

Periodontal Status And Oral Hygiene Compliance Of Orthodontic Patients In A Tertiary Hospital in South-South Nigeria

Research Article

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Abstract

Introduction: The attachment of fixed orthodontic appliances to the teeth require rigorous oral hygiene efforts in order to maintain the good oral hygiene that is needed to prevent periodontal disease. The use of correct toothbrushing technique, frequency and duration as well as self-motivation of the patients to embrace good oral hygiene practices are keys to having healthy periodontium during orthodontic treatment. The aim of this study was to assess the knowledge of and attitude towards maintenance of good oral hygiene practices and the periodontal status of patients undergoing orthodontic treatment in a Teaching Hospital in South-South, Nigeria.

Methods: This study was carried out on the 77 orthodontic patients who attended the out-patient orthodontic clinic in University of Port Harcourt Teaching Hospital Dental Centre between January 2021 and May 2021. Data was collected using an interviewer administered questionnaire after which an intra-oral and periodontal examination of each participant was carried out.

Results: Participants majorly brushed their teeth twice a day (56,72.7%) using the horizontal toothbrushing method (28,36.4%) whilst about a quarter (20, 26.0%) brushed more than twice a day. Gingivitis was present in almost all the participants (68, 88.3%) ($p=0.023$). The duration of orthodontic treatment affected the oral hygiene status of the studied participants ($p=0.034$).

Conclusion: Adolescents, female participants and those on less than 18 months of orthodontic treatment had better mean plaque and oral hygiene indices. The participants were not meticulous in plaque control and did not seem to realize the effect of their orthodontic appliances on their periodontal health.

Keywords: Periodontal Status; Orthodontic Patients; Oral Hygiene Status; Rivers State; Nigeria.

Introduction

Orthodontic appliances have been said to cause changes in the periodontium.[1] The treatment of malocclusion has been documented to result in improved facial and dental aesthetics as well as oral function and this ultimately has a positive impact on patients' quality of life.[2] The correction of malocclusion is carried out with the use of both fixed and removable orthodontic appliances that produce forces which are essential for orthodontic tooth movement and also induce inflammatory changes in the periodontium.[3, 4]

The attachment of fixed orthodontic appliances to the teeth require rigorous oral hygiene efforts in order to maintain the good oral hygiene that is needed to prevent periodontal disease. [5] Studies conducted on patients with fixed orthodontic appliances reported an increase in plaque, calculus and gingivitis. [6] Also, orthodontic patients have been known to complain of various periodontal problems including plaque and calculus accumulation, gingival bleeding and gingival enlargement. [7] Thus, it has been advocated that orthodontists should aim to finish orthodontic treatment with the least deleterious effects on the

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periodontium.[8]

The changes in the periodontium may be due to the treatment technique as well as the fact that orthodontic appliances increase the surface area for retention of dental plaque and thus require more dexterity to maintain good oral hygiene which may be difficult or too time consuming for the patients. [9, 10] Hence, prior to commencement of orthodontic treatment, it is important to give all patients adequate instructions on the importance of the maintenance of good oral hygiene as well as teach them the correct brushing technique that can help them achieve this throughout the treatment period. [11]

Multiple reasons have been attributed to poor oral hygiene and periodontal disease in orthodontic patients and these include the non-compliance of patients to given instructions, lack of knowledge or lack of cooperation and motivation. [12, 13] The use of correct toothbrushing technique, frequency and duration as well as self-motivation of the patients to embrace good oral hygiene practices are keys to having healthy periodontium during orthodontic treatment.

Therefore, the aim of this study was to assess the knowledge of and attitude towards maintenance of good oral hygiene, oral hygiene practices as well as the periodontal status of patients undergoing orthodontic treatment in a Teaching Hospital in South-South, Nigeria.

Materials and Methods

This was a descriptive cross-sectional study carried out on all consenting orthodontic patients who attended the out-patient orthodontic clinic in University of Port Harcourt Teaching Hospital Dental Centre between January 2021 and May 2021. Data was collected using an interviewer administered questionnaire which was modified from a previous study [13] after which an intra-oral and periodontal examination of each participant was carried out by the authors. The questionnaire captured the socio-demographic details of participants, the duration of fixed orthodontic appliance therapy, oral hygiene practices and attitude of patients as well as the awareness and knowledge of the need to maintain good oral health during orthodontic treatment.

Oral hygiene practice questions included frequency, technique and duration of toothbrushing as well as use of auxiliaries.

