

Original Article

Evaluation of Cases for Root Canal Treatment in a Tertiary Hospital in Nigeria

Enabulele JE*, Ibhawoh LO

¹Department of Restorative Dentistry, University of Benin, Benin City, Edo State. Department of Restorative Dentistry, Nigeria

***Corresponding author**

Dr. Enabulele, Joan E, Department of Restorative Dentistry, University of Benin Teaching Hospital, Benin City, Edo State. Department of Restorative Dentistry, Email: emien.enabulele@uniben.edu

Submitted: 09 May 2021

Accepted: 15 May 2021

Published: 18 May 2021

ISSN: 2333-7133

Copyright

© 2021 Enabulele JE, et al.

OPEN ACCESS

Keywords

• Root canal Treatment; Evaluation; Prospective

Abstract

BACKGROUND/OBJECTIVE: There is increase in demand and advocacy for root canal treatment. This study evaluated cases planned for root canal treatment in a tertiary hospital in Nigeria

METHODOLOGY: This was a prospective cross-sectional study of patients who received root canal treatment. The questionnaire sought information on the socio-demographic characteristics of the participants, the indication for the endodontic treatment and the teeth to receive endodontic treatment. Digital radiographic technique was used to evaluate the number of roots and root canals.

RESULTS: A total of 143 patients who received root canal treatment on 162 teeth participated in the study. There was a slight male preponderance with males accounting for 50.3%. More maxillary teeth (58.6%) were root-treated compared to mandibular teeth (41.4%). The central incisors constituted the most frequently root-treated teeth (27.2%), followed by the first molars (21.0%) and then the second molars (16.7%). In the mandibular arch, the most frequently root-treated teeth were the molars (69.2%), while in the maxillary arch, the most frequently root-treated teeth were the incisors (46.3%). The most frequently encountered pathologies associated with the root-treated teeth were the sequelae of dental caries (50.6%), trauma (41.4%) and failed root canal treatment (5.6%). Most anterior teeth suffered trauma while posterior teeth suffered complications of dental caries and this was statistically significant ($P < 0.0001$).

CONCLUSION: More teeth from the maxillary arch, as well as more posterior teeth than anterior teeth across both arches, were root-treated. Incisors were the most commonly root-treated teeth in the maxillary arch while the molars were the most commonly root-treated teeth in the mandible with complications of trauma being the leading indications for root treatment of maxillary anterior teeth while the sequelae of caries were the predominant indications for root treatment of mandibular molars.

INTRODUCTION

Root canal treatment is a dental treatment procedure that is carried out either to maintain asepsis of the root canal system or to disinfect it, when the pulp is non-vital or has been removed to prevent or treat apical periodontitis [1]. Root canal treatment allows the tooth to remain functional in the mouth.

There is increased awareness and interest of patients in root canal treatment as more of them prefer procedures to retain their teeth to having extractions of their teeth [2]. Dental health care providers [3], and endodontists in particular, are creating better awareness among dental patients of the root canal treatment option where applicable. With this increase in demand and advocacy, it has become necessary for more information on patterns of root canal treatment procedures to be garnered and made available to aid the understanding of disease patterns as well as for developing ideal preventive and management approaches [4]. It is important that cases for root canal treatment be evaluated properly for successful outcomes, to avoid attempting root canal treatment on teeth which do not require the treatment or are unlikely to succeed even with expert attention upon referral. The report by Ingle and Beveridge that poor selection of cases for endodontic treatment ended in avoidable failures, which

constituted as high as 22% of all endodontic failures, has been cited by Adhya [5]. Such attempts at unviable treatment tend to distort actual patterns of feasible and viable root canal treatment procedures performed. Furthermore, no consensus has been reached on the pattern of root canal treatment and most of the previous studies were retrospective [4,6-9]. Hence, this study sought to evaluate cases planned for root canal treatment in a tertiary hospital in Nigeria.

