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Impact of orthodontic treatment on oral health related quality of life at a Tertiary Hospital in Lagos, Nigeria: A pilot study

Oyapero A., Ogunbanjo B.O., Adegbite K.O., Ajisafe O.A.

ABSTRACT

Aims: Malocclusion may not be life-threatening but it is an important public health problem, which has impact on the domains of discomfort, social and functional limitations. Orthodontic treatment may also cause functional restrictions, discomfort and pain. This study aimed to determine the impact of orthodontic treatment on the oral health-related quality of life (OHRQoL) of a group of patients receiving care at the Lagos State University Teaching Hospital, Ikeja, Lagos. (LASUTH). Methods: This descriptive study was conducted among patients that were registered for care at the orthodontic clinic and had commenced fixed appliance therapy for one month. A structured interviewer administered questionnaire was used to obtain the socio-demographic information and to assess the orthodontic profile as well as the OHRQoL of the respondents. Results: The highest OHRQOL scores were observed in the subdomains of self-consciousness, pain, discomfort on chewing, being irritable and embarrassment. Subjects aged between 21–40 years had the highest mean impact scores (32.93±7.86). Similarly, females and tertiary educated respondents had the highest mean impact scores (29.93±7.48). Respondents with definite malocclusion had the lowest mean OHIP-14 scores (18.00) while the respondent with very severe handicapping malocclusion had the highest mean scores (26.98). Respondents that had poor oral hygiene had a higher mean OHIP-14 scores (1.93±0.54) even though the association was not statistically significant. Conclusion: Orthodontic treatment appears to be associated with a negative impact on the OHRQoL of respondents at the early stage of orthodontic treatment. This impact was highest in females, those aged between 21–40 years and those with a tertiary education. It is imperative that patients are adequately psychologically prepared before treatment commences and that care is taken to reduce iatrogenic damage to improve their likelihood of completing it.

Keywords: Malocclusion, Oral Health related quality of life, Orthodontic treatment

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INTRODUCTION

Malocclusion is a variation from accepted societal norm that can lead to functional difficulties or concerns about dentofacial appearance. The varied aetiology of malocclusion includes specific causes, hereditary and environmental factors. It is an important public health issue that has an impact in the domains of discomfort, social and functional limitations. Orthodontic treatment enables appropriate alignment of the teeth and it improves occlusal and jaw relationships. This results in improved mastication, speech, facial aesthetics, and overall health. Orthodontic treatment is achieved through the application of orthodontic forces delivered on the dentition and the orofacial structures to effect tooth movement and an adaptation of bone morphology and growth. It may, however, also be associated with risks and complications such as tooth discoloration, decalcification, root resorption, periodontal complications, temporomandibular joint disorders, allergic reactions, infective endocarditis, and chronic fatigue syndrome [1, 2].

The use of removable and fixed orthodontic devices is associated with changes in enamel and root structure, discomfort and pain and challenges with oral hygiene maintenance. Orthodontic appliances also interfere with effective removal of dental plaque which is the primary aetiological agent in the causation of periodontal disease. Molar bands and arch wires retain plaque and entrap food particles and thus affect the equilibrium of the oral microflora by causing a shift in bacterial composition to periodontopathogenic organisms that cause oral disease. Excessive plaque accumulation can result in gingivitis, periodontitis, dehiscence, fenestrations, gingival recession or enlargement and clinical attachment loss. Orofacial soft tissues are also susceptible to trauma from brackets, arch wires and extra oral appliances while the use of chemicals such as etchants and reactions to metal components of the appliances can cause stomatitis and chemical burns.

Traditionally, dental researchers have focused on clinician-based normative outcome measures rather than subjective patient-based measures, such as perceived functional status and psychological well-being. Quality of life is a multidimensional model that consists of subjectively perceived physical, psychological and social function, as well as a sense of subjective well-being [3]. Oral related quality of life is defined as an individual's perception of the impact of oral health on their quality of life (OHRQoL). Pre-existing malocclusion as well as appliance therapy can be associated with psychological discomfort due to the unpleasant appearance of the appliances and concomitant teasing of the patient by their friends and colleagues. Orthodontic treatment may also cause functional restrictions, discomfort and pain. Studies have also shown that, depending on the phase of the treatment, orthodontic treatment may either compromise or improve OHRQoL [3, 4]. A significant but weak correlation between OHRQoL and the occlusal indices has been reported [5]. Patients with a greater orthodontic treatment need had poorer OHRQoL than those with normal occlusion while orthodontic treatment has also been observed to have impacts on it. Thus poor oral health related quality of life and orthodontic treatment need appear to coexist in the same population.

