

## **Original Research Article**

### **FACTORS INFLUENCING CHOICE OF ROOT CANAL TREATMENT BY PATIENTS PRESENTING WITH NON-VITAL TEETH IN A TERTIARY HEALTH FACILITY IN THE SOUTH-SOUTH, NIGERIA.**

**Running Title:** Choice Of Root Canal Treatment, Patients Presenting With Non-Vital Teeth

#### **ABSTRACT**

**Aim:** To determine the factors that influenced treatment choices in patients presenting with non –vital teeth.

**Method:** A descriptive cross- sectional study was carried out among patients presenting with a non-vital tooth at the Dental Centre, University of Benin Teaching Hospital. Respondents were selected using systemic sampling techniques. Data was obtained using a structured, interviewer-administered questionnaire. This was analyzed with IBM SPSS version 25.0 Frequency distribution and cross tabulation were computed for categorical variables. Oral health practices, knowledge and awareness of root canal treatment and factors influencing choice of treatment were obtained.

**Results:** The age range of participants was 20-60 years with majority of the respondents (53.7%) being female, with a female to male ratio of 1:0.9. Most respondents (55.2%) had poor oral health practices but good knowledge of root canal treatment was greater than half 56.5%. Most respondents had tertiary education (70.6%). Majority of respondents (74.3%) preferred to extract their teeth and cost was the major determinant of their choice.

**Conclusion:** The cost of root canal treatment was the ultimate factor in deciding the treatment choice amongst respondents. Younger age groups, female respondents, employed participants and respondents on health insurance were more likely to preserve their teeth. The role of attending dentists in influencing patient's choice of treatment was relatively high, but was overshadowed by cost. This Implies that low income earners will continue to have their teeth removed except they can benefit from health insurance.

**Keywords:** Root canal treatment, Factors, Extraction, Dentists, NHIS

## INTRODUCTION

Dental Caries is “the most common etiology of pulpal and periapical disease [1]. Pulp tissues involved in caries can become irreversibly inflamed and necrotic. The only restorative treatment option for such situations is root canal treatment. This is because the infected necrotic pulp in the root canal system is not accessible to the host’s innate adaptive immune defense mechanisms and antimicrobial agents. Therefore, the infected necrotic pulp tissue must be removed from the canal space by pulpectomy to prevent development or persistence of apical periodontitis” [1,2].

The purpose of pulp treatment is to maintain the tooth structure intact in order to preserve optimal function. Maintaining the vitality of teeth damaged due to dental caries or trauma is also one of the purposes of pulp treatment [2].

Regenerative endodontic treatment procedure has been suggested in order to replace the damaged pulp tissue with the viable tissue [3].

The American Association of Endodontics suggests that “regenerative endodontic treatment can be used for teeth of a compliant patient with necrotic pulp and pulp space not needed for post and core” [4].

The routine treatment of non-vital or irreversibly inflamed primary molars is pulpectomy. Even this technique is often considered difficult because of the complexity of the root canals in primary molars and need multi-visits, clinical studies have shown a reasonable prognosis [5,6].

Although blood clot technique considered as regenerative endodontic technique has been already used for permanent teeth [6], it seems this application on deciduous teeth did not get the same attention.

Generally, majority of pulpal pathology are due to the sequelae of dental caries [7]. With the increasing rise in consumption of refined sugars and poor oral hygiene, more persons are getting affected with dental caries. In addition, the seemingly reluctance to seek early treatment often leads to irreversible damage of the pulps. Majority of these patients present at the stage of Acute Apical Periodontitis [7] as well as other forms of dental caries sequelae.

It was therefore necessary to resolve the following questions in the present study.

Are patients afraid of RCT procedures?

Do patients have enough information about RCT prior to presenting in the clinic?

Do patients receive enough information from their Dentist about RCT?

Are patients worried about the cost of RCT?

Are Dentists doing enough to inform their patients on the benefits of tooth preservation?

Why do patients who opt for RCT over extraction do so?

Are patients too busy to have a multi-visit treatment plan?

Do patients with history of missing (extracted) teeth have more inclination to preserve their affected tooth compared to first time patients?