METHODOLOGY

This was a prospective cross-sectional study of patients who, after receiving adequate patient education by the research team, gave informed consent and received conventional endodontic treatment in the Endodontics unit of the Department of Restorative Dentistry, University of Benin Teaching Hospital between January 2019 and June 2020. Data collection was by the means of an interviewer-administered questionnaire. The questionnaire sought information on the socio-demographic characteristics of the participants (age, gender, level of education and occupation), the indication for the endodontic treatment and the teeth to receive endodontic treatment. Intra-oral digital periapical radiographs were taken (Kodak RVG 5100, Carestream Dental, Stuttgart, Germany). The long-cone paralleling technique

was employed and when additional information was required, additional parallax views were obtained. The images were evaluated by the researchers using the RVG 5100 software and the number of roots were identified and dichotomized into single and multi-rooted teeth. The number of root canals identified after access cavity preparation on the teeth were noted and also dichotomized into single and multi-canal teeth.

All data collated were analysed using IBM SPSS version 26.0 statistical software. The statistical tools employed for analysis were descriptive statistics which included frequency distribution, mean and standard deviation and cross tabulations. Associations between categorical variables were determined using Chi square test with p-value set at 0.05.

RESULTS

A total of 143 patients who received root canal treatment on 162 teeth were recruited into the study. The age range of the participants ranged from 17 years to 84 years, with a mean age of 35.82±14.26years with 35.0% in the third decade of life and 29.0% in the fifth decade of life. There was a slight male preponderance with males accounting for 50.3% and skilled workers making up 40.6% of the study population (Table 1).

More maxillary teeth (58.6%) were root-treated compared to mandibular teeth (41.4%). The teeth distribution by arch is depicted in (Figure 1), with the mandibular molars accounting for (27.8%), followed by the maxillary incisors (27.2%) and the maxillary premolars (16.0%). The least root-treated teeth were the mandibular canines (1.2%) followed by the maxillary canines (2.5%) and the mandibular premolars (6.2%).

A higher proportion of the teeth were posterior teeth (premolars 22.2% and molars 40.8%) while anterior teeth made up the remaining 37.0% (Figure 2).

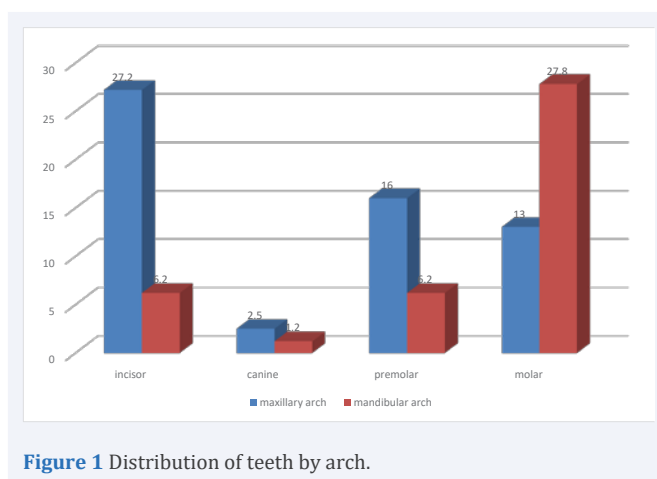


Figure 1 Distribution of teeth by arch.

Single rooted teeth were noted in 53.1% of the root-treated teeth while the remaining 46.9% had multiple roots with 31.5% having 2 roots, and 15.4% 3 roots. Lone canals were found in 48.8% of the teeth while the remaining 51.2% had multiple canals of which 15.4% had 2 canals, 32.7% 3 canals and 3.1% had 4 canals.

The central incisors constituted the most frequently root-treated teeth (27.2%), followed by the first molars (21.0%) and then the second molars (16.7%). The least frequently root-treated teeth were the third molars (0.6%) and the canines (3.7%) (Table 2).

In the mandibular arch, the most frequently root-treated teeth were the molars (69.2%) followed by the premolars and incisors 14.9% each, while in the maxillary arch, the most frequently root-treated teeth were the incisors (46.3%) followed by the premolars (27.4%) and the molars (22.1%) and this was statistically significant (p<0.0001).

