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ENDODONTIC TREATMENT IN CHILDREN: A FIVE-YEAR RETROSPECTIVE STUDY OF CASES SEEN AT THE UNIVERSITY COLLEGE HOSPITAL, IBADAN, NIGERIA

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ABSTRACT

Background: **Endodontic treatment aims at preservation of teeth that are pulpally damaged, consequently make the teeth functional on the dental arch.**

Objective: This study aimed at determining the prevalence and pattern of endodontic treatment carried out at the Paediatric dental unit of the University College Hospital, Ibadan over a five-year period.

Materials and methods: **This was a retrospective study of all patients below 16 years of age treated for various dental problems in our unit between August, 2010 and July, 2015. The records were reviewed and cases with endodontic treatments selected. Data such as age, gender, endodontically treated teeth, reasons for endodontic treatment and type of endodontic treatment given were retrieved from the patients' dental records.**

Results: **A total of 3,237 children were seen during the period under review, out of which 312 (9.6%) received endodontic treatment. There were 159 males and 153 females with a mean age of 10.2 ± 3.5. Children aged 10-13 years had the highest frequency of endodontic treatment (36.8%) and this was majorly due to dental trauma, followed by those aged 6-9 years (28.6%) who were treated mainly for dental caries. Root canal therapy was the most prevalent endodontic treatment in permanent teeth (central incisor; 32.7% and first permanent molars; 14.6%) while pulpectomy was the most prevalent endodontic treatment in primary teeth (p = < 0.001).**

Conclusion: **Dental caries and trauma were the commonest reasons for endodontic treatment in primary and permanent teeth respectively. The prevalence of endodontic treatment in the studied children was 9.6% with highly invasive and multiple visits endodontic treatment type (pulpectomy and root canal therapy) being the most common. There is a need for early presentation of dental conditions so as to reduce complications which require such endodontic treatments.**

Keywords: Endodontics, Children, Dental caries, Trauma.

INTRODUCTION

Functional dentition is an important factor in the process of growth and development of the child patient, therefore preservation of both primary and permanent teeth in a functional state is a major task in achieving good oral health in children.[1]

Many risk factors have been found to affect the health of dental pulp and consequently cause pulpal infection. Of these factors, dental caries, periodontal disease and dental trauma have been generally reported to be the major and the commonest causes of pulp necrosis and periapical periodontitis.[2,3,4] In Nigeria, studies have shown that the commonest cause of tooth loss among children is delayed presentation of dental caries and traumatic dental injury.[5,6,7] This late presentation and symptomatic visits attitude has made endodontic treatment inevitable among them.

Endodontic treatment is a procedure that is designed to maintain the health of all or part of the pulp when the pulp is diseased or injured, thereby preserving the tooth that would have been otherwise extracted due to pulpal pathology.[8] In a study carried out among Danish population, Kirkevang *et al.*[9] reported that endodontic treatment has invariably led to a decline in the tendency amongst dentists to extract diseased teeth. These treatments aim at prevention of progression of infection, preservation of normal periradicular tissues and restoration of the treated tooth to its proper form and function in the dental arch.[10]

Endodontic treatment comprises pulp capping, pulpotomy, pulpectomy, apexification, root canal therapy and surgical endodontics such as apicectomy, hemisection, root amputation and replantation.[2,11]

Recently, regenerative endodontics which is based on tissue engineering and root canal revascularization was introduced to overcome the limitations of apicectomy and apexification in the management of immature tooth with open apex and necrotic pulp.[12]

The prevalence and pattern of endodontic treatment has been studied among many adult populations, irreversible pulpitis due to dental caries was found to be the leading reason for endodontic treatment performed.[13-19] A similar study among children population also reported dental caries as the commonest reason for endodontic treatment while other reasons identified were trauma and developmental anomalies such as dens invaginatus.[20] However , previous studies among Nigerian children revealed that traumatic dental injuries was the most common reason for endodontic treatment in these children.[21-25] Although in contrary, Ajayi *et al.*[2] also reported dental caries as the dominant reason for endodontic treatment among the studied children in Lagos, Nigeria. The University College Hospital, Ibadan, Nigeria is a tertiary hospital that has well - established dental centre with well-equipped paediatric dentistry clinic which serves Ibadan and its environs. This retrospective study had the objective of determining the prevalence and pattern of endodontic treatment performed in the past five years in the Paediatric dentistry unit of the hospital. This will serve as baseline data from which reference can be made on endodontic treatment acceptability among children in our environment.

