



Nigerian Orthodontic Patients' Satisfaction with Duration of Conventional Treatment, their Perception and Attitude towards Accelerated Orthodontics in a University Teaching Hospital

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Accelerated orthodontics has been receiving increased interest in the global orthodontic community recently, but the knowledge and practice of it is still very limited among orthodontists and the orthodontic patients.

Aim: To assess the satisfaction of some Nigerian orthodontic patients with duration of conventional orthodontic treatment, as well as their perception and attitude towards accelerated orthodontics.

Materials and Methods: A clinic-based cross-sectional survey of patients at the University of Port Harcourt Teaching Hospital between March 2023 and May, 2024. All the 117 patients consisting of 50(42.7%) males and 67(57.3%) females with the age range of 10 to 63 years and mean age of 24.79 + 11.60 (SD) filled and returned the self-administered questionnaire, giving a response rate of 100%. Statistical analysis of the data was done using SPSS IBM 25 and descriptive, chi-square, student's t-test and ANOVA statistics were employed. The significance level was set at $P < .05$.

Results: Over 64% of the patients expressed satisfaction with the duration of conventional orthodontic treatment without any significant gender differences ($P > .05$). They generally prefer the non-invasive procedures of accelerated orthodontics to the invasive techniques. Although the patients would want to use non-invasive accelerated orthodontics, cost remains a major limiting factor.

Conclusion/Recommendation: High proportion of the patients is satisfied with the duration of conventional orthodontic treatment without gender bias, and some proportion of them would prefer non-invasive accelerated orthodontic procedures but cost is a limiting factor.

Keywords: Satisfaction; duration of conventional orthodontic treatment; perception and attitude; accelerated orthodontics.

1. INTRODUCTION

While orthodontic treatments have made remarkable progress in correcting malocclusions and improving oral health, the traditional orthodontic treatment has several limitations such as an extended amount of time, ranging from months to several years, needed to achieve the desired results. The complexity of malocclusions, patient compliance, and clinical expertise could further influence the duration of treatment. Long treatment times can test a patient's commitment and reduce compliance, as well as be very challenging to maintaining motivation and adherence to oral care and appointments over an extended period [1-7].

By leveraging cutting-edge techniques and technologies, accelerated orthodontics (AO) helps to optimize the alignment of teeth while minimizing the treatment duration and, therefore, provides patients with quicker, more efficient, and aesthetically pleasing outcomes [8]. In fact, accelerated orthodontic techniques aim to address these disadvantages by reducing

treatment duration, offering patients a faster and potentially more comfortable path to achieving their desired results with fewer associated challenges [2,9,10,11,12]. Indeed, accelerated orthodontics has revolutionized traditional dental practices by employing innovative techniques to expedite tooth movement and enhance treatment outcomes. It is known to represent a dynamic evolution in the field of dentistry generally and orthodontics in particular.

Accelerated orthodontics could be possible by mechanical stimulation or device assisted therapy, surgical therapy and by using pharmacological agents [4]. Both orthodontists and patients were interested in techniques that can decrease the treatment duration. Non-invasive accelerating procedures were more preferable by orthodontists and patients than invasive surgical procedures [13,14].

Despite the fact that accelerated orthodontics has been receiving renewed global attention [1, 3-49], it is only recently that few related publications emerged from Nigeria, and possibly from the entire Africa [50-54]. The only report

about orthodontic patients concerning accelerated orthodontics was among Yoruba ethnic group dominated environment in Lagos, Nigeria [50]. Therefore, this study aimed to assessing the satisfaction of some Nigerian orthodontic patients with the duration of conventional orthodontic treatment and their perception and attitude towards accelerated orthodontics in a University Teaching Hospital in the South-South (Niger Delta) Region of Nigeria. The hypotheses were that: not a good proportion of the patients would indicate satisfaction with the duration of the orthodontic treatment, and there would not be any statistically significant gender differences in their satisfaction. In addition, there would not be any statistically significant gender differences in their perception and attitude towards accelerated orthodontics.

