Satisfaction with Duration of Orthodontic Treatment, Knowledge and Perception of Accelerated Orthodontics by Nigerian Dental Practitioners

ABSTRACT

Background: The duration of orthodontic treatment with its attendant complications has been a subject of concern in the specialty of orthodontics, necessitating the need to quicken the rate of orthodontic tooth movement. Despite the growing acceptance of accelerated, there is paucity of related information from Nigeria. **Aim**: To assess the satisfaction of Nigerian dental practitioners with the duration of orthodontic treatment and their knowledge and perception of accelerated orthodontics. **Materials and Methods**: Both electronic and physical survey was conducted among Nigerian dental practitioners between January and June 2023 involving both those in Government employment and private practice. The questionnaire contained questions on satisfaction with duration of orthodontic treatment, knowledge and perception of accelerated orthodontics. The data was analysed using the IBM SPSS version 25. In addition to the descriptive statistics, the Chi-square statistics was used to test the hypotheses with the significance level set at $P < .05$. **Results**: The response rate was 50%. The participants gave significant differences in their levels of satisfaction with the duration of orthodontic treatment but only 42.4% of them were satisfied. Some knowledge-deficit of accelerated orthodontics was observed among the participants with significantly correct responses in only four out the seven methods assessed ($P < .05$), while their positive perception of accelerated orthodontics was generally significant ($P < .05$). **Conclusion**: The participants were not significantly satisfied with the duration of orthodontic treatment; had knowledge-deficit of the methods of accelerated orthodontics but significant positive perception.

Keywords: Accelerated Orthodontics, Knowledge, Perception, Duration of Orthodontic Treatment, Satisfaction, Nigerian Dental Practitioners

INTRODUCTION

The duration of orthodontic treatment is of a significant concern to both orthodontists and patients, with an average duration of approximately 24–36 months, which can be even further extended.[1-3] Prolonged duration of orthodontic treatment is associated with patient's compliance challenges and usually more prevalent clinical side effects, such as external root resorption and enamel demineralization in the form of white spot lesions, frank caries, gingival and periodontal problems[4-6]. Accelerated orthodontic tooth movement (AOTM) has been preferred for its numerous prospective benefits like shorter treatment duration, differential tooth movement, enhanced envelope of tooth movement, improved post treatment stability and reduced side effects[7, 8].

Understandably, dentists and specifically orthodontists have been interested in exploring various non-surgical and surgical approaches that could potentially reduce treatment time by accelerating tooth movement[9–11]. Non-surgical approaches such as injection of active vitamin D3 (calcitriol), parathyroid hormone, corticosteroids, prostaglandins and relaxin are non-invasive, and researchers are still working to provide more quality evidence to support their effectiveness [8,9,12]. The surgical approaches such as corticotomy-assisted orthodontic treatment (CAOT), modified corticotomy, piezoelectric surgery, alveolar corticotomy, periodontally accelerated osteogenic orthodontics (PAOO), corticision, interseptal alveolar surgery, microosteoperforations, have been associated with increased rates of orthodontic tooth movement (OTM)[7,14], but they are less attractive to patients due to their invasive nature and potential for postoperative discomfort[14,15]. Device assisted therapies such as direct electric current, cyclic vibrations and low level laser therapy (LLLT) are also useful methods of accelerated orthodontics[13]. In short, accelerated orthodontics could be possible by mechanical stimulation or device assisted therapy, surgical therapy and by the use of pharmacological agents[7].

'AcceleDent' is one of the customized appliances that orthodontic patients can wear at home for accelerated orthodontic treatment and 'Six Month Smile' is another means of achieving accelerated tooth movement but is limited to the anterior teeth used for only cosmetics reasons, among other devices[15].

Not much is known about the role of socioeconomic and psychosocial factors in the predictions of the duration of orthodontic treatment[16]. Maternal emotional support was found to be an important predictor of duration of orthodontic treatment. This was attributed to higher maternal involvement in the orthodontic treatment, which could have facilitated achieving the required orthodontic treatment outcome in shorter treatment duration[16].