Despite the increased advances in treating non-vital teeth, it has been observed that many patients still opt for extraction over RCT.

The present study was therefore necessary to observe and study the various factors influencing patients' choices between RCT and extraction.

The findings from this research will be vital in helping dentists turn the tide away from tooth extraction towards tooth preservation amongst their potential patients

## METHODOLOGY

The study was conducted at the Dental center, University of Benin Teaching Hospital, Benin City, Nigeria. The study population comprised of the patients who presented at the dental center, UBTH and Dental Surgeons working at the Dental Center, University of Benin Teaching Hospital, Benin City, Nigeria. Ethical approval was obtained and written informed consent obtained from the research participants.

This was a descriptive cross-sectional study carried out among patients presenting with a non-vital tooth at the Dental Centre, University of Benin Teaching Hospital. Respondents were selected using systemic sampling techniques. Using the Cochran [19] Statistical formula ( $N = Z^2 P q / d^2$ ), the minimum sample size for the study was calculated to be 126. Data was obtained using a structured interviewer-administered questionnaire following pretesting. Data was analyzed using IBM SPSS version 25.0. Frequency distribution and cross tabulations were processed between dichotomized categorical variables that generated two-by-two contingency tables. Oral health practices and awareness of root canal treatment and factors influencing choice of treatment were obtained

The chi-square test was used to detect statistically significant differences between two groups of any categorical variables under consideration. In all analyses, the statistical significance level was set at "p<0.05."

## RESULTS

A total of 145 questionnaires were distributed, 136 of which were completed and returned yielding a response rate of 93.8%. Table 1 shows the mean age of respondents as  $34.6 \pm 8$ . There were more female respondents (53.7%) than males (46.3%) with a female to male ratio of 1:0.9. Half of the respondents were single. Most of the respondents had tertiary education and 75% of the participants were not registered with the NHIS.

**Table 1: SOCIODEMOGRAPHIC CHARACTERISTICS OF PATIENTS IN DENTAL CLINIC, UBTH**

<b>n=136</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
<b>AGE (IN YEARS)</b>		
20-30	44	32.4
31-40	48	35.3
41-50	25	18.4
51-60	19	13.9
Mean $\pm$ S.D = $34.6 \pm 8$		

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<b>SEX</b>		
Male	63	46.3
Female	73	53.7
<b>MARITAL STATUS</b>		
Single	68	50.0
Married	63	46.3
Divorced	5	3.7
<b>ETHNICITY</b>		
Bini	62	45.6
Yoruba	27	19.8
Igbo	20	14.7
Esan	18	13.2
Urhobo	9	6.6
<b>OCCUPATION</b>		
Employed	36	26.5
Self-employed	39	28.7
Unemployed	17	12.5
Student	44	32.3
<b>RELIGION</b>		
Christianity	121	88.9
Islam	8	5.8
Others	7	5.1
<b>LEVEL OF EDUCATION</b>		
Primary	4	2.9
Secondary	36	26.5
Tertiary	96	70.6
<b>NHIS REGISTRATION</b>		
Yes	34	25.0
No	102	75.0

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A greater proportion of the respondents, (35.3%) were within the 31-40 age group, (32.4%) were aged between 20 and 30 years. (18.4%) were aged between 41-50 and (13.9%) were aged between 51 and 60 years. The mean age of the respondents was  $34.6 \pm 8$  years.

Majority of respondents (50%) were single while 63 (46.3%) were married and (3.7%) divorced.

Bini made up the highest proportion of ethnic groups at 62 (45.6%), followed by Yoruba 27 (19.8%). Igbo made up 20 (14.7%), Esan 18 (13.2%) and Urhobo 9 (6.6%).

Students 44 (32.3%) were the majority of respondents, followed closely by self-employed with 39 (28.7%) respondents. Respondents who are employed were 36 (26.5%) and 17 (12.5%) were unemployed at the time of response.

Christianity was the predominant religion making up 121 (88.9%) followed by Islam 8 (5.8%) and others 7 (5.1%).

Most respondents, 96 (70.6%), had Tertiary level of education, followed by Secondary level, 36 (26.5%) and Primary level, 4 (2.9%).