2. MATERIALS AND METHODS

2.1 Study Design

A clinic-based self-administered questionnaire survey of cross-sectional orthodontic patients was carried out in a Nigerian Teaching Hospital where many patients are referred to in the South-South (Niger Delta) Region of the country.

2.2 Data Collection

The clinic data collection was carried out between March, 2023 and May 2024 (15 months), using self-administered questionnaire after the usual pre-orthodontic counselling sessions before the commencement of any active orthodontic treatment during which the expected orthodontic treatment duration would have been explained to them, among other necessary information. All the orthodontic patients receiving treatment during this study period who consented to be part of the study were recruited. Following their consent or assent

by the parents of the minor patients, they filled the self-administered questionnaire (See Appendix).

2.3 Null Hypotheses

The following null hypotheses were generated and tested:

Ho1: that not a good proportion of the patients would indicate satisfaction with the duration of the orthodontic treatment, and there would not be any statistically significant gender differences in their satisfaction.

Ho2: that there would not be any statistically significant gender differences in their perception and attitude towards accelerated orthodontics.

2.4 Data Analysis

The Statistical Package for Social Sciences (SPSS) 25 was used to analyze the whole data. In addition to descriptive statistics, the chi-square, student's t-test and ANOVA statistics were employed in testing the hypotheses. The significance level was set at $P < .05$.

3. RESULTS

In all, 117 orthodontic patients who were given the questionnaire completed and returned the questionnaire, giving a response rate of 100%. They consisted of 50 (42.7%) males and 67 (57.3%) females with the age range of 10 to 63 years and mean age of 24.79 + 11.60 (SD).

Table 1a shows the responses of the patients to the question on their satisfaction with the duration of fixed orthodontic treatment with majority of them 75(64.1%) indicating satisfaction with the duration of the conventional orthodontic treatment.

Table 1a. The responses of the orthodontic patients to satisfaction with the duration of conventional orthodontic treatment

Question of satisfaction with duration of orthodontic treatment	Frequency	Percent
Very satisfied	50	42.7
Somewhat satisfied	25	21.4
Neutral	28	23.9
Somewhat dissatisfied	7	6.0
Very dissatisfied	7	6.0
Total	117	100.0

The question: Are you satisfied with the duration of active orthodontic treatment for yourself /child /ward?

Table 1b provides the statistical analysis for gender differences in the patients' satisfaction with the duration of conventional orthodontic treatment, which shows no significant sex difference ($P > .05$).

Table 2 provides the responses of the patients to the question on whether they consider the use accelerated orthodontics worthwhile or not. Out of the 64 patients who responded to this question, 24(48%) were males and 51(46.3%) were females without any statistically significant differences in their opinions with respect to gender ($P > .05$).

Table 3 gives the responses of the patients / parents to the questions on the type of accelerated orthodontics procedures they would prefer to use for themselves or for their children/wards for some percentage reduction in the treatment time.

Table 4 shows the responses of the patients to the question on how much reduction in treatment time would you consider undergoing / giving your child treatment using any AO technique.

Table 5 provides the responses of the patients to the question which says 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.

Table 6 gives the statistical analysis of the patients to the question on perception or attitude towards AO according to gender with generally no significant gender preference or bias found ($P > .05$), except for the use of direct light electric current where male patients gave significant preference compared to the females ($P = 0.037$).

