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ORIGINAL ARTICLE

Pattern of Endodontic Treatment among Nigerian Adults: A Single Centre Study

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Abstract

Objective: To determine the pattern and frequency of root canal treatments (RCTs) performed among patients seen at a tertiary hospital in North-eastern Nigeria. **Material and Methods:** A retrospective epidemiological survey using hospital records of patients that had RCTs done over a 5-year period. Case record forms (CRFs) were used as tools of data collection from patient records to record demographic and clinical information such as age, gender, tooth involved, diagnosis and tooth treated. Students t test and One-way analysis of variance (ANOVA) were used to compare mean root-treated teeth by gender and age group respectively. **Results:** A total of 321 RCTs were carried out on 256 patients, ranging from 1 to 4 teeth (mean, 1.3 ± 0.6 [SD]) teeth per patient. The frequency and mean number of RCTs carried out were not significant for age ($p = 0.16$) and gender ($p = 0.78$). The lower first molar was the most root-treated tooth (20.9%), and overall, dental caries (84.4%) was the most predominant etiology of pulpal and periradicular disease necessitating RCT. Forty-two percent of the RCTs were carried out due to acute apical periodontitis. **Conclusion:** Gender and age group did not affect the frequency of RCTs performed, and majority of the root canal treatments were due to dental caries and its sequelae.

Keywords: Root Canal Therapy; Endodontics; Dental Caries.

Introduction

Root canal treatment or therapy (RCT) also referred to as endodontic treatment is a therapeutic strategy aimed at retaining the teeth in form and function. The procedure for this treatment involves complete extirpation or removal of the pulpal tissue, root canal preparation and obturation, with the intent of eradicating infection from the root canal system where there was pulpal infection before commencement of treatment, and preventing further reinfection post-treatment [1].

This treatment may be indicated for several reasons and may be carried out on endodontically healthy teeth for elective reasons, but mostly on those with irreversibly damaged pulp and/or with periradicular lesions. The irreversible pulpal damage and subsequent pulpal necrosis and/or periodontitis may be a result of caries, trauma, and iatrogenic damage during dental procedures. Among these, caries has been found to be the most common aetiological factor for pulpal damage necessitating the need for a RCT [2].

Electively, RCTs may be performed in the absence of pulpal inflammation on: teeth that are to be used for support of an overdenture; or when the risk of pulp exposure is inevitable as in a mal-aligned tooth that is planned for a crown restoration. With very few absolute contraindications, all tooth types can be successfully treated endodontically [3]. And with increasing dental awareness, many teeth are now being saved by RCT that would in the past have been extracted.

Several epidemiological studies have been conducted on the prevalence/frequency of endodontically treated teeth (ETT) in different populations [4-8]. Although the prevalence values differ depending on age group and population studied, it is expected, and has been documented to increase as more people keep their dentition into older ages [9]. Increasingly, demand for endodontic treatment instead of extraction has been noticed as well as a declining tendency amongst dentists to extract teeth [10]. It has thus become one of the most commonly performed surgeries with approximately 15.1 million RCTs performed yearly according to data from a survey carried out by the American Dental Association in the United States [11].

It is important to determine and document the frequency of endodontic treatment and its determinants as a way of providing a general picture of endodontic disease and predicting future need for this treatment [12]. This would provide data that would inform decisions on adjustment of preventive and clinical procedures as well as the determination of endodontic treatment status in a particular society [12,13].

In Nigeria, epidemiological studies of endodontic status are limited. A retrospective study over a four-year period in a tertiary dental clinic in the Niger delta region reported a total of 213 patients with 241 RCTs done [14]. Such a survey has never been carried out in the Northern part of the country. Considering this as well as the importance of epidemiological investigations, the aim of this study was to determine the pattern and frequency of endodontic treatments performed among patients seen at a tertiary hospital in North-eastern Nigeria and to correlate this information to gender, age group, indications and most treated teeth.

Material and Methods

Study Design

This study was conducted as a retrospective epidemiological survey using hospital records of patients that attended and had RCTs done in the Conservative Dental Clinic of the University of Maiduguri Teaching Hospital, Maiduguri, Nigeria. The hospital is the only tertiary care centre in the North-eastern part of the country offering comprehensive and advanced dental services to the six states in the region.

