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Oral Health Behaviour, Patient/Parent-Orthodontist Relationship and Compliance of Nigerian Adolescents to Fixed Orthodontic Appliance Treatment

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Abstract

Background: Poor oral health behaviour and non-compliance to orthodontic instructions have been reported to diminish the satisfactory outcome and benefits that a patient experiences during or after orthodontic treatment. The purposes of this study were to assess the oral health behaviour, patient/parent-orthodontist relationship, and the socio-demographic factors influencing compliance of Nigerian adolescents to fixed orthodontic appliance treatment.

Methods: A 28-item questionnaire was administered to 146 adolescents undergoing fixed orthodontic appliance treatment in three Nigerian teaching hospitals located in different cities with varying levels of population density. The questions assessed oral health behaviour, level of compliance to instructions during treatment, and the level of interaction of the patient with the orthodontist.

Results: While more female patients frequently indulged in chewing sticky sweets ($p<0.05$), the males were more involved in contact sports ($p<0.001$) during the fixed orthodontic appliance treatment. Mother's educational level, the population density of the city where the dental practice is located, and the length of treatment influenced orthodontic compliance significantly ($p<0.05$). Personal likeness for the orthodontist, awareness of the consequences of poor compliance by patients, as well as prior discussion of treatment goals with parents significantly improved compliance to orthodontic treatment.

Conclusions: This study concluded that gender affected oral health behaviour during orthodontic treatment. Mother's level of education, awareness of deleterious effects of treatment, duration of orthodontic treatment, and patient/parent-orthodontist relationship, significantly influenced compliance to fixed orthodontic appliance therapy.

Key words: Oral health behaviour, compliance, patient/parent-orthodontist relationship, fixed orthodontic treatment

ORIGINAL ARTICLE

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Introduction

Fixed orthodontic appliance therapy as an important tool in the treatment of malocclusion has long served as a means of providing patients with improved dento-facial aesthetic, functional, and psychosocial benefits. Unfortunately, negative oral health behaviour and non-compliance to orthodontic instructions have been reported to diminish the satisfaction and benefits that a patient experiences during orthodontic treatment.[1]

From the orthodontic professional point of view, treatments that should normally last for 18-24 months are unnecessarily prolonged, thus leading to frustration on the part of the orthodontist.[2,3] It is a fact that treatment with the fixed orthodontic appliance is often associated with greater plaque accumulation due to difficulty in tooth cleaning especially in areas around the brackets and the gingival margins. However, negative oral health attitudes and behaviour can also jeopardize or impede successful treatment outcome.[4] Plaque, if not removed, can lead to several adverse conditions such as the occurrence of hyperplastic gingivitis, periodontal breakdown (in severe cases), enamel decalcification and white spots caused by highly

acidic plaque, and carious lesions.[5-7] Compliance with oral hygiene instructions is essential for patients in all age groups, but critical during adolescence, as patient's behaviour, personality, and self-image are formed during this transitional phase. [9,10]

Paradoxically, the stress associated with this age makes compliance more difficult. According to Mehra et al., [11] 5% to 10% of orthodontic patients do not complete their treatment due to poor oral hygiene habits. Morris et al., [12] and Feil et al.,[13] showed a compliance rate of about 50% with long-term treatment procedures like orthodontic treatments. Orthodontists are often able to predict correctly the future compliance of new patients during their early treatment stages.[9,14,15] Some behavioural and socio-demographic factors such as gender, age, and socio-economic status, psychosocial and psychological factors, self-restraint, self-esteem, relationship with parents, peers, and the orthodontist have been found to affect compliance in adolescents.[9,14,15] General and health-related issues have also been found to influence the level of compliance in adolescent patients in several ways.[14-17] To improve patient's compliance during orthodontic treatment, Richter et al[1] reported that the award/reward system may help motivate individuals who are in the below-average complier group to comply with prescribed instructions.

Therefore, this study aimed to investigate the oral health behaviour and some socio-demographics that may militate against effective compliance to fixed orthodontic appliance treatment among Nigerian adolescents. The study also examined the relationship between patient/ parent and the orthodontist during the treatment period.