The attitude of the patients was assessed with four questions relating to the importance of obeying the instructions given to them by the orthodontist as well as the importance of brushing their teeth regularly and keeping their appointments with their orthodontist regularly. Negative answers were scored as 0 and positive answers 1. Consequently the participants were grouped into those with a negative attitude (Score 0-2) and positive attitude (Score 3-4).

The five questions about awareness of their periodontal health (Do you have bad breath, bleeding or itching gums?) were scored as follows: “yes”=2, “no”=1 and “I do not know”=0. Level of awareness was scored as follows: high level of awareness (average score 8-10), moderate level of awareness (average score 5-7), low level of awareness (average score 1-4) and no awareness (score 0). The eleven questions about knowledge of periodontal health and the effect of fixed orthodontic appliance therapy on the periodontium were scored as follows: Correct answer=1, incorrect answer=0.

The periodontal examination performed on the patients assessed the absence or presence of gingivitis, gingival bleeding using the plaque index of Silness and Loe as well as mouth cleanliness by simplified oral hygiene index (OHI-S). The data collected was analyzed using SPSS version 21 (IBM SPSS Armonk, New York) and presented as frequencies and percentages.

Results

A total of 77 patients with an age range of 9 to 35 years and mean age of 16.3+ 5.7 years participated in this study. There was a slight female preponderance [females 41 (53.2%), males 36 (46.8%)] with F:M ratio of 1:1.14. Majority of participants had secondary education 29 (37.7%) and were Rivers State indigenes (Ijaw tribe). Socio-demographic details as shown in Table 1.

Table 2 depicts the oral hygiene practices of the participants. Majority brushed their teeth twice a day (56,72.7%) and used the horizontal toothbrushing method (28,36.4%) whilst about a quarter (20, 26.0%) brushed more than twice a day. Dental floss and

Table 1. Socio-demographic details of participants.

Variables		N	%
Age (years)	0-9	4	5.2
	10-19	61	79.2
	>20	12	15.6
Gender	Male	36	46.8
	Female	41	53.2
Level of education	Primary	8	10.4
	Secondary	29	37.7
	Tertiary	24	31.2
	Postgraduate	16	20.8
Tribe	Ijaw	45	58.4
	Igbo	21	27.3
	Yoruba	11	14.3
Total		77	100

toothpicks were the common auxiliaries used. More participants accessed dental care more after placement of fixed appliances.

Majority of participants did not have tooth stains, halitosis or painful, itching and bleeding gums as seen in Table 3.

Majority of adolescents, females and those who had been in treatment for more than 18 months had a high awareness of their periodontal health as seen in Table 4. More than half of the participants had some knowledge of oral health which they acquired from their dentists as depicted in Table 5a. Majority of respondents did not know what plaque is or its aetiology. They were also not aware of the effect of fixed orthodontic appliances on their periodontal health. The adolescent patients had a better knowledge of what plaque is (20, 33.9%) than the adult patients

(3,16.7%) but majority of them did not know what it causes (52, 88.1%). The participants did not seem to realize the effect of braces on their periodontal health as detailed in Table 5b. The participants had a positive attitude towards instructions given to them by the orthodontist (Table 6a) majorly among adolescents, female patients and those that had been in treatment for more than 18 months. (Table 6b) All adults had a positive attitude.

Table 7 shows the clinical findings of the participants. Gingivitis was present in almost all the participants (68, 88.3%) which was statistically significant ($p=0.023$). The means for Plaque Index, Gingival Bleeding Index, Oral Hygiene Index and presence or absence of gingivitis are displayed in Table 7. The duration of orthodontic treatment affected the oral hygiene status of the studied participants ($p=0.034$). There were almost equal numbers

Table 2. Oral hygiene practices of the participants.

Oral hygiene practices		N	(%)
Frequency of brushing	1/day	1	(1.3)
	2/day	56	(72.7)
	>2/day	20	(26)
Duration of toothbrushing	<3mins	26	(33.8)
	3-5mins	47	(61.0)
	>5mins	4	(5.2)
Type of toothbrush	Ortho brush	11	(14.3)
	Ordinary brush	66	(85.7)
Method of brushing	Bass	9	(11.7)
	Horizontal	28	(36.4)
	Vertical	26	(33.8)
	Others	14	(18.2)
Use of auxiliary aids	No	35	(45.5)
	Yes	42	(54.5)
Type of auxiliary aids	Floss	14	(33.3)
	Interdental brush	7	(16.7)
	Mouthwash	9	(21.4)
	Toothpick	12	(28.6)
Regular dental visit before fixed appliance	No	46	(59.7)
	Yes	31	(40.3)
Regular dental check after fixed appliance	No	17	(22.1)
	Yes	60	(77.9)
Total		77	(100.0)

Table 3. Participants subjective awareness of periodontal health.

