

Impact of age and marital status of orthodontic patients on their satisfaction with duration of treatment, perception and attitude towards accelerated orthodontics

ABSTRACT

Background: The idea of accelerated orthodontics is to modify the bone temporarily to enable teeth move faster in the jaws so as to shorten the orthodontic treatment time. With the increasing global interests in patients' concerns about the duration of conventional orthodontic treatment and accelerated orthodontics, there is need to investigate further into the factors that could impact the patients' satisfaction, perception and attitude towards accelerated orthodontics. **Aim:** To investigate the impact of age and marital status of orthodontic patients on their satisfaction with conventional orthodontic treatment, as well as their perception and attitude towards accelerated orthodontics. **Materials and Methods:** Using a questionnaire, a clinic-based cross-sectional and prospective study of orthodontic patients in a Nigerian teaching hospital was carried out between March, 2023 and May, 2024. The questionnaire contents involving their satisfaction with duration of orthodontic treatment and their perception and attitude towards accelerated orthodontics were analysed for associations with the patients' age and marital status. The IBM SPSS version 25 was used to analyze the data involving descriptive statistics, the ANOVA and independent t-test. The significance level set at $P < .05$. **Results:** Significant associations were found between patients' age and their satisfaction with orthodontic treatment duration ($P < .05$) and one procedure of accelerated orthodontics ($P < .05$). No significant associations were found between their marital status and satisfaction with duration of orthodontic treatment, as well as with their perception and attitude towards accelerated orthodontics ($P > .05$). **Conclusion and Recommendation:** Patients' age had significant impact on satisfaction with orthodontic treatment duration, and slightly on perception and attitude towards accelerated orthodontics but marital status did not. More of such studies are required in other orthodontic communities for evidence-based clinical orthodontic practice.

Keywords: Age, Marital Status, Satisfaction, Treatment Duration, Accelerated Orthodontics, Nigerian Patients

1. INTRODUCTION

Over many years, orthodontic treatment has been synonymous with extended timelines, often spanning numerous years [1]. This can be a significant deterrent for individuals seeking to improve their malocclusion. Fortunately, the landscape of orthodontics is undergoing a remarkable transformation with the advent of accelerated orthodontics (AO). This innovative approach utilizes various techniques to expedite tooth movement, offering patients the potential to achieve the desired results in a considerably shorter duration [1].

Despite advancements with different publications [2-35] so far made concerning accelerated orthodontics involving both invasive, non-invasive and pharmacological methods that hold the

potential of improving the efficiency of orthodontic treatment, there is an ongoing effort within the field to address the issues of safety and overall clinical significance of AO treatment modality in comparison to the conventional orthodontic treatment such as: does AO modalities really impact orthodontic treatment efficiency in a meaningful manner? This is important so as to find ways to streamline orthodontic procedures further because with any novel approach comes a responsibility for thorough evaluation.

Likewise, there is still need to provide more information on the perception and attitude of both patients and orthodontists toward this growing emphasis on accelerated orthodontics in solving the challenge of long duration of conventional orthodontic treatment. The importance of perception and attitude cannot be over emphasized in the willingness of patients to access any available health care services. At the moment, there is paucity of published data on factors that could influence the perception and attitude of both patients and the dental professionals towards this growing important subject [36-39]. Age and marital status of orthodontic patients are important demographical factors that could impact on their satisfaction or otherwise with the duration of conventional orthodontic treatment, as well as their perception and attitude towards accelerated orthodontics (AO). In fact, it has been said that marital status is an important demographical statistic to a large array of groups or institutions, and usually affects an individual's eligibility for government benefits, as well as the taxes required to be paid [40].

Therefore, this study aimed at assessing the impact of age and marital status of orthodontic patients on their satisfaction with the duration of the conventional orthodontic treatment, their perception and attitude towards accelerated orthodontics in a Nigerian tertiary hospital where most of such patients are usually referred to for treatment. It was hypothesized that: (1) there would not be any statistically significant impact of age of the patients on their satisfaction with the duration of conventional orthodontic treatment, as well as with their perception and attitude towards accelerated orthodontics; and (2) there would not be any statistically significant impact of the marital status of the patients on their satisfaction with the duration of conventional orthodontic treatment, as well as with their perception and attitude towards accelerated orthodontics.