Majority of respondents 102 (75%) were without health insurance cover under The National Health Insurance Scheme NHIS which covered only 34 (25%) of respondents.

**Table 2: ORAL HEALTH PRACTICES**

<b>n=136</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
<b>METHOD OF CLEANING</b>		
Chewing stick	11	8.1
Toothbrush and toothpaste	105	77.2
Toothbrush and powder	6	4.4
None	8	5.9
Others	6	4.4
<b>FREQUENCY OF CLEANING</b>		
	<b>n=128</b>	
After meals	12	9.4
Once daily	82	64.1
Twice daily	34	26.6
<b>TYPE OF FOOD/SNACK CONSUMED</b>		
Carbonated drinks	112	82.4
Chocolates and sweets	107	78.7
None	21	15.4
Others	4	2.9
<b>FREQUENCY OF CONSUMPTION (CARBONATED DRINKS (n=112))</b>		
Once daily	62	55.3
Twice daily	27	24.1
Three times daily	20	17.9
2-3 times weekly	3	2.7
<b>FREQUENCY OF CONSUMPTION (CHOCOLATES AND SWEETS) (n=107)</b>		
Once daily	69	64.5
Twice daily	17	15.9
Three times daily	6	5.6
2-3 times weekly	15	14.0

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**FREQUENCY OF CONSUMPTION (OTHERS) (n=4)**

Once daily	4	100.0
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**VISIT TO A DENTIST**

Yes	41	30.2
No	95	69.8

**WHEN TO VISIT A DENTIST**

When needed	108	79.4
Every 6 months	21	15.4
Yearly	7	5.2

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Majority of respondents clean their teeth with toothbrush and toothpaste 105 (77.2%) followed by chewing stick 11 (8.1%). 6 (4.4%) claimed they cleaned with toothbrush and powder.

Once daily brushing/cleaning was the most common with 82 (64.1%) respondents. Thirty-four (26.6%) respondents claimed they brushed twice daily and 12 (9.4%) claimed they brushed after meals.

Majority of respondents 112 (82.4%) claimed they consumed carbonated drinks. Most of them consumed once daily 62 (55.3%), followed by twice daily 27 (24.1%). Respondents who claimed they consumed carbonated drinks three times daily were 20 (17.9%) while, only 3 (2.7%) claimed they consumed two to three times weekly.

More than two-third, 107 (78.7%) consumed Chocolate and sweets, with majority, 69 (64.5%) claiming they consumed once daily, followed by 17 (15.9%) who consumed twice daily and 15 (14%) respondents who claimed they consumed only two to three times weekly, with a very few, 6 (5.6%) claiming they consumed three times daily.

Previous visit to the dentist was low amongst respondents, with only 41 (30.2%) having history of previous visit. Majority of respondents 95 (69.8%) had no prior visit to the dentist.

Most respondents 108 (79.4%) claimed they would visit a dentist only when problem arise, with 21 (15.4%) respondents claiming they visited every 6 months and 7 (5.2%) claiming they visit yearly.

**Table 3: SCORING OF ORAL HYGIENE PRACTICES AMONGST REPENDENTS**

<b>Variable</b>	<b>Frequency</b>	<b>%</b>
<b>Oral Hygiene Practice assessment (n=136)</b>		
Excellent	12	8.8
Good	21	15.4
Fair	28	20.6
Poor	75	55.2

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More than half of the respondents had poor oral hygiene practices at 75 (55.2%). Twenty eight (20.6%) had fair practices followed by 21 (15.4%) with good practice and 12 (8.8%) with excellent practices.