Table 1b. Statistical analysis for gender differences in the satisfaction of the patients with the duration of orthodontic treatment

		Satisfied with duration of active orthodontic treatment		t-test	p-value
		Mean	(SD)		
Gender	Male	2.18	(1.17)	0.534	0.594
	Female	2.06	(1.23)		

1...very satisfied, 5.....very dissatisfied

Table 2. The responses of the patients to the question on whether the use of the procedures for accelerated orthodontics is worthwhile or not

		Gender					
		Male		Female		Total	
		N	(%)	N	(%)	N	(%)
In your view, do you think using the above-mentioned procedures to reduce treatment time is worth it?	Yes	24	(48.0)	31	(46.3)	55	(47.0)
	No	3	(6.0)	6	(9.0)	9	(7.7)
	N/A	23	(46.0)	30	(44.8)	53	(45.3)
	Total	50	(100.0)	67	(100.0)	117	(100.0)

Chi-square = 0.353; P-value =0.838; The Question: In your view, do you think using the above mentioned procedures to reduce treatment time is worth it? (a)Yes (b) No

Table 3. The responses of the patients to preferred AO procedure for 25% to 30% reduction in treatment time

AO Procedures	Level of Willingness	n	%
Use of some medications injected locally intraoral	Most willing	17	14.5
	Willing	35	29.9
	Neutral	23	19.7
	Not willing	29	24.8
	Least willing	13	11.1
Administration of biological substance and hormones (local or systemic)	Most willing	13	11.1
	Willing	31	26.5
	Neutral	35	29.9
	Not willing	28	23.9
	Least willing	10	8.5
Direct light electric current- electric current application of about 20 µA for 5h daily	Most willing	13	11.1
	Willing	28	23.9
	Neutral	46	39.3
	Not willing	23	19.7
	Least willing	7	6.0
Low level laser therapy (LLLT)	Most willing	15	12.8
	Willing	36	30.8
	Neutral	49	41.9
	Not willing	14	12.0
	Least willing	3	2.6
Resonance vibration	Most willing	9	7.9
	Willing	18	15.8
	Neutral	47	41.2
	Not willing	28	24.6
	Least willing	12	10.5
Corticotomies	Most willing	8	7.1
	Willing	14	12.4
	Neutral	49	43.4
	Not willing	28	24.8
	Least willing	14	12.4
Piezocision	Most willing	8	7.1
	Willing	11	9.8
	Neutral	50	44.6
	Not willing	25	22.3
	Least willing	18	16.1

AO – Accelerated Orthodontics; Question: How much reduction in treatment time would you consider to undergo/give your child treatment using any acceleration technique? Please, tick any of the options below

Table 4. The responses of the patients on how much reduction in treatment time would you consider undergoing / giving your child treatment using any acceleration technique

AO Procedures		n	%
Use of some medications injected locally intraoral	0%-10%	12	11.1
	10%-20%	21	19.4
	20%-30%	26	24.1
	30%-40%	24	22.2
	Greater than 40%	25	23.1
Administration of biological substance and hormones (local or systemic)	0%-10%	12	11.2
	10%-20%	28	26.2
	20%-30%	23	21.5
	30%-40%	26	24.3

AO Procedures		n	%
	Greater than 40%	18	16.8
Direct light electric current- electric current application of about 20 μ A for 5h daily	0%-10%	19	18.1
	10%-20%	21	20.0
	20%-30%	22	21.0
	30%-40%	28	26.7
	Greater than 40%	15	14.3
Low level laser therapy (LLLT)	0%-10%	17	16.0
	10%-20%	17	16.0
	20%-30%	27	25.5
	30%-40%	25	23.6
	Greater than 40%	20	18.9
Resonance vibration	0%-10%	21	20.8
	10%-20%	17	16.8
	20%-30%	29	28.7
	30%-40%	18	17.8
	Greater than 40%	16	15.8
Corticotomies	0%-10%	21	21.2
	10%-20%	22	22.2
	20%-30%	21	21.2
	30%-40%	16	16.2
	Greater than 40%	19	19.2
Piezocision	0%-10%	22	22.0
	10%-20%	21	21.0
	20%-30%	23	23.0
	30%-40%	19	19.0
	Greater than 40%	15	15.0

Table 5. The responses of the patients to ‘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’