Variable	N	%
Stains	No	39 (50.6)
	Yes	18 (23.4)
	Do not know	20 (26.0)
Halitosis	No	73 (94.8)
	Yes	4 (5.2)
Gum itching	No	75 (97.4)
	Yes	2 (2.6)
Painful gum	No	66 (85.7)
	Yes	11 (14.3)
Bleeding gum	No	59 (76.6)
	Yes	18 (23.4)

Table 4. Level of periodontal awareness among participants according to age, gender and duration of orthodontic treatment.

	Awareness			
	High		Moderate	
	n	%	n	%
Age				
Adolescent	42	-73.7	17	-85
Adult	15	-26.3	3	-15
	(X2 = 1.06; P = 0.304)			
Sex				
Male	25	-43.9	11	-55
Female	32	-56.1	9	-45
	(X2 = 0.74; P = 0.390)			
Duration Of Treatment				
<18	18	-31.6	13	-65
>18	39	-68.4	7	-35
	(X2 = 6.88; P = 0.009)			

Table 5a. Knowledge of participants on the effect of fixed orthodontic appliances on periodontal health.

		N	%
Do you have oral/gum health knowledge	No	28	-36.4
	Yes	49	-63.6
Source of knowledge	Dentists	30	-61.2
	School	11	-22.4
	Leaflet	4	-8.2
	Media	3	-6.1
	Books	1	-2
What is plaque?	Soft deposits	23	-29.9
	Hard deposits	17	-22.1
	Stains	7	-9.1
	Don't know	30	-39
Plaqueaetiology?	Malformation	9	-11.7
	Discoloration	10	-13
	Gum disease	21	-27.3
	Don't know	37	-48.1
What does bleeding gum mean?	Healthy gum	1	-1.3
	Inflamed gum	49	-63.6
	Gum recession	3	-3.9
	Don't know	24	-31.2
How to prevent gum disease	Brushing and flossing	56	-72.7
	Soft diet	2	-2.6
	Taking Vit C	10	-13
	Don't know	9	-11.7
Can braces cause gum problems?	No	26	-33.8
	Yes	28	-36.4
	Don't know	23	-29.9
Can braces increase gum bleeding?	No	26	-33.8
	Yes	23	-29.9
	Don't know	28	-36.4
Can braces make brushing difficult?	No	20	-26
	Yes	39	-50.6
	Don't know	18	-23.4
Can braces cause severe pain?	No	33	-42.9
	Yes	28	-36.4
	Don't know	16	-20.8
Are straight teeth easier to clean?	No	10	-13
	Yes	43	-55.8
	Don't know	24	-31.2

Table 5b. Periodontal knowledge among orthodontic patients according to age, gender and duration of treatment.