2. MATERIALS AND METHODS

2.1. Study Design

A self-administered questionnaire survey of cross-sectional and prospective orthodontic patients in a Federal Teaching Hospital (Orthodontics Clinic of the University of Port Harcourt Teaching Hospital, Nigeria) in the Niger Delta Region of Nigeria was carried out.

2.2. Sampling / Data Collection

This clinic-based survey of orthodontic patients was carried out between March, 2023 and May, 2024. The one hundred and seventeen (117) patients - 50 (42.7%) males and 67(57.3%) females filled and returned the questionnaire, giving a response rate of 100%. The questionnaire used for the study is attached (Appendix). In line with the pre-counselling session in the clinic, every treatment procedure was thoroughly explained in simple English language understandable to all the patients and their questions answered to their satisfaction so as to ensure adequate comprehension of their treatment involvements, as well as the study.

2.3. Patients' Confidentiality and Ethical Considerations

As promised, the confidentiality of the patients was strictly maintained as their names were excluded in the questionnaire.

The consents of the adult patients were obtained while the minors (child participants) had their assents handled before proceeding with the filling of the questionnaire. Interestingly, all the participants showed interest in the study after explaining to them the aim of the research. Meanwhile, the Institutional Ethical Committee's approval was not applicable because of the completely non-invasive nature of the survey.

2.4. Null Hypotheses

The following null hypotheses were generated and tested:

Ho1 - that there would not be any statistically significant association between the satisfaction of the orthodontic patients with the duration of conventional orthodontic treatment and their age.

Ho2 - that there would not be any statistically significant association between their perception and attitude towards accelerated orthodontics and their age.

Ho3 - that there would not be any statistically significant impact of the marital status of the patients on their satisfaction with the duration of conventional orthodontic treatment

Ho4—that there would not be any statistically significant impact of the marital status of the patients on their perception and attitude towards accelerated orthodontics.

2.5. Data Analysis

Using the SPSS version 25, the whole data was analysed descriptively, as well as using student's t-test and ANOVA statistics to test the hypotheses. The significance level was set at $P < .05$.

3. RESULTS

One hundred and seventeen (117) patients were served the questionnaire during the study period, and they were aged 10 to 63 years with mean age of 24.79 ± 11.60 (SD). Table 1 below shows the descriptive statistics of age and marital distributions of the patients

Table 1: The descriptive statistics of age and marital distributions of the patients

| | | N | % |
|----------------|--------------------|------------|--------------|
| Agegroup | 10-20 years | 54 | 46.2 |
| | Above 20 years | 63 | 53.8 |
| Marital Status | Living with spouse | 29 | 24.8 |
| | Single parent | 10 | 8.5 |
| | Single | 78 | 66.7 |
| | Total | 117 | 100.0 |

Table 2 below shows the statistical analysis of age and marital status of the patients in respect of their satisfaction with the duration of conventional orthodontic treatment, which reveals that the younger age group being significant more satisfied than the adults group ($P = 0.044$), but no significant association with the marital status. The first and third null hypothesis is hereby rejected while the third null hypothesis is accepted.

Table 2: T-test and ANOVA statistical analyses of the age groups and marital status of patients' satisfaction with the duration of conventional orthodontic treatment

| | | Satisfied with duration of active orthodontic treatment | t-test | p-value |
|----------------|--------------------|---|--------|---------|
| | | Mean (SD) | | |
| Age group | 10-20 years | 1.87 (1.12) | -2.033 | 0.044* |
| | Above 20 years | 2.32 (1.24) | | |
| Marital Status | Living with spouse | 1.79 (.86) | 2.764 | .067 |
| | Single parent | 2.80 (1.62) | | |
| | Single | 2.14 (1.22) | | |

1...very satisfied, 5.....very dissatisfied * statistically significant

Table 3 below provides the t-test statistical analysis of the association between the age groups and the perception and attitude of the patients towards accelerated orthodontics, which virtually reveals no significant relationships ($P > .05$), except for direct light electric current ($P = .024$). The second null hypothesis is largely accepted.