MATERIALS AND METHODS

A retrospective study involving patients below 16 years of age who attended the paediatric dental clinic of University College Hospital, Ibadan between August, 2010 and July, 2015. Dental records of all patients seen within the study period were retrieved and those with endodontic treatment were selected. The following information were retrieved from the selected cases; age, sex, type of endodontically treated tooth, reasons for endodontic treatment and type of endodontic treatment given. Data obtained were analyzed using SPSS Version 20.0. Descriptive statistics was used to summarize the variables in the data set. Chi-square test was employed to test association involving discrete data with the level of significance set at $p<0.05$.

RESULTS

A total of 3,237 children aged 2-16 years were treated at the Paediatric dental clinic of the University College Hospital between August 2010 and July 2015, out of which three hundred and twelve (9.6%) of these children received endodontic treatment. Among those who had endodontic treatment, one hundred and fifty-nine (51.0%) were males while 153 (49.0%) were females with a mean age of 10.2 ±3.5 years. Reasons for endodontic treatment based on gender and age groups are as shown in Table 1.

More males had endodontic treatment on account of trauma while more females had endodontic treatment on account of caries. There was no significant difference in the reason for endodontic treatment based on gender. It was noticed that a greater proportion of children in the younger age groups (2-5, 6-9 years old) had endodontic treatment on account of caries (30.1%) while majority of those in the higher age groups (10-13, 14-16 years old) had endodontic treatment on account of trauma (37.4%).Children within the age group 10-13 years had the highest frequency of endodontic treatment (36.8%) followed by the age group 6-9 years (28.6%) (Table 1)

Table 1: Reasons for endodontic treatment according to gender and age groups

	Dental caries n(%)	**Dental trauma** n(%)	**Total** N(%)	**P value**
Gender				
Male	71(22.8)	88(28.2)	159(51.0)	
Female	90(28.8)	63(20.1)	153(49.0)	0.390
Total	161(51.6)	151(48.4)	312(100.0)	
Age groups (Years)				
2 – 5	34(10.9)	5(1.6)	39(12.5)	
6 – 9	60(19.2)	29(9.4)	89(28.6)	
10 -13	35(11.2)	80(25.6)	115(36.8)	
14 – 16	32(10.3)	37(11.8)	69(22.1)	< 0.001
Total	161(51.6)	151(48.4)	312(100.0)	
Categorized Age				
Lower (2-5, 6-9)	94(30.1)	34(11.0)	128(41.1)	
Higher (10-13, 14-16)	67(21.5)	117(37.4)	184(58.9)	
Total	161(51.6)	151(48.4)	312(100.0)	< 0.001

Table 2: Endodontically treated deciduous teeth based on their location and reasons for treatment

N = 122(100%)

	Mandible		Maxilla		Total N(%)	*p*-value
	Caries n (%)	**Trauma** n(%)	**Caries** n(%)	**Trauma** n(%)		
Tooth type						
A	0(0.0)	0(0.0)	8(6.6)	4(3.3)	12(9.8)	<0.001
B	0(0.0)	0(0.0)	2(1.6)	0(0.0)	2(1.6)	
D	32(26.2)	0(0.0)	6(4.9)	0(0.0)	38(31.2)	
E	40(32.8)	0(0.0)	30(24.6)	0(0.0)	70(57.4)	
Total	72(59.0)	0(0.0)	46(37.7)	4(3.3)	122(100.0)	