Although different techniques for accelerated orthodontics are increasingly receiving the attention of the dental profession, especially among orthodontics, there is only one related report from Nigeria that has addressed this important subject matter in the dental profession [17], an indication of relatively low awareness of this emerging orthodontic treatment options in the Nigerian dental community compared to the rest of the world. Therefore, this study

aimed at assessing the satisfaction of Nigerian dental practitioners with the duration of orthodontic treatment and their knowledge and perception of accelerated orthodontics.

MATERIALS AND METHODS

Study Design

A national self-administered questionnaire-based cross-sectional survey of Nigerian dentists (dental practitioners) was carried out, which targeted the teaching hospitals across the nation, as well as every other hospital where dentists work.

Sampling / Data Collection

This national survey was carried out between January and June 2023, using Google forms through the Nigerian Dental Association social platform and other social platforms involving Nigerian dentists such as the Consultants' and Resident doctors' platforms. While ensuring that no dentist filled the questionnaire more than once, some of the teaching hospitals were visited with the questionnaire physicallyin addition to the online distribution. According to the Nigerian Dental Association (NDA), the estimated number of dentists in Nigeria is currently about 4000 to 4500. However, not all of them were available for the survey because some have left the country and are practising in other countries due to poor condition of service in Nigeria. About two hundred and fifty (250) dental practitioners were reached for this survey. In all, one hundred and twenty five (125) them filled and returned the questionnaire, giving a response rate of 50%. The used questionnaire is attached as an Appendix.

Null Hypotheses

The following null hypotheses were generated and tested:

Ho1 – that the Nigerian dentists (dental practitioners) would not have statistically significant satisfaction with the duration of orthodontic treatment

Ho2 - that the Nigerian dentists (dental practitioners) would not have statistically significant correct knowledge of the different methods of accelerated orthodontics

Ho3 – that the Nigerian dentists (dental practitioners) would not have statistically significant positive perception of accelerated orthodontics

Data Analysis

Using the SPSS version 25, the whole data was analysed descriptively, as well as using Chi-square statistics to test the hypotheses. The significance level was set at $P < .05$.

RESULTS

Of the 125 dentists that filled and returned the questionnaire, 69 (55.2%) were male while female accounted for 56(44.8%). Their age range was 23 to 65 years with mean age of 36.86 ± 8.41 (SD).

Table 1 shows the levels of satisfaction or otherwise of the participants with the duration of orthodontic treatment with significant differences (P = .000).

Table 1: Satisfaction/Dissatisfaction with duration of orthodontic treatment

Response	Frequency	Percentage	X^2	df	P-value
Very satisfied	12	9.6			
Somewhat satisfied	41	32.8			
Neutral	34	27.2	36.64	4	.000*
Somewhat dissatisfied	32	25.6			
Very dissatisfied	6	4.8			

*****Significant at P < .05

The participants' knowledge of the different methods of accelerated orthodontics is shown in Table 2, revealing statistically significant correct knowledge of the use of some medications, resonance vibration, corticotomies and piezoincision as methods of achieving accelerated orthodontics (P =.000).

Table 2: Participants' knowledge of some of the different methods of accelerated orthodontics

Method of AO	Correct n (%)	Incorrect n (%)	Total n (%)	X^2	df	P-value
Use of some Medications	81(64.8)	44(35.2)	125(100)	10.95	1	0.001*
Administration of Biological Substances	71(56.8)	54(43.2)	125(100)	2.31	1	0.128
Direct Light Current	54(43.2)	71(56.8)	125(100)	2.31	1	0.128
Low Level Laser Therapy	71(56.8)	54(43.2)	125(100)	2.31	1	0.128
Resonance vibration	86(68.8)	39(31.2)	125(100)	17.67	1	0.000*
Corticotomies	89(71.2)	36(28.8)	125(100)	22.47	1	0.000*
Piezocision	74(59.2)	51(40.8)	125(100)	4.23	1	0.040*

AO stands for accelerated orthodontics *Significant at P < .05

Table 3 provides the responses of the participants on how much reduction in treatment time they would consider to undergo/give their children treatment or use any method of accelerated orthodontics to treat patient. The 20-30% reduction in treatment time was generally statistically preferred by the participants (P <.00).