Data Collection

Records of all patients seen in the Conservative clinic over a five-year period from 2013 to 2017 were examined. Data was collected from the records for patients who had RCTs done within this period and recorded. These included demographic and clinical information such as age, sex, level of education, occupation, tooth involved, diagnosis, tooth treated and treatment provided.

The data was collected by two trained dental officers using proposed guidelines [15] on a case record form (CRF), opened for each patient record. Prior to data collection, the interobserver variability was tested with data entered into the CRFs by the two data collectors and the primary investigator independently from 10 patients' medical records and analysed. Using Lin's Concordance correlation, the interobserver variability was found to be minimal with a strong correlation (Rc = 0.92, 0.95). The principal investigator also performed random data checks of the CRFs, comparing all the information in the original patient records to that recorded in 20% of the CRFs. Medical records with incomplete data to complete the CRFs were excluded as well as illegible handwritings that could not be agreed on by the data collector and the principal investigator.

Data Analysis

The data was entered into a computer from the CRFs and analysed with the statistical package for social sciences, SPSS version 21.0 for Mackintosh (SPSS; Chicago IL, USA). Descriptive statistics was performed and data presented in tables to show the distribution of the variables by gender and age group. Students t test and One-way analysis of variance (ANOVA) were used to compare mean root-treated teeth by gender and age group respectively, with statistical significance was set at $p\text{-value} < 0.05$.

Ethical Aspects

The study protocol was approved by the Research and Ethics Committee of the teaching hospital before commencement. Patients' names and record numbers were omitted to deidentify them and preserve confidentiality.

Results

Two hundred and fifty-six patients with ages ranging from 17 to 65 years and a mean age of 28.8 ± 8.4 (standard deviation, SD) had RCTs done within the reference period. A total of 321 RCTs

were carried out on these patients, ranging from 1 to 4 teeth with a mean of 1.3 ± 0.6 (SD) teeth per patient. Majority of the patients were males, with the 26 – 35year age range accounting for the largest proportion (42.6%) of the patients treated while overall, 82.8% of the patients were below the age of 36 years (Table 1).

Table 1. Distribution of treated patients within the study period by age and gender.

Age Group (Years)	Gender					
	Male		Female		Total	
	N	%	N	%	N	%
16 – 25	48	18.7	55	21.5	103	40.2
26 – 35	80	31.3	29	11.3	109	42.6
36 – 45	22	8.6	10	3.9	32	12.5
46 – 55	4	1.6	5	1.9	9	3.5
56 – 65	2	0.8	1	0.4	3	1.2
Total	156	60.9	100	39.1	256	100.0

The number of RCTs done, single and multiple were higher among males and the 26-35 year age group and decreased with increasing age. The same trend was noticed for the average number of teeth treated but showed no statistically significant difference (p>0.05) (Table 2).

Table 2. Distribution of root-treated teeth per patient by age group and gender.

Variables	Category	Number of RCTs per Patient				Total (N)		Mean Number of Teeth ± SD	p-value
		1	2	3	4	Patients	Teeth		
Gender	Male	132	10	11	3	156	197	1.26±0.67	
	Female	82	13	4	1	100	124	1.24±0.57	0.78
	Total	214	23	15	4	256	321	1.25±0.63	
Age Group	16 – 25	92	6	5	0	103	119	1.16±0.48	
	26 – 35	84	14	7	4	109	149	1.37±0.77	
	36 – 45	27	3	2	0	32	39	1.22±0.55	0.16
	46 – 55	8	0	1	0	9	11	1.22±0.67	
	56 – 65	3	0	0	0	3	3	1.00±0.00	
	Total	214	23	15	4	256	321	1.25±0.63	

SD = Standard deviation; RCT = root canal treatment.

More RCTs were done in the maxilla compared to the mandible. The lower first molar was the most root-treated tooth (20.9%) followed by the upper central incisor (17.4%) while no lower lateral incisor tooth was root-treated in the reference period among the patients. Overall, the first molars were the most root-treated, followed by the upper incisors, while the third molars and the canines were the least (Table 3).