**Table 4: DENTAL HISTORY AND CHOICE OF TREATMENT**

<b>n=136</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
<b>REASON FOR VISIT</b>		
Tooth ache	49	36.1
Tooth sensitivity	26	19.1
Hole in the tooth	42	30.9
Facial swelling	19	13.9
<b>TREATMENT OPTIONS</b>		
Tooth removal	133	97.8
Tooth preservation	131	96.3
Others		
<b>REMOVED A TOOTH BEFORE</b>		
Yes	39	28.7
No	97	71.3
<b>NUMBER OF TIMES OF TOOTH REMOVAL (n=39)</b>		
Once	27	69.2
Twice	12	30.8
<b>CURRENT PREFERENCE FOR TOOTH PRESERVATION</b>		
Yes	35	25.7
No	101	74.3
<b>REASONS FOR OPTING FOR REMOVAL (n=101)</b>		
Cheaper cost	77	76.2
Other teeth	11	10.9
Cost of preservation	8	7.9
Lack of trust in dentist	5	5.0
<b>OPINION ON TOOTH REMOVAL</b>		
Freedom from pain	125	91.9
Better teeth growth	118	86.8
Less Jaw problems	131	96.3
Inability to chew	27	19.8
No idea	34	0.25

More patients presented with toothache 49 (36.1%), followed by hole in the tooth 42 (30.9%), tooth sensitivity 26 (19.1%) and facial swelling 19 (13.9%).

There was only a marginal difference in the number of respondents who opted for removal 133 (97.8%) and those who opted for preservation 131 (96.3%).

Each respondent was allowed to pick both options in the questionnaire.

History of previous extraction was present in 39 (28.7%) respondents with 27 (69.2%) of them having extracted only one tooth prior to their visit and 12 (30.8%) having extracted at least two teeth.

Of the entire respondents, majority 101 (74.3%) opted for extraction over preservation (Root Canal Treatment) which was opted for by 35 (25.7%).

Cost was a major reason for opting for extraction with 85 (84.1%) picking extraction being the cheaper option. Eleven (10.9%) respondents did not see the need to preserve their non-vital tooth because they had other teeth, they believe could serve them while 5 (5.0%) did not trust the dentist could save their teeth and chose to extract instead.

**Table 5: DENTIST ASSESSMENT OF PATIENTS**

<b>n=136</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
<b>DIAGNOSIS</b>		
Irreversible pulpitis	44	32.4
Acute apical periodontitis	48	35.3
Dentoalveolar abscess	25	18.4
Others	19	13.9
<b>AETIOLOGY</b>		
Dental caries	97	71.3
Dental trauma	34	25
Others	5	3.7
<b>RCT EDUCATION</b>		
Yes	136	100.0
<b>PREFERRED TREATMENT OPTION BEFORE RCT EDUCATION</b>		
Tooth removal	87	63.9
Tooth preservation	49	36.1
<b>PREFERRED TREATMENT OPTION AFTER RCT EDUCATION</b>		
Tooth removal	21	15.4
Tooth preservation	115	84.6



The most common diagnosis was Acute Apical Periodontitis 48 (35.3%) followed closely by Irreversible pulpitis 44 (32.4%). Dentoalveolar abscess made up 25 (18.4%) respondents and others at 19 (13.9%).

Dental caries was the most common aetiology accounting for 97 (71.3%) of cases followed by Dental trauma which accounted for 34 (25%) cases. Others were 5 (3.7%).

Attending Dentists claimed they educated all their patients 136 (100%) on Root Canal Treatment.

On the preferred treatment option by patients before they were educated on Root Canal Treatment, the attending dentists claimed majority of their patients 87 (63.9%) preferred tooth extraction leaving 49 (36.1%) preferring to preserve.

Following Root Canal Treatment education but without the burden of the cost, 115 (84.6%) said they would rather preserve than extract, leaving only 21 (15.4%) sticking with extraction.

**Table 6: ASSOCIATION BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND TREATMENT CHOICE**

n=136	Frequency (percentage)		Test statistic	p-value
	Tooth removal	Root canal treatment		
<b>AGE</b>				
20-30	33(75.0)	11(25.0)	<b>14.960</b>	<b>0.014</b>
31-40	34(70.8)	14(29.2)		
41-50	18(72.0)	7(28.0)		
51-60	16(84.2)	3(15.8)		
<b>SEX</b>				
Male	49(77.8)	14(22.2)	<b>0.938</b>	<b>0.043</b>
Female	52(71.2)	21(28.8)		
<b>LEVEL OF EDUCATION</b>				
Primary	3(75.0)	1(25.0)	<b>0.838</b>	<b>0.049</b>
Secondary	28(77.8)	8(22.2)		
Tertiary	71(74.0)	25(26.0)		
<b>EMPLOYMENT STATUS</b>				
Employed	17(47.2)	19(52.8)	<b>3.745</b>	<b>0.012</b>
Self-employed	29(74.4)	10(25.6)		