Table 3: How much reduction in treatment time would you consider to undergo/give your child's treatment or use any method of accelerated orthodontics to treat patient

Method of AO	0-10% n (%)	10-20% n (%)	20-30% n (%)	30-40% n (%)	>40% n (%)	Neutral n (%)	X^2	df	P-value
Use of some Medications	22(17.6)	27(21.6)	36(28.8)	14(11.2)	20(16.0)	6(4.8)	25.77	5	.000*
Administration of Biological Substances	17(13.6)	26(20.8)	35(28.0)	20(18.0)	21(16.8)	6(4.8)	22.22	5	.000*
Direct Light Current	18(14.4)	20(16)	44(35.2)	17(13.6)	19(15.2)	7(5.6)	36.232	5	.000*
Low Level Laser Therapy	16(12.8)	23(18.4)	38(30.4)	21(16.8)	20(16.0)	7(5.6)	24.71	5	.000*
Resonance vibration	17(13.6)	28(22.4)	33(26.4)	18(14.4)	20(16.0)	9(7.2)	17.42	5	.004*
Corticotomies	13(10.4)	21(16.8)	36(28.8)	19(15.2)	27(21.6)	9(7.2)	22.70	5	.000*
Piezocision	13(10.4)	18(14.4)	37(29.6)	26(20.8)	24(19.2)	7(5.6)	26.82	5	.000*

AO stands for accelerated orthodontics; *Significant at $P < .05$

Preference of method for accelerated orthodontics for percentage increase in fee for a percentage reduction in treatment time by the participants is shown in Table 4. Statistically significant differences were generally found with the 40% being the most favoured increment.

Table 4: If you were to use any of the methods of accelerated orthodontics, indicate your preference for percentage increase in fee for a percentage reduction in treatment time

	Preference n (%)								
Method of AO	10%	20%	30%	40%	50%	Neutral			
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	X^2	df	P-value
A	48(38.4)	24(19.2)	26(20.8)	4(3.2)	15(12.0)	8(6.4)	60.33	5	.000*
B	36(28.8)	29(23.2)	33(26.4)	7(5.6)	12(9.6)	8(6.4)	42.18	5	.000*
C	27(21.6)	29(23.2)	39(31.2)	7(5.6)	15(12.0)	8(6.4)	39.59	5	.000*
D	20(16.0)	27(21.6)	37(29.6)	13(10.4)	20(16.0)	8(6.4)	25.29	5	.000*
E	22(17.6)	28(22.4)	38(30.4)	17(13.6)	13(10.4)	7(5.6)	29.51	5	.000*
F	22(17.6)	25(20.0)	34(27.2)	17(13.6)	18(14.4)	9(7.2)	17.03	5	.004*
G	22(17.6)	21(16.8)	36(28.8)	19(15.2)	19(15.2)	8(6.4)	19.34	5	.002*

*Significant at P < .05 Note: AO stands for accelerated orthodontics; A stands for Use of some Medications; B stands for Administration of Biological Substances; C stands for Direct Light Current; D stands for Low Level Laser Therapy; E stands for Resonance vibration; F stands for Corticotomies; G stands for Piezocision

DISCUSSION

This present first Nigerian study on the perception of dental professionals about accelerated orthodontics has revealed generally significant dissatisfaction with the duration of orthodontic treatment with the highest proportion indicating somewhat satisfied, followed by those who were neutral in their view. This study has also shown that the Nigerian dentists had significant knowledge of four out of the seven different methods of accelerated orthodontics assessed, while showing generally positive perception of accelerated orthodontics.