AO Procedures		n	%
Use of some medications injected locally intraoral	Increase in fees by 10%	71	68.3
	Increase in fees by 20%	16	15.4
	Increase in fees by 30%	10	9.6
	Increase in fees by 40%	3	2.9
	Increase in fees by 50%	4	3.8
Administration of biological substance and hormones (local or systemic)	Increase in fees by 10%	61	59.8
	Increase in fees by 20%	27	26.5
	Increase in fees by 30%	7	6.9
	Increase in fees by 40%	3	2.9
	Increase in fees by 50%	6	6.0
Direct light electric current- electric current application of about 20 μ A for 5h daily	Increase in fees by 10%	59	57.8
	Increase in fees by 20%	26	25.5
	Increase in fees by 30%	9	8.8
	Increase in fees by 40%	6	5.9
	Increase in fees by 50%	2	2.0
Low level laser therapy (LLLT)	Increase in fees by 10%	55	53.9
	Increase in fees by 20%	24	23.5
	Increase in fees by 30%	15	14.7
	Increase in fees by 40%	4	3.9
	Increase in fees by 50%	4	3.9
Resonance vibration	Increase in fees by 10%	51	52.6
	Increase in fees by 20%	19	19.6

AO Procedures	n	%
Increase in fees by 30%	18	18.6
Increase in fees by 40%	6	6.2
Increase in fees by 50%	3	3.1
Corticotomies	57	60.0
Increase in fees by 10%	18	18.9
Increase in fees by 20%	9	9.5
Increase in fees by 30%	8	8.4
Increase in fees by 40%	3	3.2
Piezocision	57	60.6
Increase in fees by 10%	17	18.1
Increase in fees by 20%	10	10.6
Increase in fees by 30%	7	7.4
Increase in fees by 40%	3	3.2

Table 6. The gender based responses of the patients to the questions on perception and attitude towards accelerated orthodontics

	Gender		T-Test	P-value		
	Male	Female				
	Mean	(SD)	Mean	(SD)		
Question:As a parent or patient, which of these procedures would you prefer to use, if 25% to 30% of treatment time would be gained?						
Use of some medication	2.74	(1.19)	2.99	(1.30)	-1.046	.298
Administration of biological substance	2.72	(1.13)	3.07	(1.13)	-1.680	.096
Direct light electric current	2.62	(1.07)	3.03	(1.01)	-2.114	.037*
Low level laser therapy	2.52	(.99)	2.67	(.91)	-.856	.394
Resonance vibration	2.92	(1.17)	3.31	(.95)	-1.960	.053
Corticotomes	3.06	(1.20)	3.36	(.91)	-1.501	.136
Piezocision	3.19	(1.18)	3.39	(1.00)	-.984	.327
Question:How much reduction in treatment time would you consider to undergo/give your child treatment using any acceleration technique? Please, tick any of the options below:						
Use of medication locally intraoral	5.02	(8.53)	3.25	(1.70)	1.571	.119
Administration of biologic sub	3.36	(1.22)	2.88	(1.29)	1.947	.054
Direct light electric	3.16	(1.28)	2.87	(1.37)	1.100	.274
LLLT	3.27	(1.29)	3.03	(1.38)	.888	.376
Resonance vibration	3.05	(1.29)	2.81	(1.39)	.879	.381
Corticotomies	2.93	(1.45)	2.87	(1.40)	.191	.849
Piezocision	2.95	(1.31)	2.75	(1.42)	.718	.474
Question:If you were to use any of the accelerated orthodontics techniques, indicate your preference for percentage increase in fee for a						

	Gender				T-Test	P-value
	Male		Female			
	Mean	(SD)	Mean	(SD)		
percentage reduction in treatment time (Tick only one option in each row)						
Use of some medication locally intraoral	1.57	(.97)	1.60	(1.09)	-.154	.878
Administration of biological substance	2.22	(4.75)	1.81	(1.69)	.613	.541
Direct light electric current	1.58	(.79)	1.76	(1.12)	-.908	.366
Low level laser therapy	1.67	(.93)	1.90	(1.17)	-1.073	.286
Resonance vibration	1.76	(1.09)	1.96	(1.13)	-.911	.365
Corticotomes	1.74	(1.16)	1.77	(1.11)	-.103	.918
Piezocision	1.74	(1.20)	1.75	(1.07)	-.056	.956
Reduction in time	1.60	(.89)	1.20	(.45)	.894	.397