The Null hypothesis was that in this study , there are no significant gender differences in negative oral health behaviour, no significant differences in socio-demographics, and patient/ parent-orthodontist relationship between the compliant and non-compliant groups.

Materials and Methods

Ethical approval with protocol number IPHOAU/12/599U was obtained from the Health Research Ethics Committee (HERC) of the Institute of Public Health, Obafemi Awolowo University, Ile-Ife, Nigeria. Informed consent was obtained from the participants before enrolment, after duly explaining the objectives of the study, the risks and benefits, voluntary nature of study participation, and freedom to withdraw from the study. For those younger than 18 years, parental consent was sought after obtaining the subject's assent. Participants in this study experienced no direct benefit and no compensation was paid to them.

Permission to conduct the study was obtained from each local hospital authority. The participants were randomly drawn from the orthodontic clinics of three Nigerian teaching hospitals at Ile-Ife (low-density population-280 persons/km^2), Ibadan (medium density population-985 persons/km^2) and Lagos (high density population-14,469 persons/km^2). Strict ethical standards and procedures were adhered to in administering the questionnaires. Participants' confidentiality was guaranteed by excluding identification numbers on the questionnaire so that information would not be traced back to individuals.

The inclusion criterion was patients aged 10-19 years undergoing fixed orthodontic appliance treatment. The exclusion criteria were previous orthodontic treatment and lack of consent to participate in the study.

A pre-structured self-administered questionnaire consisting of twenty-eight questions in two domains with multiple answers (yes/no) was used to assess the compliance of adolescent patients receiving fixed orthodontic appliance treatment in which the subjects were asked to tick one correct answer. The first domain assessed the oral health behaviour and the level of compliance to instructions during treatment. Second domain consisted of questions on the level of interaction of the patient with the orthodontist.

Data was entered into a personal computer and analysis was performed using Statistical Package for Social Science. (SPSS Version 16.0 for windows, SPSS inc, Chicago). Simple descriptive and inferential statistics were used for the analysis.

Results

A total of 146 adolescents currently undergoing orthodontic treatment were recruited in the study. There were 72 (49.3%) males and 74 (50.3%) females. The mean age of respondents was 14.7±2.5 years with ages ranging from 10 to 19 years, while their mean orthodontic treatment time was 16.4±12.4 months, ranging from 1 to 70 months.

Table 1 demonstrates the socio-demographic distribution of the 146 adolescent patients who participated in the study. Most of the respondents (61.6%) were young adolescents between the ages of

10 and 15 years, while the remaining 38.4% were older adolescents aged 16-19 years. There was no significant gender difference among respondents in the sample population.

Furthermore, most of the respondents (80.1%) belonged to families with more than three siblings, while about one-fifth (19.9%) of the families had three or fewer children. Most of the adolescents (63.0%) were in the middle position amongst the siblings and more than half had at least secondary school education (77.4%). Over 90% of respondents' parents (both fathers and mothers) had tertiary education. The adolescents from the low population density of Ile-Ife city constituted 42.5 percent of the respondents, while the least was from the medium population density of Ibadan city (19.9%). Only about one-third were from the high population density of the cosmopolitan city of Lagos. Also, about two-thirds of the respondents had been on treatment for 18 months or less.

Negative oral health and social behaviour detrimental to fixed orthodontic appliance treatment according to gender are presented in Tables 2 and 3. More female patients (73.0%) frequently indulged in chewing sticky sweets detrimental to good oral health behaviour than their male counterparts (50.0%) during the treatment and this was statistically significant ($p<0.05$). Similarly, more male adolescents (70.8%) were involved in contact sports during fixed orthodontic appliance treatment than their female counterparts (33.8%). The difference was also found to be quite significant statistically ($p<0.001$). Interestingly, the only three adolescent smokers reported in this study were all males.

The relationship between compliance during fixed orthodontic appliance treatment and socio-demographic characteristics is presented in Table 4. Generally, the majority of respondents in the sample population (73.3%) were compliant with treatment instructions during the treatment period. There were no significant differences in compliance regarding age group, gender, number and position of patient in the family, as well as patients' and fathers' educational levels. However, mother's educational level ($p<0.05$), population density of the city where the dental clinic is located ($p<0.001$), and the length of treatment time ($p<0.05$) influenced fixed orthodontic treatment compliance significantly.