In fact, orthodontic treatment duration is very important in assessing the outcome of orthodontic therapy. Onyeaso and BeGole[3]showed that despite the generally good finishes of cases treated at an accredited graduate training centre in North America, Peer Assessment Rating (PAR) index was very sensitive to the pre-treatment age of the patients and duration of treatment in its assessment of the quality of the treatment outcomes. They found statistically significant associations between orthodontic treatment outcomes and pre-treatment age ($p = 0.010$), as well as between orthodontic treatment outcome and treatment time ($p = 0.035$. Indeed, orthodontic treatment duration has been a major concern to orthodontists and dentists generally because of the already mentioned complications associated with it. A high proportion (27.2%) of participants in this present Nigerian study, which is only next to those were somewhat satisfied, expressed neutrality about the duration of orthodontic treatment. This is comparable to the earlier studies[18, 19], Al-Attar et al [19] had 32.2% for neutral response and 10.2% for very satisfied option while the current Nigerian study produced 27.2% and 9.6%, respectively. Uribe et al. [18] found that 93% of American orthodontists were neutral or satisfied with duration of treatment because they believed that orthodontic tooth movement is a biological process and needs time to occur.

Mavreas and Athansiou[2] in a systemic review of factors affecting orthodontic treatment duration in 2008 revealed the following: (1) there are indications that extraction treatment lasts longer than the non-extraction therapy; (2) age does not seem to play a role provided the patients are in the permanent dentition; (3) when Class II division 1 malocclusions are considered, there is evidence that the earlier the orthodontic treatment begins the longer its duration; (4) there is conflicting information regarding treatment duration within public health systems; (5) combined orthodontic–surgical treatment duration is variable and appears to be operator sensitive; (6) various factors, such as the technique employed, the skill and number of operators involved, the compliance of the patients, and the severity of the initial malocclusion, all seem to play a role; and (7) impacted maxillary canines appear to prolong treatment. According to Moresca[20],treatment time varies according to the type of malocclusion and treatment options, and orthodontist's influence, patient's characteristics and compliance are all decisive in determining treatment time, while the effects provided by orthodontic appliances and methods used to speed tooth movement up seem little effective.The present Nigerian study among dentists has shown that a higher proportion of them were either undecided about their view on the duration of orthodontic treatment or out rightly indicated dissatisfaction. This is in agreement with the first null hypothesis of this study.

The present finding about the knowledge of the different methods of accelerated orthodontics shows that there is still some deficient in knowledge in relation to the use of biological medications, direct light current and low level laser therapy (LLLT), especially in the use of direct light current where the responses revealed that higher proportion of the participants gave incorrect answers. This suggests a need for inclusion of accelerated orthodontics in the dental curriculum of Nigerian Universities, as well as in the update / revision courses of Nigerian Dental Association and the postgraduate dental education in Nigeria. It must be noted that dentists usually play a major role in the referral of orthodontic patients to the orthodontic specialists[21-23], and as such could influence the potential orthodontic patients on the uptake of available orthodontic services. However, it has been said that no guarantees should ever be given by a dental practitioner whether treatment will be offered, or as to the type of appliance which may be offered[24]. There have been so many related literatures on accelerated orthodontics for quite some time now[25-32]. Therefore, Nigerian dental practitioners need the required appropriate information, if they are to play this important role effectively.

The finding of general significant readiness of the dental practitioners to access accelerated orthodontic care or give to their children with some percentage reduction in treatment time found in this study is consistent with their generally significant different responses on satisfaction with the usual orthodontic treatment duration where majority of them indicated somewhat satisfied, followed by those who were neutral, making the proportion of those who were not satisfied higher (57.6%) than those who expressed satisfaction (42.4%). The findings seems to suggest that most of the participants would want accelerated orthodontic treatment or would allow their children to go through it when the reduction in treatment time is about 20-30%. This suggests an affirmation of their willingness or desire to have orthodontic treatment duration shortened and a positive perception of accelerated orthodontics.