An understanding of the challenges and discomforts experienced during orthodontic procedures can aid in setting realistic expectations about orthodontic treatment and avoiding iatrogenic injury and may increase patients' compliance with their treatment protocol [4, 6]. This study aimed to determine the impact of orthodontic treatment on the oral health-related quality of life of a group of patients receiving care at the Lagos State University Teaching Hospital, Ikeja, Lagos.

MATERIALS AND METHODS

This cross-sectional study was conducted at the orthodontic clinic of the Lagos State University Teaching Hospital, Ikeja, Lagos (LASUTH).

Sample Selection

The study population consisted of patients that were registered for care at the orthodontic clinic of LASUTH. A simple random sampling technique using the balloting technique was used to select the study participants using the attendance register for each clinic day as the sampling frame. Selected participants were screened for eligibility by set inclusion and exclusion criteria and those that met this criteria and were willing to give their informed consent were enlisted into the study.

Sample Size

The sample size was determined using a formula for cross-sectional studies: $N = Z^2 pq/d^2$. Using the prevalence of 93.3% for impacts on quality of life from a reference study, [7] a sample size of 96 was determined. Sixty-three respondents were, however, selected for the pilot study.

Study Setting and Location

This study was done at the Orthodontics clinic of the Lagos State University Teaching Hospital, (LASUTH), Ikeja, Lagos, Nigeria. The LASUTH is a multi-specialist tertiary health facility located in the capital of Lagos State. The Orthodontics clinic of LASUTH is conducted twice weekly by Consultant Orthodontists and an average of 15 patients are seen on each clinic day.

Inclusion and Exclusion Criteria

Respondents included in the study were those that were ≥16 years old had been registered for care at the Orthodontic clinic and had commenced fixed appliance therapy for one month. Patients that were excluded from

the study included those with craniofacial anomalies, cognitive disorders, untreated dental caries, traumatic dental injury, and those that had undergone any other dental treatment in the previous six months.

Questionnaires

The selected participants completed an interviewer administered questionnaire designed to obtain information on the subjects' bio-data and dental history. Information obtained in the first part included gender, age, level of education, religion and ethnicity. The second part obtained data on their orthodontic history and dental examination. A qualified dentist performed an intra-oral examination on each patient using a mouth mirror and CPITN probes. The OHIP-14 form, which is a validated OHRQoL instrument, was also used to evaluate the impact of orthodontic on the respondents' quality of life. They were asked to rate their dental experience with appropriate responses to the OHIP-14.

Dental Aesthetics Index (DAI)

The respondents were classified into four classes of malocclusion with diverse orthodontic treatment needs given to each group: slight malocclusion/minor treatment need (DAI ≤ 25), definite malocclusion/elective treatment need (26 ≤ DAI ≤ 30), severe malocclusion/very desirable treatment need (31 ≤ DAI ≤ 35), and handicapping malocclusion/mandatory treatment need (DAI ≥ 36). A standard Dental Aesthetic Index (DAI) score was calculated for each participant according to the severity of malocclusion and treatment need as measured by the standard DAI score [8].

OHRQOL Measurement with OHIP-14

The OHIP-14, a 14-question tool that defines seven measurements of impact (functional limitation, pain, psychological discomfort, physical disability, psychological disability, social disability and handicap) was employed. For all the OHIP-14 questions, participants rated how frequently they had had an impact in the past month, on a 5-point Likert scale stating if the impact had been experienced "very often" (code 4), "fairly often" (code 3), "sometimes" (code 2), "hardly ever" (code 1), or "never" (code 0). To compute the OHIP-14 scores for specific domains, the average of the participants' scores was calculated to give a maximum score of 4. For separate sub-domain scores 0, 1 and 2 were categorized as low impact while scores 3 and 4 were categorized as high impact. In order to compute the total OHIP-14 impact score for all domains, item response codes were added to give the final scores (Maximum obtainable impact score = 56). The OHIP-14 total impact scores were categorized as low (0–18.9), moderate (19–37.9) and high (38–56) to define the impact level in the study participants [9, 10].