4. DISCUSSION

This clinic-based Nigerian study on the satisfaction of orthodontic patients concerning the duration of conventional orthodontic treatment and their perception and attitude towards accelerated orthodontics has revealed no statistically significant gender differences in satisfaction with the duration of conventional orthodontic treatment, as well as their perception of accelerated orthodontics. Khaing et al [54] reported similar gender finding. Also, similar to other reports of [13, 50, 54, 55], our present Nigerian study has male: female ratio of the participants that favours more of female patients than their male counterparts. They reported 100% response rate from their participants that our present study has. Descriptive statistics of our present study shows that 75(64.1%) of the patients indicated they were satisfied with the duration of conventional orthodontic treatment with 28(23.0%) being neutral and 14(12.0%) not satisfied. According to Khaing et al [54], in the first six months of their treatment the patients reported 66.7% being satisfied with only 33.9% that indicated unsatisfied. Again, their study sample size of 125 patients is comparable to our sample size of 117 patients. In this study, patient satisfaction during orthodontic treatment was in relation with: (1) duration period of orthodontic treatment, (2) self-awareness of tooth position improvement, and (3) frequency of in-between visits. Meanwhile, in two earlier studies, Alqfare et al. [56] concluded that the satisfaction level with fixed orthodontic treatment was higher in females than males while Younis et.al [57] reported that female patients were more willing to take care of their oral hygiene and more satisfied

with their current treatment condition rather than male patients.

In their study [54], patients with long-term wearing of fixed appliances were more satisfied than patients with short-term wearing. Based on the findings, they assumed that patient acceptance of orthodontic treatment during the first three months is crucial [58, 59] and that patient acceptance of their teeth position changes as a result of fixed orthodontic treatment increases with treatment duration. The longer duration and pre-existing malocclusion conditions should be evaluated to obtain more accurate data and to be able to draw the causal relation.

In a related work by Ayele et al[60], it was reported that the result of their study revealed that overall client satisfaction was low. Furthermore, the politeness of health service providers, the convenience of the environment for asking questions, and the availability of all prescription drugs were found to have a significant relationship with level of satisfaction with the health centre. They recommended that health managers and service providers should come up with creative ways to improve health workers' caring behaviour, protect patients' privacy, and increase patient satisfaction by making all necessary drugs available.

According to Al-Attar et al [13], the orthodontic patients were ready to pay up to 20% more for acceleration techniques while the orthodontists were ready to pay for up to 40%. The study [13] concluded that both orthodontists and patients were interested in techniques that could decrease the treatment duration, and that non-invasive

accelerating procedures were more preferable by orthodontists and patients than invasive surgical procedures. In our present Nigerian study, out of the 64 patients who responded to the question that sought their opinion on whether accelerated orthodontics was worth it or not, 55(47.0%) responded positively while only 9(7.7%) said no. This suggests a positive perception of the concept by the patients.

Concerning the willingness of the Nigerian patients to use different acceleration procedures, the results revealed that use of some medications was most preferred by the patients (44.4%), followed by low level laser therapy (43.6%), administration of biological substances (37.6%), and direct light electric current (35.0%) compared to the surgical procedures which had lower percentages. This suggests that the patients prefer the non-invasive procedures to the surgical ones. This finding agrees with the findings reported earlier [13-15, 61-63].

Regarding reduction in the treatment time before one could use or allow child to have treatment using any of the accelerated orthodontics techniques, the pattern follows the same pattern of responses as the one on willingness: more interest on the non-invasive techniques like the direct light current having the highest as 26.7% by the patients than the invasive procedures like corticotomies having 22.2% as the highest. Again, this agrees with the report by Al-Attar et al [13].