Table 5 shows patient/parent-orthodontist relationship and the level of compliance to fixed orthodontic appliance treatment. More of the compliant group personally liked their orthodontist when compared to the non-compliant group. This difference was statistically significant ($p<0.05$). Similarly, all the compliant adolescent patients were fully aware of the consequences of poor compliance to fixed orthodontic treatment outcomes when compared to the 92.3 per cent of the non-compliant group. This was also found to be very highly statistically significant ($p<0.001$).

Previous discussion of treatment goals with parents of patients before embarking on fixed orthodontic appliance therapy had a highly significant impact on compliance to treatment ($p<0.01$).

Table 1: Socio-demographic variables of Nigerian adolescents undergoing fixed orthodontic appliance treatment

	Variables	Frequency	Percentage
Age (years)			
	10-15 (young adolescents)	90	61.6
	16-19 (older adolescents)	56	38.4
Gender			
	Male	72	49.3
	Female	74	50.7
Number of children in the family	≤3	29	19.9
	>3	117	80.1
Position in the family			
	First	30	20.5
	Middle	92	63.0
	Last	24	16.5

Variables		Frequency	Percentage
Patient's educational level			
	Primary	4	2.7
	Secondary	113	77.4
	Tertiary	29	19.9
Father's educational level			
	Primary	5	3.4
	Secondary	6	4.1
	Tertiary	135	92.5
Mother's educational level			
	Primary	7	4.8
	Secondary	7	4.8
	Tertiary	132	90.4
Location			
	Low population density (Ile-Ife)	62	42.5
	Medium population density (Ibadan)	29	19.9
	High population density (Lagos)	55	37.6
Length of orthodontic treatment (months)			
	≤ 18	99	67.8
	> 18	47	32.2

Table 2: Oral health behaviour detrimental to fixed orthodontic appliance treatment according to gender

Oral habit during treatment		Male(%)	Female(%)	x^2	p-value
Brushing less than twice a day					
	Yes	18(46.2)	54(50.5)		
	No	21(53.8)	53(49.5)	0.21	0.65
Digit sucking					
	Yes	9(12.5)	14(18.9)		
	No	63(87.5)	60(81.1)	1.13	0.29
Finger nail biting					
	Yes	12(16.7)	20(27.0)		
	No	60(83.3)	54(73.0)	2.29	0.13
Tongue thrusting habit					
	Yes	11(15.3)	13(17.6)		
	No	61(84.7)	61(82.4)	0.14	0.72
Biting on pen/pencil					
	Yes	11(15.3)	14(18.9)		
	No	61(84.7)	60(81.1)	0.34	0.56
Frequent chewing of sticky sweets					
	Yes	36(50.0)	50(73.0)		
	No	36(50.0)	24(27.0)	4.65	0.03*
Frequent chewing of gum					
	Yes	36(50.0)	28(37.8)		
	No	36(50.0)	46(62.2)	2.19	0.14

Oral habit during treatment		Male(%)	Female(%)	x^2	p-value
Eating hard food stuff					
	Yes	53(73.6)	54(73.0)		
	No	19(26.4)	20(27.0)	0.01	0.93
Eating in-between meals					
	Yes	52(45.6)	20(62.5)		
	No	62(54.4)	12(37.5)	2.85	0.09
Eating late at night					
	Yes	36(50.0)	39(52.7)		
	No	36(50.0)	35(47.3)	0.11	0.74

* significant p<0.05; **highly significant p<0.01; ***very highly significant p<0.001

Table 3: Negative social behaviour during fixed orthodontic appliance treatment according to gender

Habits during treatment		Male(%)	Female(%)	x^2	p-value
Smoking					
	Yes	3(4.2)	0(0.0)		
	No	69(95.8)	74(100.0)	3.15	0.08
Not keeping appointment					
	Yes	17(23.6)	23(31.1)		
	No	55(76.4)	51(68.9)	1.02	0.31
Play with braces					
	Yes	11(15.3)	20(27.0)		
	No	61(84.7)	54(73.0)	3.01	0.08
Involvement in contact sport					
	Yes	51(70.8)	25(33.8)		
	No	21(29.2)	49(66.2)	20.07	0.00***
Scare/intimidate children with braces					
	Yes	16(22.2)	16(21.6)		
	No	56(77.8)	58(78.4)	0.01	0.93
Brawl/fight with braces					
	Yes	27(37.5)	23(31.1)		
	No	45(62.5)	51(68.9)	0.67	0.41