Table 3: T-test analysis of the age of the patients and their perception and attitude toward accelerated orthodontics

| | Age group | | t-test | p-value |
|--|-------------|-------------|--------|---------|
| | 10-20 | Above 20 | | |
| | Mean (SD) | Mean (SD) | | |
| Q8 | | | | |
| Use of some medication | 3.06 (1.31) | 2.73 (1.19) | 1.405 | .163 |
| Administration of biological substance | 3.06 (1.19) | 2.81 (1.09) | 1.167 | .246 |
| Direct light electric current | 2.85 (1.14) | 2.86 (.98) | -.027 | .979 |
| Low level laser therapy | 2.70 (1.02) | 2.52 (.88) | 1.025 | .307 |
| Resonance vibration | 3.15 (1.14) | 3.13 (1.00) | .074 | .941 |
| Corticotomes | 3.33 (1.13) | 3.14 (.97) | .998 | .321 |
| Piezocision | 3.42 (1.10) | 3.20 (1.06) | 1.035 | .303 |
| Q9 | | | | |
| Some medication injected locally | 4.61 (8.37) | 3.53 (1.59) | .957 | .341 |
| Biological substance and hormones | 2.92 (1.37) | 3.25 (1.18) | -1.320 | .190 |
| Direct light electric current | 2.96 (1.38) | 3.02 (1.30) | -.226 | .822 |
| LLLT | 2.92 (1.43) | 3.32 (1.24) | -1.534 | .128 |
| Resonance vibration | 2.87 (1.42) | 2.94 (1.29) | -.267 | .790 |
| Corticotomies | 2.73 (1.40) | 3.06 (1.43) | -1.158 | .250 |
| Piezocision | 2.75 (1.39) | 2.92 (1.36) | -.630 | .530 |
| Q10 | | | | |
| Use of medication locally intraoral | 1.44 (.84) | 1.72 (1.19) | -1.390 | .168 |
| Administration of biologic sub | 2.13 (4.66) | 1.87 (1.72) | .377 | .707 |
| Direct light electric | 1.45 (.65) | 1.89 (1.18) | -2.294 | .024* |
| LLLT | 1.63 (1.00) | 1.96 (1.13) | -1.587 | .116 |
| Resonance vibration | 1.67 (1.00) | 2.06 (1.18) | -1.747 | .084 |
| Corticotomies | 1.63 (1.08) | 1.88 (1.17) | -1.069 | .288 |
| Piezocision | 1.62 (1.03) | 1.86 (1.19) | -1.020 | .311 |
| Reduction in time | 1.40 (.55) | 1.40 (.89) | .000 | 1.000 |

Q8: 1= most willing, 5= least willing; Q9:1=0%-10%, 5=Greater than 40% ; Q10: 1 = Increase in fees by 10%, 5 =Increase in fees by 50%

Table 4 below gives the t-test statistical analysis of the associations between the marital status of the patients and their perception and attitude toward accelerated orthodontics, which virtually reveals no significant relationships. The fourth null hypothesis is accepted.

Table 4: T-test statistical analysis of the marital status of the patients against their perception and attitude toward accelerated orthodontics