Unemployed	16(94.1)	1(5.9)		
Student	39(88.6)	5(11.4)		
<b>NHIS</b>				
Yes	16(47.1)	18(52.9)	<b>0.919</b>	<b>0.038</b>
No	85(83.3)	17(16.7)		

Thirty three (75%) respondents who were between the ages of 20-30 preferred to extract their teeth. Eleven (25%) of the same age group chose to preserve. For those in the 31-40 age group, 14 (29.2%) picked root canal treatment over extraction. For the 41-50 age group, 7 (28%) opted to preserve. The highest age group of 51-60 had only 3 (15.8%) who were willing to preserve their teeth. The relationship between age and treatment choice was statistically significant ( $\chi^2=14.960$ ,  $p = 0.014$ ).

Of male respondents present, 14 (22.2%) opted for preservation of their teeth, with 49 (77.8%) preferring to extract instead. Female respondents who opted for preservation were 21 (28.8%) with 52 (71.2%) opting to extract. The relationship between sex and choice of treatment was statistically significant ( $\chi^2=0.938$ ,  $p = 0.043$ ).

Tertiary level of education had 25 (26.0%) respondents opting to preserve their teeth, followed by secondary with 8 (22.2%) respondents wanting to preserve as well. Primary level of education had its majority of respondents opting to extract 3 (75%). The relationship between level of education and choice of treatment was statistically significant ( $\chi^2=0.838$ ,  $p = 0.049$ ).

More employed respondents preferred to preserve their teeth 19 (52.8%), but only 10 (25.6%) of self-employed respondents opted to do the same. Only 1 (5.9%) unemployed respondent chose Root Canal Treatment over extraction. Students preferred to extract with 39 (88.6%) respondents sticking with the option, leaving only 5 (11.4%) respondents opting for preservation. The relationship between employment status and choice of treatment was statistically significant ( $\chi^2=3.745$ ,  $p = 0.012$ ).

More patients who were under the National Health Insurance Scheme NHIS preferred to preserve their teeth 18 (52.9%). However, majority of those who were not under the scheme preferred to extract with 85 (83.3%) of respondents sticking with extraction. The relationship between National Health Insurance Scheme NHIS status and choice of treatment was statistically significant ( $\chi^2=0.919$ ,  $p = 0.038$ ).

**TABLE 7 ASSOCIATION BETWEEN TREATMENT CHOICE AND FACTORS INFLUENCING CHOICE OF TREATMENT**

n=136	Frequency (percentage)		Test statistic	p-value
	Root Canal Treatment	Extraction		
<b>COST (EXPENSIVE)</b>				
Yes	23(20.4)	90(79.6)	<b>7.235</b>	<b>0.034*</b>
No	10(90.9)	1(9.1)		
No Idea	2(16.7)	7(83.3)		
<b>COST (AFFORDABILITY)</b>				

Yes	12(66.7)	6(33.3)	<b>5.428</b>	<b>0.021*</b>
Yes with NHIS	18(62.1)	11(37.9)		
No	3(3.9)	74(96.1)		
No Idea	2(16.7)	10(83.3)		
<b>KNOWLEDGE</b>				
Good	21(27.3)	56(72.7)	<b>2.431</b>	<b>0.105</b>
Fair	12(38.7)	19(61.3)		
Poor	2(7.1)	23(82.1)		
<b>LENGTH OF TREATMENT</b>				
Acceptable	25(40.3)	37(59.7)	<b>0.875</b>	<b>0.058</b>
Too many visits	7(19.4)	29(80.6)		
Others	3(7.9)	35(92.1)		
<b>FEAR OF PAIN</b>				
Yes	6(23.1)	20(76.9)	<b>2.439</b>	<b>0.072</b>
No	20(22.7)	68(77.3)		
No Idea	9(40.9)	13(59.1)		
<b>TRUST IN DENTIST</b>				
Yes	35(26.7)	96(73.3)	<b>0.953</b>	<b>0.060</b>
No	0(0.0)	5(100.0)		
<b>PREVIOUS EXTRACTION</b>				
0	21(21.7)	76(78.3)	<b>1.203</b>	<b>0.053</b>
1	8(29.6)	19(70.4)		
≥2	6(50.0)	6(50.0)		
<b>ENOUGH INFORMATION FROM DENTIST</b>				
Yes	32(26.9)	87(73.1)	<b>0.922</b>	<b>0.051</b>
No	3(17.6)	14(82.4)		