	Age				Sex				Duration of treatment			
	Adolescent		Adult		Male		Female		< 18 months		≥ 18 months	
	N	%	N	%	N	%	N	%	N	%	N	%
What is dental plaque?												
Correct answer	20	(33.9)	3	(16.7)	14	(38.9)	9	(22.0)	9	(29.0)	14	(30.4)
Incorrect answer	39	(66.1)	15	(83.3)	22	(61.1)	32	(78.0)	22	(71.0)	32	(69.6)
	(X ² = 1.95; P = 0.162)				(X ² = 2.63; P = 0.105)				(X ² = 0.17; P = 0.895)			
What can dental plaque cause?												
Correct answer	7	(11.9)	2	(11.1)	2	(5.6)	7	(17.1)	7	(22.6)	2	(4.3)
Incorrect answer	52	(88.1)	16	(88.9)	34	(94.4)	34	(82.9)	24	(77.4)	44	(95.7)
	(X ² = 0.01; P = 0.931)				(X ² = 2.46; P = 0.117)				(X ² = 5.96; P = 0.015)*			
What does bleeding gum mean?												
Correct answer	37	(62.7)	12	(66.7)	19	(52.8)	30	(73.2)	20	(64.5)	29	(63.0)
Incorrect answer	22	(37.3)	6	(33.3)	17	(47.2)	11	(26.8)	11	(35.5)	17	(37.0)
	(X ² = 0.09; P = 0.760)				(X ² = 3.45; P = 0.063)				(X ² = 0.02; P = 0.895)			
How to prevent gum disease												
Correct answer	43	(72.9)	13	(72.2)	28	(77.8)	28	(68.3)	18	(58.1)	38	(82.6)
Incorrect answer	16	(27.1)	5	(27.8)	8	(22.2)	13	(31.7)	13	(41.9)	8	(17.4)
	(X ² = 0.01; P = 0.956)				(X ² = 0.87; P = 0.351)				(X ² = 5.63; P = 0.018)*			
Can braces cause gum problems?												
Correct answer	19	(32.2)	9	(50.0)	11	(30.6)	17	(41.5)	9	(29.0)	19	(41.3)
Incorrect answer	40	(67.8)	9	(50.0)	25	(69.4)	24	(58.5)	22	(71.0)	27	(58.7)
	(X ² = 1.88; P = 0.169)				(X ² = 0.98; P = 0.321)				(X ² = 1.21; P = 0.272)			
Can braces increase gum bleeding?												
Correct answer	13	(22.0)	10	(55.6)	7	(19.4)	16	(39.0)	7	(22.6)	16	(34.8)
Incorrect answer	46	(78.0)	8	(44.4)	29	(80.6)	25	(61.0)	24	(77.4)	30	(65.2)
	(X ² = 7.40; P = 0.007)				(X ² = 3.51; P = 0.061)				(X ² = 1.32; P = 0.251)			
Can braces make brushing difficult?												
Correct answer	28	(47.5)	11	(61.1)	15	(41.7)	24	(58.5)	16	(51.6)	23	(50.0)
Incorrect answer	31	(52.5)	7	(38.9)	21	(58.3)	17	(41.5)	15	(48.4)	23	(50.0)
	(X ² = 1.03; P = 0.310)				(X ² = 2.18; P = 0.140)				(X ² = 0.02; P = 0.890)			
Can braces cause severe pain?												
Correct answer	20	(33.9)	8	(44.4)	9	(25.0)	19	(46.3)	11	(35.5)	17	(37.0)
Incorrect answer	39	(66.1)	10	(55.6)	27	(75.0)	22	(53.7)	20	(64.5)	29	(63.0)
	(X ² = 0.66; P = 0.416)				(X ² = 3.77; P = 0.052)				(X ² = 0.02; P = 0.859)			
Are straight teeth easier to clean?												
Correct answer	34	(57.6)	9	(50.0)	17	(47.2)	26	(63.4)	14	(45.2)	29	(63.0)
Incorrect answer	25	(42.4)	9	(50.0)	19	(52.8)	15	(36.6)	17	(54.8)	17	(37.0)
	(X ² = 0.33; P = 0.568)				(X ² = 2.04; P = 0.153)				(X ² = 2.40; P = 0.121)			

of participants that had gingivitis, however amongst participants where gingivitis was absent, there was a significantly higher proportion of females (8, 88.9%). P=0.023.

Discussion

Our study yielded valuable information about knowledge and attitude of orthodontic patients towards maintenance of good oral hygiene as well as the periodontal findings in those undergoing orthodontic treatment in a Teaching Hospital in South-South, Ni-

geria.

There were slightly more females than males that sought orthodontic treatment in this study which is consistent with other reports. [5, 14, 15] This has been attributed to the fact that women are generally more concerned about their appearance, especially aesthetics than men. [16]

The oral hygiene protocol for orthodontic patients involves brushing after each meal, however many of the patients in this

Table 6a. Participants' attitude to oral hygiene instructions given after fixed orthodontic treatment.

Attitudes	N	%
Oral hygiene instruction is important		
No	4	5.2
Yes	69	89.6
Don't know	4	5.2
Important to follow advice		
No	2	2.6
Yes	72	93.5
Don't know	3	3.9
Important to brush after wearing braces		
No	1	1.3
Yes	69	89.6
Don't know	7	9.1
Regular visit contributes to good gum health		
No	3	3.9
Yes	68	88.3
Don't know	6	7.8

Table 6b. Participants' attitude to oral hygiene instructions given after fixed orthodontic treatment versus some demographics.

	Attitude			
	Positive (3-4)		Negative (0-2)	
	n	%	n	%
Age				
Adolescent	54	-75	5	-100
Adult	18	-25	0	0
	(X ² = 1.63; P = 0.202)			
Gender				
Male	35	-48.6	1	-20
Female	37	-51.4	4	-80
	(X ² = 1.54; P = 0.215)			
Duration Of Treatment				
<18	29	-40.3	2	-40
>18	43	-59.7	3	-60
	(X ² = 0.00; P = 0.990)			

Table 7. Participants' periodontal indices versus age, gender and duration of treatment.