Data Analysis

Data was analyzed using SPSS (Statistical package for social sciences) for Windows (version 18, Chicago, IL) statistical software package. Frequency distribution tables were produced for all variables and measures of central tendency and dispersion were computed for numerical variables. Since the data was normally distributed, descriptive statistics including means, standard deviations, and percentages were used to present the demographic variables and health-related behavior of the study sample. The chi square test was used to determine the level of association between variables. The ANOVA test was used to compare means between the variables. A 95% confidence interval and a 5% level of significance was adopted.

RESULTS

Socio-demographic characteristics of the study population

Most of the subjects were female (57.7%), were in the ≤20 years age category (69.8%) and there were more Yoruba (65.1%) enrolled in the study. Majority of participants (69.8%) were married while 44.4% had tertiary education. Most of the subjects (89.6%) were students (Table 1).

OHRQOL of the study participants

The subjects' OHIP-14 scores are given in Table 2. The highest OHRQOL scores were observed in the subdomains of self-consciousness, pain, discomfort on chewing, being irritable and embarrassment. More than 20% of the subjects reported high impacts on their quality of life in the sub-domains of discomfort and embarrassment. The highest mean impact score (2.57) was observed in the subdomain of self-consciousness. None of the subjects reported a high impact in the sub-domain of ability to function.

Association between the OHRQOL of the subjects and their socio-demographic variables

Using the overall mean OHIP-14 scores, the age of the subjects was significantly associated with OHRQOL. Subjects aged between 21–40 years had the highest mean impact scores (32.93±7.86). Similarly, females (28.76±8.45) and tertiary educated respondents (29.93±7.48) had the highest mean impact scores. Association between the socio-demographic variables of the subjects and their OHIP-14 scores were however not significant in any of the other categories explored (Table 3).

Table 1: Socio-demographic characteristics f the respondents

Variable		Frequency	Percentage
Gender	Male	27	42.9
	Female	36	57.7
Age	≤20	44	69.8
	21–40	14	22.2
	≥41	5	7.9
Ethnic group	Yoruba	41	65.1
	Igbo	3	4.8
	Others	19	30.2
Occupation	Students	44	69.8
	Employed	19	30.2
Religion	Christianity	50	79.4
	Islam	13	20.6
Highest level of education	Primary	8	12.7
	Secondary	27	42.9
	Tertiary	28	44.4
Marital status	Single	54	85.7
	Married	9	14.3
Family member with similar tooth arrangement	Father	17	27.0
	Mother	9	14.3
	Sister	5	7.9
	Brother	3	4.8
	None	2	3.2
	Unknown	27	42.9

Table 2: OHRQOL of the study subjects

OHIP Domains	OHIP-14 Sub-domains	Low Impact Band- 0, 1 and 2. N %		High Impact Band 3 and 4 N %		Mean OHIP-14 Impact Score
Functional limitation	Words	58	92.1	5	7.9	1.65
	Taste	58	92.1	5	7.9	1.55
Physical pain						
	Pain	53	84.1	10	15.9	2.51
	Discomfort	48	76.2	15	23.8	
Psychological discomfort						
	Consciousness	47	74.6	16	25.4	2.49
Physical disability	Tense	58	92.1	5	7.9	
						2.57
	Diet	61	96.8	2	3.2	1.95
Psychological disability	Interrupt	56	88.9	7	11.1	
						1.65
Social disability	Not relaxed	58	92.1	5	7.9	2.03
	Embarrassed	52	82.5	11	17.5	
						1.68
Handicap	Irritable	57	90.5	6	9.5	2.11
	Job	60	95.2	3	4.8	
						2.20
	Life	56	88.9	7	11.1	1.52
	Function	63	100.0	0	0.00	
						1.60
						1.08

The relationship between the DAI scores of the study subjects and their OHIP-14 scores

Table 4 gives the relationship between orthodontic treatment need (DAI) and oral health related quality of life (OHIP-14). Respondents with definite malocclusion had the lowest mean OHIP-14 scores (18.00) while the respondent with very severe handicapping malocclusion had the highest mean scores (26.98).

Oral hygiene practice of the respondents

Table 5 gives the oral hygiene practices of the respondents. Majority of the respondents have received oral hygiene education (60; 95.2%), have had a recent scaling and polishing (38; 60.3%) and use a medium bristle toothbrush (43; 68.3%). Most of them however do not use any type of mouthwash (36; 57.1%), do not use interdental floss (48; 76.2%) nor interdental brushes (48; 76.2%).