The most frequently encountered pathologies associated with the root-treated teeth were the sequelae of dental caries (50.6%), trauma (41.4%) and failed root canal treatment (5.6%) (Table 4).

Table 5 depicts the association between the pathology and teeth type. Most anterior teeth suffered trauma while posterior

Table 1: Demographic characteristics of the participants.

Characteristics	Frequency	Percent
Age group (years)		
<20	11	7.7
21-30	50	35.0
31-40	47	29.0
41-50	12	7.4
>50	23	14.2
Gender		
Male	72	50.3
Female	71	49.7
Level of education		
No formal education	2	1.4
Secondary education	20	14.0
Tertiary education	121	84.6
Occupation		
Professional	23	16.1
Skilled worker	58	40.6
Semi-skilled worker	8	5.6
Unskilled worker	12	8.4
Dependents	42	29.4
Total	143	100.0

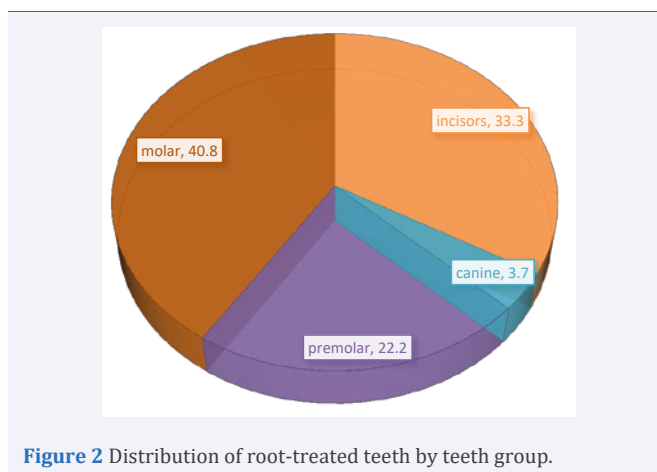


Figure 2 Distribution of root-treated teeth by teeth group.

Table 2: Distribution of root-treated tooth type.

Tooth type	Frequency	Percent
Central Incisor	44	27.2
Lateral Incisor	12	7.4
Canine	6	3.7
First Premolar	18	11.1
Second Premolar	20	12.3
First Molar	34	21.0
Second Molar	27	16.7
Third Molar	1	0.6
Total	162	100.0

Table 3: Association of root-treated teeth by arch.

Arch	Teeth				Total
	Incisor	Canine	Premolar	Molar	
Maxillary	44 (46.3)	4 (4.2)	26 (27.4)	21 (22.1)	95 (100.0)
Mandibular	10 (14.9)	2 (3.0)	10 (14.9)	45 (67.2)	67 (100.0)
Total	54 (33.3)	6 (3.7)	36 (22.2)	66 (40.7)	162 (100.0)

P<0.0001

Table 4: Pathology associated with the root-treated teeth

Pathology	Frequency	Percent
Sequelae of dental caries	82	50.6
Trauma	67	41.4
Non-carious tooth loss	4	2.5
Failed-root canal treatment	9	5.6
Total	162	100.0

Table 5: Association of pathology by tooth type.

Teeth	Pathology				Total
	Sequelae of dental caries	Trauma	Non-carious tooth loss	Failed root canal treatment	
Incisor	10 (18.5)	36 (66.7)	0 (0.0)	8 (14.8)	54 (100.0)
Canine	1 (16.7)	2 (33.3)	3 (50.0)	0 (0.0)	6 (100.0)
Premolar	23 (63.9)	12 (33.3)	1 (2.8)	0 (0.0)	36 (100.0)
Molar	48 (72.7)	17 (25.8)	0 (0.0)	1 (1.5)	66 (100.0)
Total	82 (50.6)	67 (41.4)	4 (2.5)	9 (5.6)	162 (100.0)

Fisher's exact p<0.0001

teeth suffered complications of dental caries and this was statistically significant (P<0.0001).

DISCUSSION

A total of 143 patients who received root canal treatment on 162 teeth participated in the study as some patients received root canal treatment on multiple teeth either concurrently or serially, within the research period.