* significant p<0.05; **highly significant p<0.01; ***very highly significant p<0.001

Table 4: Relationship between compliance during fixed orthodontic appliance treatment and socio-demographic characteristics

Variables	Compliance(%)	Non-compliance(%)	x^2	p-value
Age (years)				
10-15 (young adolescents)	64(59.8)	26(66.7)		
16-19 (older adolescents)	43(40.2)	13(33.3)	0.57	0.45
Gender				
Male	53(49.5)	19(48.7)		
Female	54(50.5)	20(51.3)	0.01	0.93
Number of children in the family				
≤ 3	17(15.9)	12(30.8)		
> 3	90(84.1)	27(69.2)	3.98	0.05

Variables	Compliance(%)	Non-compliance(%)	x^2	p-value
Position in the family				
First	22(20.6)	8(20.5)		
Middle	71(66.4)	21(53.9)	3.45	0.18
Last	14(13.0)	10(25.6)		
Patient educational level				
Primary	3(2.8)	1(2.6)		
Secondary	85(79.4)	28(71.8)	1.12	0.57
Tertiary	19(17.8)	10(25.6)		
Father's educational level				
Primary	2(1.9)	3(7.7)		
Secondary	3(2.8)	3(7.7)	4.85	0.09
Tertiary	102(95.3)	33(84.6)		
Mother's educational level				
Primary	3(2.8)	4(10.3)		
Secondary	3(2.8)	4(10.3)	7.32	0.03*
Tertiary	101(94.4)	31(79.4)		
Location				
Low density population (Ile-Ife)	56(52.3)	6(15.4)		
Medium density population (Ibadan)	17(15.9)	12(30.8)	16.07	0.00***
High density population (Lagos)	34(31.8)	21(53.8)		
Length of orthodontic treatment time (months)				
≤18	78(72.9)	21(53.8)		
>18	29(27.1)	18(46.2)	4.75	0.03*

* significant p<0.05; **highly significant p<0.01; ***very highly significant p<0.001

Table 5: Patient/parent-orthodontist relationship and compliance to fixed orthodontic appliance treatment

Relationship		Compliance(%)	Non-compliance(%)	x^2	p-value
Patient liked the orthodontist					
	Yes	72(67.3)	19(48.7)		
	No	35(32.7)	20(51.3)	4.20	0.04*
Awareness of consequences of poor compliance by patient					
	Yes	107(100.0)	36 (92.3)		
	No	0(0.0)	3(7.7)	8.40	0.00***
Discipline/sanction of patient by parent for poor compliance					
	Yes	59(55.1)	23(59.0)		
	No	48(44.9)	16(41.0)	0.17	0.68
Possible sanction of patient in form of additional charges/fees for poor compliance					
	Yes	45(42.1)	17(43.6)	0.03	0.87
	No	62(57.9)	22(56.4)		
Orthodontist discussed treatment goals with patient before treatment					
	Yes	101(94.4)	34(87.2)	2.14	0.14
	No	6(5.6)	5(12.8)		
Orthodontist discussed treatment goals with parent before treatment					
	Yes	99(92.5)	30(76.9)	6.76	0.00**
	No	8(7.5)	9 (23.1)		

Discussion

Generally, a successful orthodontic treatment outcome requires that patients be guided by recommended instructions, including maintenance of good oral hygiene behaviour, adherence to healthy dietary advice, and compliance with appointment time during the course of treatment. This study primarily set out to assess the oral health behaviour, relationship of stakeholders and socio-demographic factors that may influence compliance to fixed orthodontic appliance therapy and not necessarily the treatment outcome. The findings of this study clearly indicate a very good compliance to fixed orthodontic appliance treatment which is a weak link in the chain between a good treatment plan and a successful treatment outcome. [18]