Majority of respondents, 90 (79.6%), who felt Root Canal Treatment was expensive opted for extraction instead while most of the respondents who thought it was not expensive 10 (90.9%) preferred to preserve their teeth. For respondents who were not sure if it was expensive, majority 10 (83.3%) opted for extraction. The relationship between cost (expensive) and treatment choice was found to be statistically significant ( $\chi^2=7.235$ ,  $p = 0.034$ ).

A higher proportion of respondents who claimed they could afford Root Canal Treatment 12 (66.7%) opted for it over extraction. Majority of those who also claimed they could afford it but with the National Health Insurance Scheme NHIS 18 (62.1%) opted for root canal treatment over extraction. For the respondents who claimed they could not afford it, most of

them 74 (96.1%) picked extraction over root canal treatment. Extraction was also the favoured choice of respondents who were not sure if they could afford to do root canal treatment with 10 (83.3%) choosing to remove their teeth. The relationship between cost (affordability) and treatment choice was found to be statistically significant ( $\chi^2=5.428$ ,  $p = 0.021$ ).

Most respondents with good knowledge chose extraction 56 (72.7%) over root canal treatment. A similar trend can be observed in participants with fair knowledge 19 (61.3%) and those with poor knowledge 23 (82.1%). The relationship between knowledge and treatment choice was however not statistically significant ( $\chi^2=2.431$ ,  $p = 0.105$ ).

Twenty five (40.3%) respondents who thought the length of treatment for root canal treatment was acceptable opted for it over extraction. Twenty nine (80.6%) of those who felt it required too many visits preferred to extract their teeth. Those who were undecided picked extraction more 35 (92.1%). The relationship between length of treatment and treatment choice was however not statistically significant ( $\chi^2=0.875$ ,  $p = 0.058$ ).

Most respondents who were concerned root canal treatment may be painful 20 (76.9%) opted for extraction, however majority of those who thought it would not cause pain 68 (77.3%) also preferred to extract. A similar trend can be seen in those who had no idea if it would cause pain or not, with 13 (59.1%) also opting for extraction. The relationship between fear of pain and treatment choice was however not statistically significant ( $\chi^2=2.439$ ,  $p = 0.051$ ).

Ninety six (73.3%) respondents who had trust in the dentist to preserve their teeth opted for extraction. All respondents who said they did not have trust in the dentist 5 (100.0%) preferred to extract their teeth. The relationship between fear of pain and treatment choice was however not statistically significant ( $\chi^2=0.953$ ,  $p = 0.060$ ).

Twenty one (21.7%) respondents who had no history of previous extraction opted to preserve their tooth, while 8 (29.6%) of those who had extracted only one tooth made the same choice. For those who had previously extracted at least two teeth, 6 (50%) chose to preserve their non-vital teeth. The relationship between fear of pain and treatment choice was however not statistically significant ( $\chi^2=1.203$ ,  $p = 0.053$ ).

Majority of the respondents who believed they had gotten enough information on root canal treatment 87 (73.1%) chose to extract. Similarly, majority of those who believed they had not gotten enough information on root canal treatment 14 (82.4%) also chose to extract.

## DISCUSSION

### SOCIODEMOGRAPHY

The predominant age group was the 31-to-40-year group. More than half of the participants were female. In a related study by Enone et al. [20], the predominant study population was equally female. A high number of participants had tertiary level of education. This was similar when compared to the previous study [20], where a total of 66% had tertiary level of education.