Oral hygiene practice and mean OHIP score

Respondents that had poor oral hygiene had higher mean OHIP-14 scores (1.93±0.54) even though the association was not statistically significant (Table 6). Poor oral hygiene was similarly insignificantly associated with gingival hyperplasia (Table 7).

DISCUSSION

This study appraised the impact of fixed orthodontic therapy on OHRQoL in a cohort of patients undergoing treatment at LASUTH. Oral health-related quality of life is a crucial element of oral health investigations and studies appraising the outcomes of preventive and therapeutic programs intended to improve oral health. The form of the face plays a significant role in human life and interpersonal interactions. The highest OHRQOL scores observed in this study in the subdomains of self-consciousness, pain, discomfort on chewing being irritable and embarrassment and this may not be unexpected since the study was done in the early stage of treatment. More than 20% of the subjects reported high impacts on their quality of life in the sub-domains of discomfort and embarrassment. Some researchers [11] similarly observed that the greatest decline in OHRQoL happens in the early stage of treatment and that OHRQoL improved as treatment progressed. This observation was validated by a similar research that found that OHRQoL significantly improved after two years of orthodontic therapy was completed [12].

Pain and discomfort are adverse consequences commonly associated with orthodontic treatment [13]. Some authors have observed that 70–95% of orthodontic patients experience pain [14, 15] which is significant enough to be a reason for discontinuing treatment in 8-30% of orthodontic patients [13]. Sergl et al. [16] similarly stated that the most common complaints were impaired speech, difficulty in swallowing, feeling

Table 3: Association between the OHRQOL of the subjects and their socio-demographic variables

Variable	Category	N	Low impact (0- 23.9) N %	Moderate Impact (24-47.9) N %	High Impact (48- 70) N %	Mean OHIP-14	SD
Gender	Male	27	10 15.87	17 26.98	0 0	26.85	± 7.68
	Female	36	13 20.63	23 36.51	1 1.6	28.76	± 8.45
			$\chi 2^*$ = 2.523	df^{Φ}= 2	P =0.125	F*** =2.361	P=0.143
Age group (years)	< 20	44	19 30.2	25 39.7	0 0	24.45	± 5.86
	21-40	14	2 3.2	11 17.5	1 1.6	32.93	± 7.86
	≥41	5	1 1.6	4 6.3	0 0.0	28.00	± 6.44
			$\chi 2^*$ = 7.410 df^{Φ}= 4 p = 0.016			F*** =9.474	P=0.000
Marital status	Married	9	1 1.6	8 12.7	0 0	30.00	± 5.24
	Single	54	24 33.3	32 50.8	1 1.6	26.06	± 7.37
			$\chi 2^*$ = 2.938 df^{Φ}= 2 p = 0.230			F*** =2.361	P=0.130
Educational qualification	Primary	8	5 7.9	3 4.8	0 0	20.63	± 6.13
	Secondary	27	9 14.3	18 28.6	0 0	24.93	± 5.47
	Tertiary	28	8 12.7	19 30.2	1 0	29.93	± 7.48
	Total	63	22 34.9	40 63.5	1 0.0		
			$\chi 2$ *= 4.313 df^{Φ}= 4 p = 0. 035			F* =0.7852	P=0.001

Table 4: The relationship between the DAI scores of the study subjects and their OHIP-14 scores

Dental Aesthetic Index	Severity levels	Low impact (0- 23.9) N %	Moderate Impact (24-47.9) N %	High Impact (48- 70) N %	Mean OHIP-14
≤ 25	Normal or minor malocclusion (No treatment need or slight need)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
26–30	Definite malocclusion (Treatment elective)	19(32.8)	38(65.5)	1(1.7)	18.00
31–35	Severe malocclusion (Treatment highly desirable)	2(50.0)	2(50.0)	0(0.0)	23.50
≥ 36	Very severe handicapping malocclusion (Treatment mandatory)	0(0.0)	1(100.0)	0(0.0)	26.98

Table 5: Oral hygiene practice of the respondents

Variable		Frequency	Percentage
Do you use of any type of mouth wash?	Yes	27	42.9
	No	36	57.1
Have you ever received oral hygiene education?	Yes	60	95.2
	No	3	4.8
Have you had scaling and polishing done since commencement of orthodontic treatment?	Yes	38	60.3
	No	25	39.7
Type of toothbrush used.	Soft	18	28.6
	Medium	43	68.3
	Hard	2	3.2
How many time a day do you brush?	Once	11	17.5
	Twice	47	74.6
	Others	5	7.9
Do you use interdental floss?	Yes	15	23.8
	No	48	76.2
Do you use interdental brushes?	Yes	15	23.8
	No	48	79.4