The non-compliant behaviour of about one-quarter of adolescents in this sample may be as a result of a number of factors which include failure to show up for appointment due to forgetfulness, transportation difficulties and other socio-economic commitments. [19-21]

Normally, the placement of orthodontic appliances can bring about a number of changes in the oral environment leading to high concentrations of acid producing bacteria resulting from the difficulty in performing effective oral hygiene. The deleterious effects on the oral health become pronounced if proper oral health behaviour is not adopted. In this study, various negative oral health practices and social behaviour were reported. As expected, the frequent chewing of sticky sugary sweets by female patients has a tendency to make the teeth prone to dental caries. More male adolescents' involvement in contact sports on the other hand may have a serious damaging effect on the appliances if mouth guards are not used to protect them. In a cultural environment like Nigeria, teenage smoking is uncommon. It is therefore not surprising that the only three reported cases of smoking during fixed appliance treatment in this population were recorded in the male patients. All these practices and oral health behaviour may be socio-culturally related and the social role of gender in this society cannot be over emphasized.

With respect to the role of gender in orthodontic compliance, this present study did not observe any gender predilection. This is consistent with previous studies that found no gender difference in various aspects of orthodontic cooperation. [22-25] However, some other studies have reported more girls' cooperation during orthodontic treatment. [26-28]

Surprisingly, adolescent age grouping in this study did not show any significant difference in orthodontic compliance but generally, adolescents are known to be less compliant than the younger children. [17,23,24] This is probably due to the fact that younger patients are more obedient to their parents than the adolescents. This is however in contrast with other reports that found no association between age and level of orthodontic compliance. [1,6] This lack of association could well be due to the confounding effect of psychological changes and development often associated with adolescent patients.

Again, some of the socio-demographic factors reported in this study did not demonstrate any significant relationship with compliance to orthodontic treatment. Graber, [16] however, found that patients belonging to families in the higher socio-economic category had higher levels of compliance due to the importance they placed on good dental appearance for social and professional achievement. In contrast, Dorsey and Korabik [29] reported that patients belonging to families categorized in the low and middle socio-economic class were more compliant than their counterparts from the high socio-economic status because they had more appreciation of orthodontic treatment, greater social ambition and recognition needs, and better child-parent relationship. Hulka, [30] in a report on compliance in health care found that age, sex, marital status, education, family size, and social class were not significantly related to compliance. Similarly, Sergel et al., [31] in another study reported no relationship between parental occupational status and patient's compliance with orthodontic instructions. Given the inconsistencies reported in literature about these studies, socio-demographic factors such as age, gender, and socio-economic status alone may not be reliable to predict orthodontic compliance. However, some interesting findings in the present study demonstrated that mother's educational level, population density of the city where the dental clinic is located, and the length of treatment time influenced patient compliance to treatment greatly. Albino et al [9] examined the cooperation of 39 adolescent orthodontic patients 8 to 10 months into treatment and at completion. They reported that parents' positive attitude towards treatment significantly predicted patient's compliance. There is no gainsaying that mothers' role, especially the educated ones, contribute significantly to the development of their children, hence, influencing their decision on matters affecting orthodontic treatment.

Compliance to treatment in this study was found to be at its best in the low population density area of Ile-Ife. This may probably be due to much reduced traffic congestion on roads and other transportation difficulties that are often encountered by patients in order to meet regular orthodontic appointments. It was also observed from this study that the longer the length of treatment, the lower the compliance level. Ordinarily, treatment that should last for an average of 18 to 24 months, when prolonged as a result of several factors may lead to frustration for the patient and/ or parent(s), hence reduced compliance, and in some cases leading to non-completion of treatment. In orthodontic literature, it has been reported that the rates of discontinuation of orthodontic treatment vary greatly from 4 to 42 per cent. [32,33]

The impact of interpersonal relationship between patient/parent and the orthodontist cannot be overemphasized. Nanda et al [14] concluded that the relationship between the patient and the orthodontist was a very strong predictor of compliance amongst patients. Therefore, the way the orthodontist perceives his/her relationship with the patient and the establishment of an effective rapport early in the treatment has a beneficial effect on future compliance. [15] The importance of this interaction is further supported by this study. Other interactions between the patient/parent and the orthodontist for the purpose of educating the patients on the consequences of poor compliance and a good discussion on treatment goals with the parents before embarking on orthodontic treatment were found to improve compliance significantly.