### ORAL HABITS

In a study carried out by Avula et al. [22] fewer participants brushed their teeth twice daily, compared to another study by Assery.. In this study, 26.6% indicated that they brushed their teeth for the recommended twice daily sitting right between the previously mentioned studies. This showed a general discouraging negative attitude towards personal oral hygiene. A high proportion of the total population affirmed to brushing with toothbrush and toothpaste, this is comparable to other studies [24][25]. However, a study by Oyetola et al [27], almost all study participants brushed using toothbrush and toothpaste. This may be due to an increased

awareness of the population on the right materials to clean their mouth with as well as their availability.

More than half of the respondents 69.8% had never visited a dentist before, this is in contrast to a study by Oyetola et al [27] in which only about a quarter of the respondents had a history of nil previous dental visits but more in keeping with a study done by Kumar [28] which had 58% of respondents without previous dental visits. More than 1/3 of respondents affirmed that they would visit a dentist only when problems arose. Although this is much higher than half of the respondents gotten in [27]. It shows a similar trend of poor attitude towards oral health care and may have been a factor in respondents presenting with non-vital teeth.

### **TREATMENT CHOICE OF PATIENTS**

A large percentage of respondents opted for extraction over preserving their affected tooth as their final treatment choice. This is similar to a related study [20] with majority of participants opting for extraction. However, patients opting for extraction made their choice mainly because of costs with about 84.4% of all respondents saying they would have preserved their tooth if they could afford it. This was in contrast to the study [20] where the main reason for treatment choice was on instruction of the dentist.

### **ROLE OF AGE IN TREATMENT CHOICE OF PATIENTS**

Younger age groups were found to have opted more for root canal treatment with the 31-40 age range having the highest percentage. However, each age range equally showed high preference for extraction with all having percentages above 70%. The findings were observed to be statistically significant with a p-value of 0.014.

### **ROLE OF GENDER IN TREATMENT CHOICE OF PATIENTS**

Female respondents were more likely to pick root canal treatment than their male counterparts. They were also less likely to pick extraction than their male counterparts. This was in keeping with [32] where female respondents were found to pick root canal treatment more than their male counterparts who opted more for extraction. This may be because women in general tend to exhibit greater concern for aesthetics, beauty and health than men. The result was found to be statistically significant with a p-value of 0.043.

### **ROLE OF EDUCATION IN TREATMENT CHOICE OF PATIENTS**

It was more likely for respondents with tertiary levels of education to opt for root canal treatment, with a sizeable proportion of respondents opting to save their teeth, higher than every other level of education. In a similar study in Saudi Arabia [32], more respondents with at least college education opted for root canal treatment than those without. This may have been due to better understanding of root canal treatment and its advantages over extraction. It may also be because those with higher levels of education tend to get higher paying jobs and will consequently be more capable of affording the procedure. The level of education was also found to be statistically significant.

### **ROLE OF EMPLOYMENT IN TREATMENT CHOICE OF PATIENTS**

Employed respondents had more than double the percentages of those who opted for root

canal treatment when compared to other groups. This was closely followed by Self-employed group. Unemployed respondents were the least likely to opt for root canal treatment while also being the most likely to choose extraction, In a study in India [33], similar results were observed as well in a study by Brennan et al [34] and Michael J et al [35]. This may have due to the fact that unemployed respondents had less money to spend on RCT. The results were of statistical significance with p-values of 0.034 and 0.021.

It was more likely for respondents under the National Health Insurance Scheme NHIS to opt for tooth preservation compared to those not registered with NHIS. This is in keeping with a study in Saudi Arabia [30] where more than half preferred root canal treatment as long as it was financed by the National Health Fund. The National Health Insurance Scheme covers the root canal procedure itself, although supplementary procedures such as bleaching and crowning are not covered. Patients who opted for root canal treatment still had to bear a part of the costs out of pocket. The finding was statistically significant with a p-value of 0.038.

