appointment RCT in the USA<sup>9</sup> and 38.9% of the dentists instrumented the canals to a level 1 mm short of the radiographic apex, independent of the presence of preoperative periapical radiolucency.<sup>8</sup>

Unlike in developed nations, data concerning endodontic practice in Nigeria is lacking. Therefore, the purpose of the study was to investigate endodontic practices among Nigerian dentists. At the time of the survey, the two cities lacked an updated dentists' register. However, approximately 3,000 dentists take care of the dental health of over 150 million Nigerians and most of them work in six

major cities with a population of over 1 million people in each. The vast majority of the Nigerian rural population has little or no access to modern dental treatment, because most of the dental clinics are located in the cities.<sup>10</sup>

## MATERIALS AND METHODS

This study was a questionnaire-based survey of a sample of 100 dentists in the Nigerian cities of Enugu and Benin, two of Nigeria's major cities in the South-East and South-South geopolitical zones, respectively. The self-administered questionnaire contained 25 close-ended questions with multiple choice options and it was designed to gather information about Nigerian dentists' practice of endodontics.

The study was conducted between February and April 2010 and the data collected included the demographic details of respondents, root canal preparation techniques, irrigants, intracanal medicaments, number of visits per RCT, method of WL determination, root filling technique, the type of cement used and the scope of endodontic treatments performed.

The questionnaire (Chart 1) was first piloted on a few dentists in a local setting and minor modifications were made before it was utilized in this study. The data was collated and presented as percentages and absolute frequencies.

**Chart 1:** The questionnaire used in the study

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| <p>1. Gender<br/>(a) Male (b) Female</p> <p>2. Highest professional qualification.</p> <p>3. Number of years post qualification.</p> <p>4. Do you practice RCT?<br/>(a) Yes (b) No</p> <p>5. If 'No' to question 4, why?</p> <p>6. Who decides your RCT cases?<br/>(a) Self (b) Endodontist<br/>(c) From referral</p> <p>7. Do you determine WL for your RCT cases?<br/>(a) Yes (b) No</p> <p>8. Which method do you use most often?<br/>(a) Radiograph (b) Tactile sense<br/>(c) Known tooth length (KTL) (d) Electronic apex locator</p> <p>9. If you use radiograph, how much is your instrumentation level short of the apex?<br/>(a) 0 mm (b) 1 mm<br/>(c) 1.5 mm (d) 2 mm</p> <p>10. What is the scope of your RCT case?<br/>(a) Anterior teeth (b) Premolars<br/>(c) Molars (d) All teeth</p> <p>11. Average visit per treatment<br/>(a) 1 (b) 2<br/>(c) 3 (d) ≥ 4</p> <p>12. Are there any complications associated with the RCT?<br/>(a) Yes (b) No</p> <p>13. Types of RCT-related complication in your practice<br/>(a) Irrigant-related (b) Perforation<br/>(c) Over instrumentation (d) Ledge formation<br/>(e) Swelling (f) Unbearable pain<br/>(g) Other</p> | <p>14. Isolation method used most often<br/>(a) Rubber dam (b) Cotton roll<br/>(c) Saliva ejector (d) Other</p> <p>15. How long is your postoperative follow-up?<br/>(a) less than 1 year (b) 1-2 years<br/>(c) 3-4 years (d) ≥ 5 years</p> <p>16. Which type of preparation technique do you use?<br/>(a) Push/pull (b) Step back<br/>(c) Step down (d) Nonstandardized<br/>(e) Profile (f) Other</p> <p>17. Which is your instrument of choice?<br/>(a) Reamer (b) File<br/>(c) Reamer and file (d) Hedstrom<br/>(e) Reamer, file and hedstrom<br/>(f) Endodontic hand piece</p> <p>18. How do you manage emergency?<br/>(a) Analgesics and antibiotics<br/>(b) Pulpectomy<br/>(c) Pulpectomy and medication<br/>(d) Extraction<br/>(e) Other</p> <p>19. How do you manage tooth with lesion &gt; 10 mm in diameter?<br/>(a) Extraction<br/>(b) RCT only<br/>(c) Apical surgery only<br/>(d) Apical surgery and RCT<br/>(e) Reject advice<br/>(f) Refer</p> <p>20. Type of irrigant used<br/>(a) Normal saline (b) Hydrogen peroxide<br/>(c) NaOCl (d) Chlorhexidine<br/>(e) Combination (f) Other</p> <p>21. What concentration of NaOCl do you use?<br/>(a) 0.5% (b) 1%<br/>(c) 2% (d) 5%</p> <p>22. Do you use intracanal medicament?<br/>(a) Yes (b) No</p> <p>23. If 'Yes' to 22 above, which type?<br/>(a) Cresophene (b) Ca(OH)<sub>2</sub><br/>(c) Eugenol (d) Other</p> <p>24. How do you obturate the canal?<br/>(a) Silver points (b) Single cone<br/>(c) Lateral condensation (d) Vertical condensation<br/>(e) Other</p> <p>25. The sealer I use most often is<br/>(a) ZOE (b) Endomethasone<br/>(c) AH26 (d) Sealapex<br/>(e) Other</p> |
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## RESULTS