Dental caries was recorded as the most common etiology (271, 84.4%) of pulpal and periradicular disease that necessitated the RCT of the teeth for both gender and all age groups. Trauma as the etiological factor was however commoner among males (20, 6.2%), and in patients less than 36 years old (29, 9.0%). All 30 root-treated teeth due to pulpal and periradicular disease secondary to trauma were carried out on upper central (70%) and lateral (30%) incisors. More RCTs were carried out due to acute apical periodontitis, AAP (129, 40.2%) than for any other reason. A

higher proportion of the male patients (46.2%) were treated due to AAP when compared to the female patients (30.6%) that received treatment for the same reason (Table 4).

Table 3. Distribution of root-treated teeth by tooth type and jaw.

Tooth Type	Maxilla		Mandible		Total	
	N	%	N	%	N	%
Central Incisor	56	17.4	1	0.3	57	17.8
Lateral Incisor	20	6.2	0	0.0	20	6.2
Canine	2	0.6	1	0.3	3	0.9
First Premolar	15	4.7	5	1.6	20	6.2
Second Premolar	34	10.6	14	4.4	48	15.0
First Molar	53	16.5	67	20.9	120	37.4
Second Molar	8	2.5	42	13.1	50	15.6
Third Molar	2	0.6	1	0.3	3	0.9
Total	190	59.2	131	40.8	321	100.0

Table 4. Distribution of etiology and diagnosis of pulpal and periradicular disease.

Category	Etiology of pulpal/periradicular disease (N)							Total
	Dental Caries	Crown Fracture	Trauma with necrosis	Failed RCT	Failed Restoration			
Male	164	7	20	4	2			197
Female	107	4	10	0	3			124
Total	271	11	30	4	5			321
	Diagnosis of pulpal and periradicular disease (N)							
	IP	AAP	CAP	AAA	CAA	PN	PC	
Male	49	91	28	9	16	2	2	197
Female	46	38	31	4	3	1	1	124
Total	95	129	59	13	19	3	3	321

IP = Irreversible pulpitis; AAP = Acute apical periodontitis; CAP = Chronic apical periodontitis; AAA = Acute apical abscess; CAA = Chronic apical abscess; PN = Pulpal necrosis; PC = Periradicular cyst.

Conventional orthograde RCT was the most used method (304, 94.7%), while surgical endodontics was carried out on 17 (5.3%) teeth, which involved only upper anterior teeth. Over the 5-year period of the retrospective study, the number of root-treated teeth per year showed very minimal increase in the first three years (2013 - 2015) but with a leap in the last two years (2016, 2017) of the reference period (Figure 1).

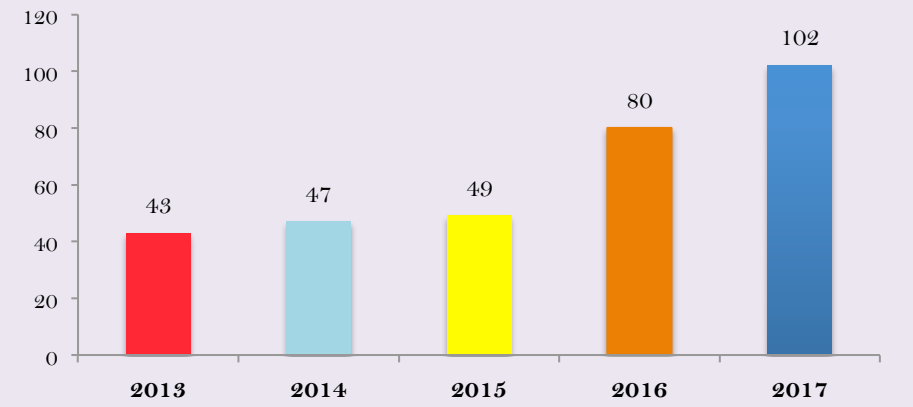

Figure 1. Distribution of root-treated teeth through the reference period of study.