### **EFFECT OF COST IN TREATMENT CHOICE OF PATIENTS**

More than two-third of respondents thought the cost of Root Canal treatment was expensive, while only about a third of the respondents felt it was not expensive, the remaining were unsure. More than half of respondents affirmed the cost was above what they could afford. A combined 34.5% said they could afford it out of pocket and with support from the National Health Insurance Scheme NHIS.

It was more likely for those who claimed the cost of root canal treatment was not expensive to opt for it over extraction. Similarly, most respondents who claimed they could afford the procedure opted to preserve their teeth over extracting them. Those paying out of pocket and those paying under the National Health Insurance Scheme preferred root canal treatment. This finding is in keeping with a study by Grembowski et al [36].

### **EFFECT OF LENGTH OF TREATMENT ON TREATMENT CHOICE**

Majority of respondents felt the length of treatment for root canal treatment was acceptable. About a quarter said it bothered them that there may be too many visits and less than half were not sure. This was in contrast to a previous study [37] more than half of respondents said they were concerned about the treatment time. The length of treatment however, was found to be statistically insignificant with a p-value of 0.058.

### **ROLE OF PAIN IN TREATMENT CHOICE**

Majority of respondents who were bothered that root canal treatment may be painful opted for extraction. However, about two-third of those who did not think RCT would be painful also opted for extraction, leaving about a quarter who picked root canal treatment as treatment of choice. The highest percentage of those picking root canal treatment was found in the group of respondents who were unsure of the possibility of pain. It can be said then that pain was not a viable factor in treatment choice of patients. Of the total population, only a small proportion of respondents was concerned about pain, this is in contrast to a study [38] where more than half of respondents were bothered about pain. The reduced fear for pain in root canal treatment may be due to the general perception that extraction is the more painful procedure.

### **INFLUENCE OF DENTISTS ADVICE ON TREATMENT CHOICE**

A sizeable portion of participants presented with the initial notion of extracting their teeth but

this dropped drastically to about a third following dental health education from their attending dentist. This is similar to a previous study [20] where dentist's instruction was a major factor in treatment choice. However, the number rose to about two-third of respondents who picked extraction rather than preserve their teeth when majority discovered they may not be able to afford the Root Canal procedure. This was contrasting to the same study [20] that cost and not dentist's advice was the major factor influencing choice of treatment.

All attending Dentists claimed they informed all their patients about the two treatment options of extraction and root canal treatment, although this may have been due to them being aware of the study beforehand.

### **OTHER FACTORS INFLUENCING CHOICE OF TREATMENT**

History of previous extraction was observed in 28.7% of the total population, amongst which majority had extracted once and 30.8% had extracted at least twice. More than two-third of the respondents who had either had one extraction or none at all opted against root canal treatment. However, respondents who had previously extracted at least two teeth were more willing to preserve, with exactly half of them opting for root canal treatment. This may have been due to the concerns of the patients in losing more teeth. This was however not statistically significant with a p-value of 0.053

A fraction of the total respondents 3.7% opted for extraction because they did not trust the dentist to preserve their teeth.

### **CONCLUSION**

The cost of root canal treatment was the ultimate factor in deciding the treatment choice of either root canal treatment or extraction amongst respondents. This is because those who could afford the root canal treatment were more willing to preserve their teeth rather than extract. It was also evident by the rate at which participants under the National Health Insurance Scheme NHIS took advantage of the subsidized cost of treatment, although a sizeable number of them opted against tooth preservation when they discovered they may have to bear some costs out of pocket. It was also observed that younger age groups tended towards tooth preservation than their older counterparts with highest percentages recorded in the 31-40 age group.

Gender as well as level of education also played important roles in the treatment choice of patients. Female respondents were more likely to preserve their teeth than their male counterparts. Similarly, respondents with higher levels of education also had higher chances of opting for tooth preservation.

The chances for employed participants to preserve their teeth was also higher when compared to unemployed participants.

Knowledge of root canal treatment, concerns about the length of treatment and pain did not play very influential roles in patients' choice. Although previous history of extraction was not found to be statistically significant, respondents with two or more previous extractions were more likely to opt for tooth preservation.

While it can be said that the role of attending dentists in influencing patient's choice of treatment was relatively high, it was overshadowed by the influence of cost on the patients.

## COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly used products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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