Questionnaires were distributed to 100 dentists in two cities; only 86 of them returned the questionnaires. In addition, six questionnaires were judged to be unusable because four respondents did not practice endodontics and two other replies had incomplete information. Eighty questionnaires were therefore analyzed in this study (response rate = 80%). More males (57.5%) than females (42.5%) participated in the survey and the highest qualification of the majority of respondents (62.8%) was a Bachelor of Dental Surgery (BDS) or its equivalent (BChD). Most respondents (46%) had 6 to 10 years of postgraduation professional experience as a dentist, while 20% had 11 to 15 years of experience, and 2.5% had more than 20 years experience. Table 1 summarizes all of the data.

**Table 1:** Various data analyzed in this study

Analyzed data		%
Decide your RCT cases	Self	68.8
	Endodontist	25
	From referral	6.2
WL determination	Radiography	70
	Tactile sense	18.8
	Known tooth length	11.2
	Electronic apex locator	0
	0 mm	3.7
WL level (short of the radiographic apex)	1 mm	67.5
	1.5 mm	16.3
	2 mm	12.5
	Anterior teeth	20
RCT scope	Premolars	12.5
	Molars	5
	All	62.5
Number of visits	One appointment	3.7
	Two appointments	26.3
	Three appointments	63.8
Complication	≥ Four appointments	6.2
	Irrigant-related	6.3
	Over instrumentation	15.3
	Perforation	23.4
	Ledge	6.3
	Swelling	10.8
	Unbearable pain	27
	Other	10
Method of isolation	Rubber dam	1.2
	Saliva ejector	6.3
	Cotton roll	92.5
Postoperative follow-up	Less than 1 year	37
	1-2 years	25
	3-4 years	20
	≥5 years	18
Method of instrumentation	Push/pull motion	28.8
	Step back	52.5
	Step down	11.3
	Profile	1.2
	Nonstandardized	6.2
Instruments	Reamer	22.5
	File	28
	Hedstrom	7.5
	Reamer and file	36.3
	Reamer and file and hedstrom	2.5
	Endodontic handpiece	2.5
	Antibiotic therapy	28.8
Management of emergencies	Pulpectomy	7.5
	Pulpectomy and medication	50
	Extraction	13.7
	RCT only	5
	Apical surgery only	5
Management of lesions larger than 10 mm	RCT and apical surgery	62.4
	Refer	11.3
	Extraction	11.3
	Reject advice	5
	H <sub>2</sub> O <sub>2</sub>	22.5
	Normal saline	28.8
Type of irrigants	Chlorhexidine	2.5
	NaOCl	32.5
	Combined	2.5
	Other	1.2
	0.5	30
NaOCl concentration	1	10
	2	53.3

Contd.

Contd.

Intracanal medicament	5	6.7
	Cresophene	28.8
	Ca(OH) <sub>2</sub>	24.4
	Eugenol	32.1
Choice of sealer	Other	12.8
	ZOE sealer	61.2
	Endomethasone	10
	AH26	13.8
Obturation method	Seal apex	6.2
	Other	8.8
	Lateral condensation	78.8
	Vertical condensation	3.8
	Silver point	1.2
	Single cone	11.2
	Other	5

## DISCUSSION

The respondents in the current study were dentists who were able to provide valid and valuable information on the current status of endodontic practice in a subpopulation of Nigerian dentists, but the information provided may not necessarily mirror the teaching of endodontics in Nigeria.

The major limitations and weaknesses of this study include the inflexible nature of the study design. As opposed to direct observations, it is difficult to deal with specific contexts in the current questionnaire-based study. Moreover, some questions that may be more appropriate to respondents may have been missed in an attempt to standardize the questions.

The limited financial, human and material resources have made most oral health studies in Nigeria sporadic in nature and based on convenient samples. In addition, because therapeutic dental services are available mainly in the cities, most of the dentists are located in the cities.<sup>10</sup> From this current study of the dentists in both Enugu and Benin cities, it is possible to gain an insight into endodontic practices among dentists in Nigeria.