| | Marital status | | | F(ANOVA) | P-value |
|--|--------------------|---------------|-------------|----------|---------|
| | Living with spouse | Single parent | Single | | |
| | Mean (SD) | Mean (SD) | Mean (SD) | | |
| Q8 | | | | | |
| Use of some medication | 2.55 (1.27) | 3.10 (1.29) | 2.97 (1.24) | 1.378 | .256 |
| Administration of biological substance | 2.76 (1.18) | 2.30 (.82) | 3.06 (1.13) | 2.460 | .090 |
| Direct light electric current | 2.76 (1.09) | 2.40 (.84) | 2.95 (1.06) | 1.374 | .257 |
| Low level laser therapy | 2.41 (.95) | 2.50 (.85) | 2.69 (.96) | .985 | .377 |
| Resonance vibration | 3.07 (1.15) | 3.20 (.92) | 3.16 (1.06) | .084 | .920 |
| Corticotomes | 3.14 (1.21) | 3.33 (.87) | 3.25 (1.02) | .151 | .860 |
| Piezocision | 3.25 (1.32) | 3.44 (.88) | 3.31 (1.01) | .109 | .897 |
| Q9 | | | | | |
| Use of medication locally intraoral | 3.30 (1.44) | 3.70 (1.16) | 4.37 (7.16) | .340 | .713 |
| Administration of biologic sub | 2.93 (1.33) | 3.56 (1.13) | 3.10 (1.28) | .818 | .444 |
| Direct light electric | 3.07 (1.30) | 3.11 (1.17) | 2.94 (1.38) | .133 | .876 |
| LLLT | 3.37 (1.24) | 3.56 (.88) | 2.99 (1.41) | 1.304 | .276 |
| Resonance vibration | 2.92 (1.41) | 3.00 (.87) | 2.90 (1.39) | .024 | .976 |
| Corticotomies | 2.85 (1.43) | 3.00 (1.53) | 2.91 (1.42) | .037 | .964 |
| Piezocision | 2.77 (1.42) | 2.63 (1.41) | 2.89 (1.36) | .182 | .834 |
| Q10 | | | | | |
| Use of some medication locally intraoral | 1.50 (1.03) | 1.50 (.76) | 1.63 (1.08) | .172 | .842 |
| Administration of biological substance | 1.42 (.64) | 1.56 (1.01) | 2.27 (4.13) | .660 | .519 |
| Direct light electric current | 1.73 (1.08) | 1.78 (1.09) | 1.66 (.96) | .092 | .912 |
| Low level laser therapy | 1.96 (1.22) | 1.63 (.74) | 1.76 (1.07) | .426 | .655 |
| Resonance vibration | 1.84 (1.07) | 2.00 (1.12) | 1.87 (1.14) | .068 | .934 |
| Corticotomes | 2.04 (1.40) | 1.43 (.79) | 1.68 (1.03) | 1.228 | .298 |
| Piezocision | 2.04 (1.46) | 1.29 (.49) | 1.68 (.99) | 1.600 | .208 |
| Reduction in time | 1.00 (.00) | 3.00 (.) | 1.40 (.55) | 9.333 | .011 |

Q8: 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?

Q9: How much reduction in treatment time would you consider to undergo/give your child treatment using any acceleration technique?

Q10: 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

5. DISCUSSION

The present Nigerian study has shown that the younger orthodontic patients are significantly more satisfied with the duration of conventional orthodontic treatment than the older age group. The same group of patients gave significantly better preference for direct light electric current as a procedure for accelerated orthodontics ($P < .05$). Generally, marital status of the patients did not reveal any significant associations with duration of conventional orthodontic treatment, as well as with their perception and attitude towards accelerated orthodontics ($P > .05$). Therefore, the first null hypothesis was rejected with the second largely accepted, as well as the acceptance of the third and the fourth hypotheses.

According to Oriki et al [38], although no significant associations were found between the participants' demographics and satisfaction with duration of orthodontic treatment, gender gave significant associations with knowledge of two methods of accelerated orthodontics, while years of practice of dentistry revealed the most significant associations with knowledge of accelerated orthodontics. In another similar study that investigated the influence of some demographic factors of Nigerian dentists on their perception of accelerated orthodontics found that generally, the participants' demographics did not have significant influence on their perception of accelerated orthodontics, and recommended for further related studies to be carried out [39]. According to a previous study, satisfaction towards fixed orthodontic brackets and the age difference were not statistically significant [41]. This result totally agrees with this study in which most of the patients of any age group were satisfied with their current orthodontic treatment condition. However, a recent study showed that there was a relationship between age and patient satisfaction [42] which was in contrast with the very recent study by Khaing et al [43]. Within 6 months of orthodontic treatment duration, satisfied patients (66.1%) were two times greater than unsatisfied ones (33.9%). With increased time, over six months duration, satisfied patients (87.3%) were drastically higher than the unsatisfied patients (12.7%) and there were statistically significant ($p < 0.004$) [43]. This report could be comparable to our present Nigerian study because both studies have shown that orthodontic patients were significantly satisfied with treatment and treatment duration.