A= Primary central Incisors
B= Primary lateral incisors
D= Primary first molar
E= Primary second molars

With regards to endodontically treated teeth during the study period, a total of 404 teeth were treated. One hundred and twenty two primary teeth were endodontically treated while 282 permanent teeth were endodontically treated. Among the primary teeth, the first and second molars were the most frequently treated (88.6%) with the mandibular molars more involved than the maxillary molars (59.0 %/29.5%). The difference in the teeth treated was statistically significant (p= < 0.001). Dental caries was the commoner reason for endodontic treatment in primary teeth in both anterior and posterior region and this was statistically significant (p= 0.001). Conversely, in the permanent dentition, the most affected anterior

Table 3: : Endodontically treated permanent teeth based on their location and reasons for treatment

N = 282(100%)

	Mandible		Maxilla		Total N(%)	*p*-value
	Caries n (%)	**Trauma** n(%)	**Caries** n(%)	**Trauma** n(%)		
Tooth type						
1	2(0.7)	12(4.3)	15(5.3)	149(52.8)	178(63.1)	<0.001
2	2(0.7)	3(1.1)	6(2.1)	17(6.0)	28(9.9)	
6	44(15.6)	0(0.0)	21(7.5)	0(0.0)	65(23.1)	
7	9(3.2)	0(0.0)	2(0.7)	0(0.0)	11(3.9)	
Total	57(20.2)	15(5.3)	44(15.6)	166(58.9)	282(100.0)	

1 = Permanent central Incisors
2 = Permanent lateral Incisors
6 = Permanent first molars
7 = Permanent second molars

Table 4: Endodontic treatments done on deciduous teeth **N = 122(100%)**

	Pulpotomy n (%)	**Pulpectomy n (%)**	**Total n (%)**
Tooth			
A	0(0.0)	12(100.0)	12(100.0)
B	0(0.0)	2(100.0)	2(100.0)
D	13(34.2)	25(65.8)	38(100.0)
E	31(44.3)	39(55.7)	70(100.0)
Total	44(36.1)	78(63.9)	122(100.0)

A= Primary central Incisors
B= Primary lateral incisors
D= Primary first molar
E= Primary second molars

Table 5: Endodontic treatments done on permanent teeth

N = 282(100%)

	Pulp capping n (%)	Apexogenesis/Apexification n (%)	Regenerative Endodontics n (%)	Root Canal Therapy n (%)	Total n (%)
Tooth					
1	2(1.1)	41(23.0)	3(1.7)	132(74.2)	178(100.0)
2	2(7.1)	24(85.8)	2(7.1)	0(0.0)	28(100.0)
6	6(9.2)	0(0.0)	0(0.0)	59(90.8)	65(100.0)
7	2(18.2)	0(0.0)	0(0.0)	9(81.8)	11(100.0)
Total	12(4.3)	65(23.0)	5(1.8)	200(70.9)	282(100.0)

1 = Permanent central Incisors
2 = Permanent lateral Incisors
6 = Permanent first molars
7 = Permanent second molars

teeth were the central incisors especially maxillary central incisors (due to dental trauma) while in the posterior teeth, the first permanent molars mainly the mandibular first permanent molars (due to dental caries) were the most involved.

However, more permanent teeth were endodontically treated as a result of dental trauma than dental caries and this was also statistically significant (p=< 0.001)

Among the deciduous teeth, 63.9%of the endodontic treatment was pulpectomy, while 36.1% was pulpotomy. In the permanent dentition, Root canal therapy was the most common endodontic treatment (70.9%) performed followed by apexogenesis and apexification (23.0%). Table 4.

DISCUSSION

In this study, 9.64% of all the children that presented in the paediatric dentistry clinic had endodontic therapy on account of dental caries or trauma. The mean age of these children was 10.2±2.5 years. There was no gender predilection, a finding similar to those reported by Ajayi *et al.*[2] and Barbakov *et al.*[27] However, Hina *et al.*[3] in their study observed female preponderance while other studies by Hull *et al.*[28] and Sabahat *et al.*[4] reported a male preponderance. The lack of sex preponderance in this study may be due to late presentation of the children which invariably determines the treatment plan for these children irrespective of their gender.