The oral health status in Nigeria is an interesting one as periodontal disease has a prevalence rate of 15 to 58% in people over 15 years, while caries experience is moderate in cities, ranging from very low to low.<sup>11</sup> In addition, although the average DMFT is less than 4, the restorative index is substantially low, as most carious teeth are unrestored.<sup>12</sup> Other oral health problems are tumors, trauma, malocclusion and dental fluorosis. The rural population has little or no access to modern dental treatment and the limited oral health care services in the country are mainly available in the cities, where most dentists are located. Their training is patterned after that of UK dentists. Some receive foreign specialist training, while some train locally and others are either foreign or locally trained nonspecialists. Largely, but with the exception of the private dental clinics, dental practice in Nigeria is driven by both government support and policies.

Apart from facilitating the biomechanical preparation and filling of the root canal system, the WL determination is a critical step in endodontics.<sup>13</sup> Bjørndal et al<sup>14</sup> showed that WL has a great influence on endodontic outcome. An inaccurate WL may cause apical overextension of instruments, irrigants or materials. Otherwise inaccurate WL determination may lead to incomplete instrumentation and filling.<sup>1</sup> The most commonly used method to determine the WL in the current study was the use of a periapical radiograph.

The common use of 1 mm short of the apex as the instrumentation level in the current study agrees with the report of Slaus and Bottenberg,<sup>5</sup> but not with that of Whitten et al.<sup>8</sup> In the latter study, 0.5 mm short of the apex was more popular. However, Kerekes and Tronstad<sup>15</sup> showed that the tooth's preoperative pulp status may affect instrumentation levels. They allowed 1 mm and 1 to 2 mm instrumentation levels for teeth with necrotic and inflamed pulps, respectively. Other factors that may influence instrumentation levels are anatomic variability in the apical region and age.<sup>16</sup> The thickness of cementum increases with age by a factor of 2- to 3-fold and the apical constriction to the outer orifice is 0.5 mm in the younger persons and 0.8 mm in the adults.

Choosing between single and multiple appointments for RCT varies among authors. Whereas the trend in the USA and Europe is toward single appointment treatment, respondents in the current study preferred multiple appointments, which agrees with the Sudanese findings. The preference for multiple appointments by Nigerian dentists may be related to the level of professional training of respondents in the study, which agrees with Whitten et al<sup>8</sup> finding that endodontists preferred single appointments compared with general dental practitioners who preferred multiple visits. Gatewood et al<sup>9</sup> reported that 34.7% of Diplomates of the American Board of Endodontists treated cases with normal periapical tissues in one visit, while only 16.2% would do so if apical periodontitis was present. It is also likely that because of fear of a possible flare-up, and late case presentations resulting from poor oral health awareness of Nigerians, dentists practiced multiple appointments more often in the current report. Other reasons for multiple appointment popularity in the study may include patient/operator comfort consideration, patient/operator preference and satisfaction, function and cost. Others are chairside time for patient/operator, the tooth pretreatment status, as well as pre- and intraoperative factors.

Various complications may occur during RCT. Root perforation is an external opening in root walls created by boring, piercing, cutting or resorption that results in a communication between the root canal system and the

periodontal tissues. Compared with 70% of practitioners reporting about 5% of chronic apical periodontitis complications, without root perforation, in the study of Slaus and Bottenberg,<sup>5</sup> 23.4% of the respondents in the current study reported perforations as a complication they have experienced. This was second only to unbearable pain (27%). The reasons for this high rate might be due to the high rate of nonspecialists in the study and the use of radiographs as the only preassessment aid. The use of radiographs, without complementary aids, is limited in that a two-dimensional image of a three-dimensional structure is provided. Furthermore, refinements in radiographic interpretation may be lacking in the Nigerian endodontic protocol. In addition, the existence of anatomic variations may be contributory and it is most probable that due attention may not have been given to such variations as radix entomolaris (RE). A 3% prevalence rate of RE is reported among Africans<sup>17</sup> in contrast to 0.2% recorded among Indians.<sup>18</sup>

The use of cotton rolls for the isolation of teeth by the majority of respondents in the current study is in defiance of the use of RD as an established technique for over 140 years in controlling the oral environment.<sup>19</sup> Cotton rolls suffer the setback of repeated changing and frequent rinsing by the patient.<sup>20</sup> In addition, unlike RD, visual contrast and mirror fogging are problems to surmount.<sup>21</sup> Udoye and Jafarzadeh<sup>2</sup> identified the cost of RD, lack of training, availability and acceptability as barriers to the use of RD by Nigerian dentists.