Conclusion

In conclusion, this study submits that gender affects oral health behaviour during orthodontic treatment. Mother's level of education, awareness of deleterious effects of treatment, duration of orthodontic treatment, and²patient/parent-orthodontist relationship significantly influence compliance to fixed orthodontic appliance therapy.

Authors' Contributions

Conceived and designed by: ODO. All the other authors contributed substantially to data collection, analysis, and write-up. All authors approved the final manuscript.

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Conflict of Interest

None declared

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Appendix 1

QUESTIONNAIRE ON ORAL HEALTH BEHAVIOUR, LEVEL OF COMPLIANCE WITH PROFESSIONAL ETIQUETTE AMONG PATIENTS UNDERGOING FIXED ORTHODONTIC APPLIANCES TREATMENT. AGE RANGE (10 – 19yrs).

AGE ☐ ***SEX*** ☐ ***FAMILY SIZE*** ☐ ***POSITION IN FAMILY*** ☐

EDUCATIONAL LEVEL: TERTIARY ☐ ***SECONDARY*** ☐ ***PRIMARY*** ☐

EDUCATIONAL LEVEL OF FATHER : TERTIARY ☐ ***SECONDARY*** ☐ ***PRIMARY*** ☐

EDUCATIONAL LEVEL OF MOTHER: TERTIARY ☐ ***SECONDARY*** ☐ ***PRIMARY*** ☐

Mark like this ☑

1. How long have you been on fixed orthodontic appliances treatment? ☐ months.
2. Interaction between you and your dentist concerning your treatment. Good ☐ Poor ☐
3. Interaction between your parents and your dentist concerning your treatment. Good ☐ Poor ☐

ORAL HEALTH BEHAVIOUR S DURING TREATMENT.

4. How many times do you brush in a day? once ☐ twice or more ☐
5. Are you involved in thumb or digit sucking during treatment? Yes ☐ No ☐
6. Are you involved in fingernail biting during treatment? Yes ☐ No ☐
7. Are you involved in tongue thrusting during treatment? Yes ☐ No ☐
8. Do you chew pen/pencil during treatment? Yes ☐ No ☐
9. Do you take sticky sweets during treatment? Yes ☐ No ☐
10. Do you chew gums during treatment? Yes ☐ No ☐
11. Do you always follow your dentist instructions and also come to the clinic at the appointed day and time? Yes ☐ No ☐
12. Have you ever been involved in smoking during treatment? Yes ☐ No ☐
13. Do you eat the following hard foods during treatment? Hard corn ☐ nuts ☐ hard plantain ☐ fried yam ☐ fried meat ☐ Apple ☐ Carrot ☐
14. Do you often play with your braces? Yes ☐ No ☐
15. Are you involved in contact sports during treatment? Yes ☐ No ☐
16. If yes, which of the following do you always play? football Basketball Volleyball Handball Boxing Wrestling
17. Do you show off braces to scarce young children? Yes ☐ No ☐
18. Do you eat in-between meals during treatment? Yes ☐ No ☐
19. Do you eat late at night during treatment? Yes ☐ No ☐
20. Have you ever involved in fight/brawl with your neighbour or a colleague in school during the fixed appliance treatment Yes ☐ No ☐

CONCERNING YOUR DENTIST DURING TREATMENT

21. Do you understand your dentist advice/instructions during the course of the treatment? Yes ☐ No ☐
22. Did your dentist educate you on the consequences of poor compliance to the treatment? Yes No
23. Did your dentist discuss treatment goals with you at the beginning of treatment ? Yes ☐ No ☐
24. Did your dentist discuss treatment goals with your parents? Yes ☐ No ☐
25. Do you personally like the dentist who is currently treating you? Yes ☐ No ☐
26. Are your parents aware of the consequence of poor compliance to treatment? Yes ☐ No ☐
27. Has your parents disciplined or threatened to discipline you for poor cooperation with treatment? Yes ☐ No ☐
28. Has your dentist threatened to sanction you or ever scolded you or charged additional fees for poor compliances? Yes ☐ No ☐