	Plaque index Mem (SD)	OHIS Mem (SD)	Gingival Bleeding Index Mem (SD)	Gingivitis	
				Prement	Abvent
Age				N %	N %
Adolescent	1.15 (0.57)	143 (0.65)	2252 (14.65)	52 (76.5)	7 (77.8)
Adult	1.2% (0.89)	158 (0.79)	1698 (9.70)	16 (29.5)	2 (22.2)
	p=0.470	P=0.004	p=0.137		
Gender					
Male	1.29 (0.65)	160 (0.79)	2247 (19.76)	95 (51.5)	1 (11.1)
Female	1.14 (0.59)	1.42 (0.69)	20.12 (19.91)	98 (485)	3 (23.9)
	0.536	P=0.263	p=0.459		
Duration of treatment					
<18 month	1.06 (0.59)	1.90 (0.69)	2223 (10.79)	27 (99.7)	4 (44.4)
>18 month	1.26 (0.69)	164 (0.65)	2054 (15.58)	41 (60%)	5 (55.6)
	p=0.151	p=0.034*	p=0.577	(x ² =0.07;P=0785)	

study brushed just twice daily which is comparable to results obtained in an earlier study with similar participants where very few remembered to brush after every meal. [17] This report is also consistent with findings in Nigeria as well as other countries where majority of patients brushed twice daily in the morning and before bedtime. [5, 6, 18, 19] This behaviour depicted the attitude of the patients, many of whom did not adhere to the oral hygiene instructions given to them by their orthodontist because they feel it is either unnecessary or too arduous to comply with. [5]

Lack of adequate toothbrushing during orthodontic treatment leads to plaque accumulation around the brackets particularly around the gingival margins which predisposes to periodontal disease therefore it is expedient that at each visit the value of toothbrushing be re-emphasized. However, it is worthy of note that about a quarter of our patients brushed their teeth more than three times daily which is highly commendable and is also comparable to other studies. [20]

An increase in frequency of toothbrushing alone is not adequate for the maintenance of good oral hygiene because toothbrushing technique is also a key factor as seen in previous studies where instructions on the importance of tooth brushing along with toothbrushing technique and type of toothbrush used improved oral hygiene very significantly. [21, 22] The main toothbrushing technique used by the participants in this study was either horizontal or vertical with the additional use of auxiliaries like dental floss and interdental brushes. Interdental brushes and floss have been reported to produce significant reduction in the quantity of plaque and gingival inflammation in the section where they are applied. [23, 24] Daily use of interdental brushes was found to reduce interdental bleeding thus implying that interdental cleaning is an effective means of achieving optimal oral health. [25] The additional attempts to maintain good oral hygiene by some of the participants is commendable.

Majority of adolescents, females and those who had been in treatment for more than 18 months had a high level of awareness of their periodontal health. Other studies have reported lack of gender differences. [10] Our participants could identify stains but could not identify plaque or calculus on their teeth. This is similar to findings in another Nigerian study. [26]

Adolescents, males and those that had been in treatment for more than 18 months had a better knowledge about what plaque was than other participants however not many of them knew what plaque can cause or its connection with bleeding gums. The vast majority were also ignorant of the effect of the fixed appliance on their periodontal health. Thus, orthodontists need to thoroughly educate their patients on the potential deleterious effects of fixed orthodontic appliances on their periodontal tissues as this will help to prevent periodontal disease occurring during orthodontic treatment. [27] Various motivational methods have been employed across the globe to improve on the oral hygiene of orthodontic patients, which include chair-side oral hygiene education using models or videos, message reminders with either sms or Whatsapp, behavioral modification, personalized counselling and Hawthorne effect.

Conclusion

In this study, adolescents, female participants and those on less than 18 months of orthodontic treatment had better mean plaque index and mean oral hygiene index than others. The mean gingival bleeding index was better in adults, females and those who have had orthodontic treatment more than 18 months. All these did not translate to better gingival conditions as the majority of the participants had gingivitis. This indicated that the participants had not been meticulous in plaque control. The participants did not seem to realize the effect of their orthodontic appliances on their periodontal health. There is the need for orthodontists to collaborate with periodontists in the management of their patients during fixed orthodontic appliance therapy.

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