The age distribution of participants in the study is comparable to findings from previous reports, [4,6-8,10-13] with a higher proportion of the study population between the ages of 21 and 30 years, a finding similar to previous reports [4,8,10,12] but contrary to another study which reported 46-60years as the most prevalent age group that received root canal treatment [14].

A slight male preponderance was observed in this study, a finding different from previous Nigerian retrospective studies [4,6,9,12] that reported higher prevalence of root-treated teeth in females. This may be a pointer to an increasing demand for oral health care by males. Another Nigerian study reported a more substantial male preponderance [8] than the slight one observed in this study. The difference in gender distribution between these two studies may be because the previous study was carried out in Northern Nigeria where it is believed that females are culturally more restricted in interactions outside family contacts hence the male predominance in that study. Studies from other geographic settings have reported a female preponderance [7,13-16].

An overwhelming proportion (81%) of the participants had tertiary education. A possible explanation is the fact that the research setting was contiguous to the neighboring main campus of the University of Benin with students, staff and their families living on campus and its environs, numbering in the tens of thousands, within easy reach of the hospital, although the facility is open to all members of the public for healthcare. On the other hand, even after receiving dental education on root canal treatment by members of the research team, only 2 participants who had no formal education consented to participating in this study. This might represent a mindset of members of this group in preferring tooth extraction to root canal treatment, as both an immediate and a permanent solution to toothache and other symptoms which would also be indications for root canal treatment. More enlightenment, through outreach programs in pre-hospital situations in the communities, by dental health care workers on the root canal treatment option when feasible, instead of extractions, will help spread awareness about it. Providing facilities and materials for dentists in the communities to undertake root canal treatment in primary and secondary care dental facilities may also enhance the awareness and acceptability of the root canal treatment option, especially to preserve teeth, among those without formal education.

Similarly, skilled workers and professionals together, constituted the majority (56.7%) of the participants, followed by the dependents group which was largely comprised of undergraduates whose dental treatments were sponsored while very small representations were seen in the semi-skilled (5.6%) and unskilled (8.4%) groups. These findings would suggest that the former groups were more receptive to recruitment into the study group which was an indication of their acceptance of root canal treatment as their preferred treatment option than the latter groups. While this may be linked to literacy and educational levels, it may indicate that professionals and skilled workers were more likely to accept the possibility of receiving multi-visit root canal treatment procedures and making the necessary rearrangements in their schedules to keep the multiple appointments that may be necessary to complete root canal treatments and save their teeth. Unskilled workers are also more likely to see multi-visit

root canal treatment appointments as disruptions in their daily earnings since no payments are received by them when they are away on dental appointments and therefore unavailable to do their work. Tooth extraction may therefore have been the more expedient option for them.

More maxillary teeth were root-treated compared to mandibular teeth, a finding similarly observed in other previous reports [4,7,9,12,13,15-18] but contrary to one other report [19]. Furthermore, a higher proportion of the root-treated teeth were posterior teeth, a finding similarly seen from some previous Nigerian studies [8,12,20] and an Argentine study [16] but contrary to other studies that reported a higher prevalence of root canal treatment in anterior teeth [17,18].

The mandibular molars were observed to be the most frequently root-treated teeth in this study. This finding is consistent with findings of previous studies [7,12,21,22] but differed from reports that recorded maxillary incisors as the most frequently root-treated teeth. [4,17]. However, the pattern of teeth affected as seen in this study, showed that maxillary incisors were next to mandibular molars in prevalence, a finding similar to a previous Nigerian study [12] but contrary to another report where the maxillary premolars were found to be next to mandibular molars in prevalence of root canal treatment [7]. The teeth with the lowest prevalence observed in this study were the mandibular canines, which tallies with the finding from another study [4] but differs from that observed in another study that reported mandibular incisors [14] and another study that reported maxillary second molars [18].

Single rooted teeth were noted in more than half of the root-treated teeth. This may be because single rooted teeth tend to be less complex to treat. The prevalence of multiple canals in this study was higher than that of lone canals. This can be attributed to the higher prevalence of posterior teeth which are teeth with multiple canals observed in this study.