Table 6: Oral hygiene practices and means OHIP score

	Mean	Standard deviation	P-value
Oral hygiene practices			0.175
Poor	1.93	0.54	
Good	1.75	0.46	

Table 7: Oral hygiene status and gingival hyperplasia

	Oral hygiene		p-value
	Poor	Good	
Gingival hyperplasia			0.773
Yes	7(20.0)	3(10.7)	
No	28(80.0)	25(89.3)	

of oral constraint, and lack of confidence in public after undergoing orthodontic treatment. Miller et al. [17] however observed less impacts between Invisalign aligners and fixed appliance therapy during the first week of treatment possibly indicating that bonded and banded appliances create more discomfort. The pain and discomfort associated with orthodontic treatment is characterized by pressure, tension, or soreness of the teeth especially within the first week of treatment. Most mucosal lesions (erosion and ulceration) are related to trauma caused by the orthodontic appliance [18]. Individuals wearing fixed appliances may also experience limited oral functions. A detailed allergy history should be obtained prior to treatment and inappropriate orthodontic forces and improperly placed appliances should be avoided during treatment. Patients should also be adequately counseled while appropriate pharmacologic and non-pharmacologic regimens may be required to alleviate pain.

Females experienced more negative impacts on their quality of life as observed by previous researchers [19, 20]. This is due to the observation that females are more conscious of their appearance and societal expectations about beauty in addition to being more comfortable with expressing their feelings [21]. Research revealed that females in adolescent years have a tendency to become more troubled about their appearance and are more likely than males to report a negative body image or low self-esteem. This findings, however, differed from the observations by some other authors [22–23] who observed greater impacts in males. Participants aged between 21–40 years had the highest mean impact scores. Younger patients have been observed to have less discomfort from appliances and are more co-operative in hygiene maintenance and keeping of appointments [24]. The management of the adult patient frequently necessitates modification of the orthodontic intervention due to oral structure changes and modified status. Adult patients are also not easily satisfied with treatment results.

This study observed an association between orthodontic treatment need and OHRQoL. Respondents with definite malocclusion had the lowest mean OHIP-14 scores while the respondent with very severe handicapping malocclusion had the highest mean score. Some authors found a strong relationship between malocclusion or orthodontic treatment need and OHRQoL, but others reported no clear relationship. Some researchers reported up to 2.65 times more impacts on the OHRQoL in patients with high orthodontic treatment need than did children with acceptable or ideal occlusion [25, 26]. The unpleasant effects of malocclusion can be psychologic in nature and may be linked to aesthetic impairment rather than any functional handicap. Other studies, however, observed that orthodontic treatment needs did not significantly affect the oral health-related quality of life [27, 28].

Most of the study participants were observed to be compliant with routine oral hygiene device but deficient in the use of adjunct oral hygiene aids. Respondents that had poor oral hygiene had a higher mean OHIP-14 scores and gingival hyperplasia. Orthodontic therapy results the proliferation of dental plaque and an increased colonization by more periodontopathogenic organisms which results in gingivitis [29]. It is also probable that continuous release of low doses of nickel on epithelium is the starter factor in gingival hyperplasia that is created during orthodontic treatment [30]. An improvement in the level of oral hygiene through appropriate tooth brushing and the use of an interproximal brush in addition to the orthodontic brush is mandatory [31]. Adequate exposure to fluoride as well as antibacterial mouthwashes such as chlorhexidine is also required to reduces the level of plaque accumulation and to produce a caries inhibitory effect.

CONCLUSION

Orthodontic treatment is a multifaceted therapeutic intervention, done over an extended time during which some complications may arise. Orthodontic treatment appears to be associated with a negative impact on the OHRQoL of respondents at the early stage of orthodontic treatment. This impact was highest in females, those aged between 21–40 years and those with a tertiary education. It is imperative that patients are adequately psychologically prepared before treatment commences. Care should also be taken to reduce iatrogenic damage from orthodontic forces and trauma from the appliances while the patient should be motivated on oral hygiene maintenance to reduce periodontal complications that could worsen OHRQoL.

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Author Contributions

Oyapero A. – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Ogunbanjo B.O. – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

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Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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