Furthermore, despite the lack of sex preponderance, the reason for endodontic treatment differed. Dental trauma was the commonest reason for endodontic treatment in males while dental caries was the commonest reason in females. This disparity may be due to the fact that male children are more physically active hence, have an increased susceptibility to falls and other forms of injuries while the female children are prone to dental caries due to excessive snacking on cariogenic diets.[5]

In the primary dentition, dental caries was found to be commonest reason for endodontic treatment with a peak age range of 6-9years. This finding is similar to those reported in previous studies where dental caries was the main reason for endodontic treatment in children.[2, 5, 20] It may be associated with the fact that primary dentition is regarded as unimportant dentition thus the patient only report in the clinic when pain from such carious teeth become unbearable or are associated with severe morbidity.[2] At the time of presentation, the carieous lesion would have advanced well into the pulp thus requiring advanced endodontic interventions.

More mandibular primary teeth had endodontic treatment relative to the maxillary teeth with the lower second molar being the commonest teeth to undergo endodontic treatment. This is in agreement with other studies.[2] The susceptibility of the lower teeth to caries may be associated with the relative ease of food packing and plaque accumulation in the mandibular posterior region.[2] The vulnerability of the second primary mandibular molars to advanced caries may be due to its occlusal fissure topography. The occlusal pits and fissures of these teeth are deeper and less completely coalesced thereby acting as stagnation areas where accumulated bacteria are not easily removed.[29]

In permanent dentition, trauma was found to be the commonest reason for endodontic treatment with a peak age range of 10-13years and the incisors are the most common endodontically treated teeth. This finding similar to those reported by Sote *et al.*, [30] where the incisor was the most root filled tooth but differs

from that of Ajayi *et al*.,[2] where the first molar was the most root filled tooth. The difference in the findings may be attributed to the fact that in the present studied population, the prevalence of trauma was high.

However, when the posterior region in the permanent dentition was considered, it was observed that dental caries was the main reason for endodontic treatment and the mandibular first permanent molars were mostly affected. This finding is similar to those reported in literature.[2,30] The susceptibility of the mandibular first permanent molar can be attributed to their early eruption which may have subjected them to the cariogenic oral environment for a long time than other posterior permanent teeth.[4] Moreover, it is possible that being the first set of permanent teeth to erupt in the mouth many parents may fail to recognize them as permanent teeth and thus neglect them through bad oral health practices such as ineffective oral hygiene measures.[31] Another reason for their susceptibility may be related to their prolonged period of eruption which makes oral hygiene measures ineffective.[31]

Of all the various endodontic treatment modalities in the primary dentition, pulpectomy was the commonest treatment carried out. This finding is different from that of Ajayi *et al*., where pulpotomy was the major endodontic treatment carried out. This difference may be attributed to the fact that children in this study present very late when the disease process would have advanced thereby necessitating this type of endodontic treatment in contrast to those of Ajayi *et al.,* where more children presented at an early stage when the disease was still confined to the coronal pulp. Meanwhile in the permanent dentition root canal therapy was the commonest endodontic treatment offered, a finding similar to those reported in previous studies and this may also be related to late presentation.[2,30]

In conclusion, dental caries and trauma are the commonest reasons for endodontic treatment in primary and permanent teeth respectively. When dental caries was the reason for endodontic treatment, the mandibular molars were the most involved while when trauma was the reason for treatment, the incisors were the most involved.

In both dentitions, advanced endodontic treatments were the most commonly performed treatment which suggests that at the time of presentation, the disease process had advanced. Thus there is a need to educate children and their parents on the importance of early presentation to the dental clinic and the possible sequel of late presentation in terms of morbidity, cost and time.

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