Overall, the central incisors constituted the most frequently root-treated teeth, a finding different from a previous study in South-South Nigeria that reported molars as the most frequently root-treated teeth [4]. The least frequently root-treated teeth were the third molars followed by the canines. Third molars generally erupt later than the other molars, making them have rather shorter times in service with less exposure to the carious environment as well as being more often handled by extractions when impacted. These reasons and their frequently encountered anatomical complexities may explain why third molars were the least commonly root-treated molars.

In the mandibular arch the molars were the most frequently root-treated teeth, a finding similar to that from a previous study [22] followed by the premolars and incisors, while in the maxillary arch, the most frequently root-treated teeth were the incisors followed by the premolars and the molars and this was statistically significant ($p < 0.0001$). Maxillary incisors tend to be prone to traumatic injuries including luxation injuries and fractures which could compromise pulp vitality and later necessitate root canal treatment. Rampant caries also tends to seriously affect the maxillary anterior teeth, including the

incisors when they are involved, opening up the possibility of the root canal treatment option.

A higher proportion of root-treated anterior teeth were maxillary anterior teeth rather than the mandibular anterior teeth, a finding consistent with some previous studies [8,20]. This is also possibly related to the higher vulnerability of maxillary anterior teeth to traumatic injuries than their mandibular counterparts due to their anatomically more prominent and more anterior positions.

The indications for root canal treatment recorded in this study were similar to those of previous studies [13,16]. The most frequently encountered pathology associated with the root-treated teeth were the sequelae of dental caries, a finding similar to ones from previous Nigerian studies [8,9]. This may be because dental caries is not usually associated with pain until complications set in and the symptoms often then make patients to seek care. The second most frequent indication for root canal treatment in this study was dental trauma. It has been reported that pulp and periapical diseases are most commonly due to caries and dental trauma [13]. So, it is not surprising that they were also the two most common indications for root canal treatment in this study.

Failed root canal treatment was encountered in 5.6% of the cases, a value lower than the 7.5% reported in a previous Nigerian study [6] and the 17.44% reported in Tunisia [13]. This is not surprising given that many reports acknowledge the high success rates of primary non-surgical root canal treatment [23-25].

The prevalence of root-treated anterior teeth and premolars (59.2%) was similar to, but slightly lower than, the 66% reported in a previous Nigerian study [6].

CONCLUSION

Root canal patterns seen in this study showed that generally, more teeth from the maxillary arch, as well as more posterior teeth than anterior teeth across both arches, were root-treated. Incisors were the most commonly root-treated teeth in the maxillary arch while the molars were the most commonly root-treated teeth in the mandible with complications of trauma being the leading indications for root treatment of maxillary anterior teeth while the sequelae of caries were the predominant indications for root treatment of mandibular molars. More specifically, the maxillary central incisors were found to be the most commonly root-treated series, followed by the mandibular first molar series while the mandibular canines had the least prevalence of root treatment.

REFERENCES

1. European Society of Endodontology. Quality guidelines for endodontic treatment consensus report of the European Society of endodontology. *Int Endod J.* 2006; 39: 921-930.
2. Doumani M, Habib A, Qaid N, Abdulrab S, Bashnakli AR, Arrojue R. Patients awareness and knowledge of the root canal treatment in Saudi population: Survey based research. *Int J Dent Res.* 2017; 5: 89-92.
3. Adhya PS. Case selection in endodontic cases.
4. Umanah AU, Osagbemi BB, Arigbede AO. Pattern of demand for