On the increase in fee for the use of any of the accelerated orthodontics techniques, majority of the patients indicated readiness most at 10% increase for all the techniques. This finding suggest that the patients would be ready to use any of the techniques of accelerated orthodontics whether non-invasive or invasive procedures with much increase in the cost of treatment. This finding concurs with other earlier findings [13, 64]. Again, this means that though they appreciate the advantages of accelerated orthodontics but cost will still be a major determinant. This is understandable because of the hostile economic condition in Nigeria where families are struggling to survive and multidimensional poverty is on the increase in the country.

Generally, no significant gender differences were observed in this present Nigerian study concerning the patients' perception and attitude towards accelerated orthodontics, except with

regards to direct light electric current. This is comparable to earlier related studies on Nigerian dental practitioners [52, 53].

4.1 Strengths and Limitations of the Study

Location of the teaching hospital for this study favours access for many of the patients in the South-South Region of Nigeria, which presents a fair representation of the target population. However, this study is limited as it did not factor in the impact of the pre-existing malocclusions, the frequency of hospital visits outside the normal monthly routine follow-up checks by the different individual patients and their awareness or otherwise of the changes or improvement in their occlusions on their eventual responses.

5. CONCLUSION

- High proportion (64.1%) of the Nigerian orthodontic patients expressed satisfaction with the duration of conventional orthodontic treatment without any significant gender differences.
- The patients generally prefer the non-invasive procedures of accelerated orthodontics to the invasive techniques.
- Although the patients would want to use non-invasive accelerated orthodontics, cost remains a major limiting factor.

6. RECOMMENDATION

Further related research should be encouraged to ensure adequate preparation for the practice of accelerated orthodontics, especially in Africa.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

ETHICAL APPROVAL

It is not applicable.

CONSENT

As per international standards or institutional standards, Participants' gave their consent before participating in the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

QUESTIONNAIRE ON ACCELERATED ORTHODONTICS

Please, we need your support by responding to the questions below. This is purely for academic and treatment planning purposes. Your responses will be confidentially handled. Please, provide honest responses as much as possible. Thank you and God bless.

SECTION A

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

- (1) Age ----- (2) Gender: Male /Female (3) Academic Qualification: (a) Primary School Certificate (b) O' Level (WASCE/GCE) (c) University Degree (d) Postgraduate Degree (4) Type of Work/Job: -----
----- (5) Estimate of Annual Income: -----
(6) Marital Status: (a) Living with Spouse (b) Single Parent

SECTION B

- (7) Are you satisfied with the duration of active orthodontic treatment for yourself /child /ward?
(a) Very satisfied (b) somewhat satisfied (c) neutral (d) somewhat dissatisfied (e) very dissatisfied
(8) Any of the procedures below can help to accelerate the orthodontic treatment. As a parent or patient, which of these procedures would you prefer to use, if 25% to 30% of treatment time would be gained?

Procedure	Most willing	Willing	Neutral	Not willing	Least willing
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 μ A for 5 h daily:					
Low level laser therapy (LLL):					
Resonance vibration:					
Corticotomies:					
Piezocision:					

- (9) How much reduction in treatment time would you consider to undergo/give your child treatment using any acceleration technique? Please, tick any of the options below:

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 μ A for 5 h daily:					
Low level laser therapy (LLLT):					
Resonance vibration:					
Corticotomies:					
Piezocision:					

(10) 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 (Tick only one option in each row)

Increase in fees (%)	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 μ A for 5 h daily:					
Low level laser therapy (LLLT):					
Resonance Vibration:					
Corticotomies:					
Piezocision:					
Reduction in time (%)	Reduction in time by 50%	Reduction in time by 40%	Reduction in time by 30%	Reduction in time by 20%	Reduction in time by 10%

11. In your view, do you think using the above mentioned procedures to reduce treatment time is worth it? (a)Yes (b) No

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