Discussion

This present study reviewed the pattern of endodontic treatments carried out in the restorative clinic of a teaching hospital in the Nigerian North-eastern region over a 5-year period. Being a single centre study, it does not represent the general population of patients treated by RCT in the Nigerian population. Therefore, generalisation to the population of patients seen and treated with RCT in the country must be with caution. It does however presents an overview that may or not be similar to that of other centres.

In this study, more males had RCTs done compared to the females. The reason for this finding is unknown, and although it was not assessed in this study, but in line with the general belief that females are more conscious of their health, it is possible that they reported earlier and had the cavities restored before they progressed to cause pulpal and periradicular diseases. However, it has been suggested in a similar study that the better access to health by males in their environment was the reason for their own findings [16]. Results from other studies has shown contrasting findings with reasons proffered for such findings. Although most of these studies reported higher prevalence and demand for endodontic treatment among females, majority of them, like the present one did not show significant difference in prevalence of endodontic treatment between the genders [4,5,10,14,17-19].

A high proportion of the patients (82.8%) were between the ages of 16 to 35 years of age, and decreased with advancing age, which is similar to a previous report [14] while in contrast with others [5,10]. As suggested, one reason may be the location of the dental clinic in a university teaching hospital where majority of the patients are students within this age range [14]. Furthermore, the two latter studies that contrasted with the findings of the present study used radiographs to assess the endodontically treated teeth (ETT) in their subjects and these included past treatments received. Therefore, it would be expected that older subjects who has had their teeth longer would probably have had more teeth treated than the younger subjects.

Consistent with other studies [4,16,18,20], the lower first molars were the most root-treated teeth. The reason for this is believed to be its presence in the mouth before the other permanent teeth, with increased susceptibility to caries and its sequelae [4]. This assertion was supported by the present study and the above studies, where dental caries was reported as the most common etiologic factor for pulpal and periradicular disease necessitating RCT. In contrast to this, the upper central incisor was observed to be the most root-treated teeth in a similar study [14]. Their explanation for the finding is the propensity for these teeth to be traumatized in the younger adult. In the present study, the upper central incisors were the second most root-treated teeth with a majority of them requiring root treatment due to a pathology that was secondary to trauma, similar to the findings of the above study [14]. Unlike in our study, however, other studies have also reported the premolars [5,10] and upper first molars [4] as the second most root-treated teeth.

In contrast to our results, several studies have reported irreversible pulpitis (IP) as the most common indication for RCT [14,21,22]. The most predominant indication for RCT in this study was

acute apical periodontitis (AAP) followed by IP, both sequalae of dental caries. This finding may indicate a low dental awareness among the patients since most had to wait until the pain of AAP severely disturbed daily activities before seeking treatment. This supports the general fact that pain is the most motivating factor for dental visits among patients. Comparing the indications among the genders, it was noted that more females had RCTs due to IP while more males had RCTs due to AAP, suggesting that females reported earlier before the pulpal disease progressed to affect the periradicular tissues. This may support the suggestion by some researchers that females tend to be more concerned about their health and may seek treatment earlier [19,23].

Considering the trend of RCTs carried out over the years in review, there was a 63% increase in the number of RCTs done in the year 2016 over that of 2015, and a 28% increase over that of 2016 in the year that followed. Two reasons may be responsible for this increase over these periods studied. It could be a better awareness of the dental procedures and the desire of patients to keep their teeth rather than extract. On the other hand, it could be due to increased access to endodontic procedures by patients, a result of enrolment into the National Health Insurance Scheme (NHIS). RCT is a relatively expensive procedure, and patients who would have opted for tooth extraction, for financial reasons, can now undergo endodontic treatments at no cost to them. This study is limited by its retrospective nature, and since there was no available full mouth radiographs of the patients in their records, it was not possible to assess the RCTs performed prior to the period in review. In spite of these limitations, this study can still serve as a source of baseline information and reference for other studies.

Conclusion

More RCTs were carried out on male patients and individuals in the younger age group. Dental caries was identified as the major etiology of pulpal and periradicular disease and one of its sequelae, AAP, the most common indication for root canal therapy. Most of the procedures were done on the maxillary teeth, and the lower first molars followed by the upper central incisors were the most treated. It is encouraging that the number of RCTs increased over the years in the period studied, probably signifying lesser extractions.

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