- endodontic treatment by adult patients in Port Harcourt, South-South Nigeria. *J West Afr Coll Surg*. 2012; 2: 12-23.
5. Sorrell JT, McNeil DW, Gochenour LL, Jackson CR. Evidence-based patient education: knowledge transfer to endodontic patients. *J Dent Educ*. 2009; 73: 1293-1305.
 6. Enone LL, Oyapero A, Awotile AO, Ijarogbe O, Akinleye AI, Dahunsi M. A preliminary assessment of endodontic difficulty encountered at a tertiary health center in Lagos, Nigeria. *J Int Oral Health*. 2018 ;10: 303-309.
 7. Oglah FS, Zeidan BM, Gholam MK. Evaluation of endodontic treatment in three specialized private clinics in Baghdad (retrospective study). *MDJ*. 2011; 8: 233-236.
 8. Sotunde OA, Alalade O, Igweagu C, Adeyemo YI, Ikusika OF. A five year audit of root canal treatment at a tertiary centre in northwest Nigeria. *Nig J Rest Dent* 2018; 3:11-14.
 9. Ibhawoh LO, Enabulele JE. Retrospective analysis of reasons for conventional root canal treatment of permanent teeth in a Nigerian tertiary hospital. *Nig J Dent Sci*. 2019; 2: 13-21.
 10. Farrel TH, Burke FJT. Root canal treatment in General Dental Service, 1948-1987. *Br Dent J*. 1989; 166: 203-208.
 11. Saunders WP, Saunders EM. Endodontics and the elderly patient. *Restorative Dent*. 1988; 4: 4- 9.
 12. Umesi DC, Oremosu OA, Makanjuola JO, Nwachukwu NC. Frequency and distribution of teeth treated by single and multiple-visit root canal treatment in a Nigerian population by differently skilled operators. *Odontostomatol Trop*. 2016; 39: 56-64.
 13. Berrezouga L, Bouguezzi A, Belkhir MS. Outcome of initial endodontic treatment performed by one specialist, in 122 Tunisian patients: A retrospective study. *Int J Dent* 2018.
 14. Hollanda ACB, Alencar AHG, Estrela CRA, Bueno MR, Estrela C. Prevalence of endodontically treated teeth in a Brazilian adult population. *Braz Dent J*. 2008; 19: 313-317.
 15. Yousuf W, Khan M, Mehdi H. Endodontic procedural errors: frequency, type of error and the most frequently treated tooth. *Int J Dent* 2015.
 16. Scavo R, Lalis RM, Zmener O, Dipietro S, Grana D, Pameijer CH. Frequency and distribution of teeth requiring endodontic therapy in an Argentine population attending a specialty clinic in endodontics. *Int Dent J* 2011; 6: 257-260.
 17. Al-Negrish ARS. Incidence and distribution of root canal treatment in the dentition among a Jordanian subpopulation. *Int Dent J*. 2002 ;52: 125-129.
 18. Jamani KD, Fayyad MA. A radiographic study of the prevalence of endodontically treated teeth and procedural errors of root canal filling. *Odontostomatol Trop*. 2005; 28: 29-33.
 19. Mozayani MA, Asnaashari M, Modaresi SJ. Clinical and radiographic evaluation of procedural accidents and errors during root canal treatment. *Iran Endod J*. 2006; 3: 97-100.
 20. Oginni AO, Olusile OA, Oginni FO. Pattern of endodontic treatment in Ile-Ife, South Western Nigeria. *Nig Postgrad Med J* 1999;6: 1-5.
 21. Ridell K, Sundin B, Mattson L. Endodontic treatment during childhood and adolescence. *Swed Dent J*. 2003; 27: 83-89.
 22. Hull TE, Robertson PB, Steiner JC, del Aguila MA. Pattern of endodontic care for a Washington State population. *J Endod*. 2003; 29: 553-556.
 23. Laukkanen E, Vehkalahti MM, Kotiranta AK. Impact of type of non-surgical root canal treatment. *Clin Oral Invest*. 2019; 23: 4011-4018.
 24. Moazami F, Sahebi S, Sobhnamayan F, Alipour A. Success rate of non-surgical endodontic treatment of non-vital teeth with variable periradicular lesions. *Iran Endod J*. 2011; 6: 119-124.
 25. Elemam FR, Pretty I. Comparison of the success rate of endodontic treatment and Implant treatment and Implant Treatment. 2011.

Cite this article

Enabulele JE, Ibhawoh LO (2021) Evaluation of Cases for Root Canal Treatment in a Tertiary Hospital in Nigeria. *JSM Dent* 9(1): 1135.