However, the present Nigerian study has shown that younger age group had significantly more satisfaction with the treatment duration compared to the Japanese study [43] where there was no statistically significant difference between patients who were less than 24 years and those above. This could be because this Nigerian study dichotomized the age differently (<20 years and > 20 years) from the Japanese study (<24 years and > 24 years). The younger Nigerian patients were statistically significantly more satisfied compared to the older age group. Also, it is important to note that the present Nigerian study has the age range of the patients as 10 to 63 years while the Japanese had 15 to 33 years. Al-Attar et al had most the patients less than 18 years of age [44]. Meanwhile, both The present Nigerian study and the Japanese study [43] had 100% response rate from the participants while Al-Attar had 78%. In an earlier 21-month clinic-based study in the Western part of Nigeria on demand and referral pattern of orthodontic patients by Onyeaso [45], it was reported that the mean age of the orthodontic patients was 16.21 ± 7.81 years, while the present study in the South-South

(Niger Delta Region) part of Nigeria has it as 24.79 ± 11.60 . However, the mean age of the present Nigerian patients is comparable to Thai patients (26.4 ± 6.75) and Taiwanese patients (25.23 ± 5.33) reported by Laothong and Cheng [46]. Another related relatively recent study [36] from Lagos, Nigeria (Western part of the country too) had patients ages ranging from 11 to 51 years. This suggests that older Nigerians are now seeking orthodontic treatment, and possibly because this South-South part of Nigeria had for long been deprived of easy access to orthodontic care until the relatively young teaching and practice of orthodontics in the region. This related earlier Nigerian study [36] did not investigate the influence of age on the satisfaction with duration of orthodontic treatment and their perception and attitude toward accelerated orthodontics.

According to Khaing et al [43], in checking the relationship between frequency of visits to the clinic for various complaints and satisfaction with treatment (69.4%) that prolonged treatment duration and patients who only visited the clinic once a month (84.1%), these two visits were statically significant in patient satisfaction ($p < 0.05$). In addition, the Japanese study [43] considered other patient's experiences such as the frequency of the patients having oral hygiene problems and discomfort and patient's awareness of tooth movement. The present Nigerian study did not consider these experiences and their possibly effect in their satisfaction with the treatment duration. It is important to note that negligible association was found between oral health related quality of life assessed by using General Oral Health Assessment Index (GOHAI) and patients satisfaction during fixed orthodontic treatment [43].

In the present Nigerian study, marital status was not significantly associated with satisfaction with duration of orthodontic treatment, as well as with their perception and attitude towards accelerated orthodontics. In China, Laothong and Cheng [46] found marital status, age and active treatment significantly associated with Taiwanese attitude toward treatment ($p < 0.05$). In addition, age, among other factors, was significantly associated with the factors affecting Taiwanese patients' motivation ($p < 0.05$). They concluded that ethnicity influenced patients' motivation to seek orthodontic treatment [46].

Strengths and Limitations of the present Nigerian Clinic-based Study

The originality of the present study is a plus, considering the present paucity of literature that have investigated into the possible influence or impact of age and marital status on the satisfaction of orthodontic patients on the duration of orthodontic treatment and their perception and attitude towards the growing importance of accelerated orthodontics globally. In addition, the orthodontic patients at this tertiary institution are usually referred from various parts of Nigeria, especially from the Niger Delta Region. It is hoped that this report will serve as a modest contribution to knowledge in this aspect for the global orthodontic community, especially the African orthodontic community. The frequent industrial actions in Nigerian health sector would have affected the overall turnout of patients, as well as the growing multidimensional poverty in the country.

5. CONCLUSION

- The age of the Nigerian orthodontic patients have statistically significant impact on their satisfaction with duration of conventional orthodontic treatment with the younger age group being significantly satisfied than the older age group.
- Meanwhile, there were generally no statistically significant associations between the age of the patients and their perception and attitude towards accelerated orthodontics, except in the accelerated orthodontics procedure of using direct light current, which gave significant association with the younger age group.
- No statistically significant association was found between the marital status of the Nigerian orthodontic patients and their satisfaction with the duration of conventional orthodontic treatment, as well as with their perception and attitude towards accelerated orthodontics

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- 1.
- 2.
- 3.

6. RECOMMENDATION

We recommend similar studies to be carried out from other orthodontic communities across the globe for more evidence-based orthodontic practice and comparison of data.

CONSENT

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

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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 (LLLT): | | | | | |
| 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% | |

THE END

We appreciate your kind participation in this study.

UNDER PEER REVIEW