Also, their responses to the question on their preference for percentage increase in fee for a percentage reduction in treatment time confirm their positive perception of accelerated orthodontics. The current findings suggest that majority of the participants were most comfortable with 30% price increase for accelerated orthodontics. Majority of orthodontic patients in Iraq limited their desire for accelerated orthodontics to 20% price increase[19].

While recognizing the main strength of this present Nigerian study as being the first Nigerian study to assess the knowledge and perception of Nigerian dental practitioners concerning accelerated orthodontics, which provides a good opportunity of increasing the awareness of these growing and important treatment procedures in orthodontics, it must be mentioned that the authors would have preferred a larger sample size. Meanwhile, the current sample size is quite representative, which is very crucial in this study because dental practitioners from different parts of the country were assessed.

Conclusions

- Although significant differences were found on the levels of satisfaction / dissatisfaction by the participants with duration of orthodontic treatment, higher proportions of them were not satisfied.
- The participants (Nigerian dental practitioner) significantly had correct knowledge of four out of the seven methods of accelerated orthodontics assessed with obvious knowledge deficit, needing improvement on the remaining three methods, especially the use direct light current.
- The Nigerian dental practitioners surveyed showed encouraging significant positive perception of accelerated orthodontics with most of them ready to access orthodontic care or for their children using accelerated orthodontics mostly for 20-30% reduction in treatment time and 30% in fee increment.

Recommendation

- Based on the findings of this present Nigerian study, there is need for incorporation of accelerated orthodontics into the dental curriculum in the country, as well as at the postgraduate level so as to enable the dental graduates from our dental schools to be properly educated on these emerging procedures in dental practice, especially in orthodontics.

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APPENDIX

QUESTIONNAIRE ON ACCELERATED ORTHODONTICS

Please, we need your help to respond to the questions below. This is purely for academic purposes and your responses will be confidentially handled. Please, provide honest responses as much as possible. Thank you.

SECTION A (Please, tick your choice out of any of the options)

(1)Age ----- (2) Gender: Male / Female (3) Duration of Practice ------- (4) Specialty. ----------

(5) Qualification: (a) BDS only (b) Part I or Membership/Masters (c) Fellowship

SECTION B

(6) Are you satisfied with the duration of active orthodontic treatment for patients?

(a) very satisfied (b) somewhat satisfied (c) neutral (d) somewhat dissatisfied (e) very dissatisfied

(7) Which of these do you know form(s) part of accelerated orthodontics?

Procedure	Yes	No
Use of some medications injected locally intraoral:		
Administration of Biological Substance and Hormones (local or systemic):		
Direct Light Electric Current-electric current application of about 20 μA for 5 h daily:		
Low Level Laser Therapy (LLLT):		
Resonance Vibration:		
Corticotomies:		
Piezocision:		

(8) How much reduction in treatment time would you consider to undergo/give your child's treatment? Please, tick of the optionsbelow:

Technique	0% -10%	10%-20%	20%-30%	30%-40%	Greater than 40%
Use of some medications injected locally intraoral:					
Administration of Biological Substance and Hormones (local or systemic):					
Direct Light Electric Current-electric current application of about 20 μA for					

5 h daily:					
Low Level Laser Therapy (LLLT):					
Resonance Vibration:					
Corticotomies:					
Piezocision:					

(9) If you were to use any of the acceleration techniques, indicate your preference for percentage increase in fee for a percentage reduction in treatment time

Reduction in time (%)	Increase in fees by 10%	Increase in fees by 20%	Increase in fees by 30%	Increase in fees by 40%	Increase in fees by 50%
Use of some medications injected locally intraoral:					
Administration of Biological Substance and Hormones (local or systemic):					
Direct Light Electric Current-electric current application of about 20 μA for 5 h daily:					
Low Level Laser Therapy (LLLT):					
Resonance Vibration:					
Corticotomies:					
Piezocision:					

THE END

We appreciate your kind participation in this survey.