The main objective of root canal preparation is to cleanse, shape, and fill the canal to destroy any microorganisms within the canal and to prevent ingress of new organisms. The mechanical preparation of the root canal system is achieved with intracanal instrumentation. As in the report of Slaus and Bottenberg<sup>5</sup> and Hommez et al,<sup>6</sup> traditional intracanal hand instruments were employed most commonly in the current study. Despite the reported qualities of NiTi systems,<sup>22</sup> they have yet to diffuse among the Nigerian dentists. This may be due to cost and availability factors, lack of training and expertise.

The level of antibiotic use for emergencies in the current study is high, though lower than that recorded by Flemish dentists.<sup>5</sup> The study population and design, expertise and experience of the dentists, among other factors, may account for the differences. The level of antibiotic use for endodontic emergencies in a given situation, may be a function of the pretreatment status of the tooth, school of thought believed in, endodontic concepts and the level of sophistication of practice prevalent in that community. In Nigeria, oral health awareness is low, explaining late presentation of cases and endemic very high rates of unrestored carious teeth.

Potentially, such cases may have acute infections when they receive RCT. Perhaps, to pre-empt such infections from escalating to life-threatening problems (such as cavernous sinus thrombosis or Ludwig's angina), the respondents use antibiotics. Other explanations may include a lack of experience because most respondents in the study had only 6 to 10 years of postgraduation professional experience and about 64% of the respondents were not specialists.

More than 60% of the respondents in the current study reported that they performed apical surgery for radiolucencies more than 10 mm in diameter in contrast to doing endodontic treatment alone by most dentists as reported by Slaus and Bottenberg.<sup>5</sup> The Nigerian dentist's orientation, their clinical decision capability and the study design may account for the differences between these studies. In addition, operator/patient chairside time, costs and operator/patient preference may be other important factors.

In both the present and the Chan et al<sup>1</sup> studies, the most popular irrigants were sodium hypochlorite and normal saline. This may be due to the proven usefulness and effectiveness of sodium hypochlorite as an antimicrobial agent.<sup>23</sup> However, it is limited by its caustic and distasteful properties. Perhaps, because of these properties, respondents in the current study preferred a 2% version of the solution, which agrees with other reports.<sup>1,24</sup> Perhaps, nonpopularity of RD in the current study may account for the preference of the lower concentration and less caustic 2% NaOCl over higher concentrations.<sup>2</sup> On the other hand, EDTA which has been used in endodontics for many years is not a routine irrigant among Nigerian dentists who tend to only use it to help negotiate calcified canals.

Since, it is almost impossible to create a sterile root canal system through mechanical means alone, the use of intracanal medicaments becomes important, especially in RCTs with multiple appointments.<sup>6</sup> Whereas only 60% of the respondents used intracanal medicaments in Chan et al' report,<sup>1</sup> all dentists preferred it in the current study. This is not surprising because multiple visit treatment was the most popular approach in the current study. Generally, cases tend to present late (some with infected canals) in less dentally aware nations, such as Nigeria. In order to ensure removal of all microorganisms, it is likely that the dentists used medicaments more often. It may also imply that Nigerian dentists understand better the effectiveness of intracanal medicaments in reducing bacteria, pain and inflammation in root canal systems. On the other hand, while eugenol was used more often in the current study, dentists in the study by Chan et al<sup>1</sup> preferred calcium hydroxide. The current study's preference may relate to cost, ease of

availability and use. This is notwithstanding that Ca(OH)<sub>2</sub> is regarded as the standard intracanal dressing among authors.<sup>6</sup>

It is required that cements should be readily available and nontechnique sensitive, have reasonable setting time, and be biocompatible. The preference for nonmedicated zinc oxide-eugenol cement in the current study agrees with the practice by English private practitioners, while most Flemish and National Health Scheme (NHS) practitioners preferred AH26 and endomethasone, respectively.<sup>25</sup> Largely, variation of cement use across studies may be a function of choice, convenience, cost and ease of availability.

The preferred technique for filling the root canals in the current study was the lateral condensation technique and this has been reported as the most universally accepted technique.<sup>5</sup> It is also the preferred technique among undergraduate dental students.<sup>26</sup>

## CONCLUSION

Endodontic practice by Nigerian dentists differs from some established practice quality guidelines in many other countries, particularly in nonperfusion of modern techniques into practice, popularity of antibiotic use for endodontic emergencies and a high rate of perforations.

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