

Oral Health Related Quality of Life of Patients on Fixed and Removable Orthodontic Appliances

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ABSTRACT

Objective: Quality of life is defined as the discrepancy between our expectations and experiences. In the field of orthodontics, there is a longstanding recognition that malocclusion and dentofacial anomalies can produce immense physical, social and psychological upset. The study aimed at assessing the age, sex and socioeconomic status of patients using fixed and removable orthodontic appliances evaluating the possible change in their quality of life during fixed or removable appliance orthodontic therapy.

Methods: A prospective cross-sectional study was carried out among patients attending the Orthodontic Clinic of the University of Benin Teaching Hospital, Benin City, Edo State who were on fixed and removable appliances for various orthodontic reasons. The Oral Health Impact Profile (OHIP)-14 questionnaire was used for data collection and was self-administered. The questionnaires were administered at baseline and two months into treatment.

Results: Most of the study participants were in the 16-20 years old age group (44.4%), females made up (53.5%) and most participants were of the low socioeconomic status (63.6%). Participants aged 10 years and below had more of physical pain while those within the 11-15 years age group had more of psychological and social disability. The 26-30 years age group had more functional limitation and psychological discomfort while participants aged 30 years and above experienced more handicap due to the presence of orthodontic appliance in the mouth. More males had functional limitation and social disability while females had physical pain, psychological discomfort, physical disability and psychological disability. Participants of the low socioeconomic status had more psychological disability, social disability and handicap. Participants of the middle socioeconomic group had more functional limitation, physical pain, psychological discomfort and physical disability due to the presence of orthodontic appliance in the mouth.

Conclusion: The general OHIP-14 score reduced when comparing the score at baseline of orthodontic treatment to the score during treatment. Therefore, the oral health related quality of life of the participants improved as orthodontic treatment progressed.

Keywords: Oral health related quality of life, fixed, removable, orthodontic appliances

INTRODUCTION

Quality of life (QoL) is defined as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns (WHOQoL, 1997). This concept has two fundamental elements: multidimensionality and subjectivity. The former refers to the coverage of a broad range of content, including physical, functional, emotional and social well-being. The latter refers to the fact that quality of life can only be understood from the patient's perspective (Abreu, 2015). The concept of oral health related quality of life (OHRQoL) regards how oral outcomes impact on individuals' well-being and quality of life (Sischo & Broder, 2011).

Quality of life is an increasingly important component of the evaluation of treatment outcomes and has been defined as the discrepancy between our expectations and experiences (Ramesh et al., 2014). Oral diseases seriously impair quality of life in a large number of individuals and they may affect various aspects of life, including function, appearance, interpersonal relationships and even career opportunities (Ramesh et al., 2014). Studies have shown that malocclusion is a global problem and most of it can be corrected by the use of fixed or removable orthodontic appliances. Malocclusion and its treatment using fixed or removable orthodontic appliances can affect physical health in terms of pain, speech and mastication. In terms of psychological health, malocclusion and its treatment has been reported to affect self-concept. Socially, malocclusion and its treatment can affect perceived attractiveness by others, social acceptance and perceived intelligence (Zhang et al., 2006).

Orthodontics is an area of dentistry that prevents, diagnoses and treats dental and facial irregularities which are misalignments called malocclusion. Malocclusion is a misalignment or incorrect relation between the teeth of the two dental arches when they approach each other as the jaw closes. It is characterized by anomalies within the dental arches, malrelation of dental arches and skeletal facial discrepancies (Profit et al., 1998). They could be inherited or acquired, inherited malocclusions include jaw growth problems, congenitally missing teeth, extra teeth, crowded or protruded teeth and spacing problems. Acquired forms arise from the premature loss of primary teeth, over-retention of primary teeth, thumb- or finger-sucking, accidents and certain types of dental disease can also result in a need for orthodontic treatment. In the field of orthodontics there is a long-standing recognition that malocclusion and dentofacial anomalies can produce immense physical, social and psychological upset. Increasingly patient centered measures are used to assess the orthodontic need and in determining the outcomes of orthodontic care (Zhang et al., 2007).

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The treatment of malocclusion, which has a large psychosocial component calls for the use of Oral health related quality of life measures (De Oliveira & Sheiham, 2004). Many patients who seek orthodontic treatment are concerned with improving their appearance and social acceptance more than they are with improving their oral function or health. Patients undergoing orthodontic treatment were more likely to report an oral health impact, which may suggest that the process of treatment causes oral health impacts and affects the patients' Quality of life (Erdinc & Diner, 2004).

MATERIALS AND METHODS

This was a prospective cross-sectional study. It was carried out in the Orthodontic clinic in the Department of Preventive Dentistry of the University of Benin Teaching Hospital, Benin City, Edo State.

Patients undergoing orthodontic treatment (fixed, removable or functional appliance therapy) who gave written informed consent to participate in the study either by themselves or their parents/ legal guardians. Assent was sought from participants 8-years and older whose parents/legal guardians already gave consent.

Sample size was determined using the formula: $N = Z^2 pq/d^2$ (Araoye, 2003). A prevalence of patients with malocclusion in Benin City of 94% was used (Ajayi, 2008). The minimum sample size calculated was 87. A total of 99 patients using fixed, removable or functional appliances were included in the study.

A self-administered Oral Health Impact Profile (OHIP-14) questionnaire was used to obtain data from the study participants. The OHIP-14 consisted of 14 items covering seven domains; functional limitation, physical pain, physical disability, psychological discomfort, psychological disability, social disability and any handicaps. Each item was scored on a 5-point Likert scale to rate the impact of overall oral health status as it relates to the participants' quality of life. Response was coded ranging from never (score 0), rarely (score 1), occasionally (score 2), often (score 3) to very often (score 4). This questionnaire had previously been tested and validated in this study environment (Azodo et al., 2012).

A section of the questionnaire collected data on the sociodemographic characteristics of the study participants which included gender, age, marital status and socioeconomic status.

The questionnaire was administered twice. The participants completed the first 14-item OHIP questionnaire two weeks into their orthodontic treatment as baseline and the second after eight weeks thus participants were followed up for two months. All

study participants were interviewed at baseline (T1) and two months later (T2). This was to enable the changes in the quality of life of the participants over a period of two months to be determined. Data analysis was carried out on a personal computer using the IBM SPSS software for windows version 22.

RESULTS

Table 1: Sociodemographic characteristics of study participants

Variable	Frequency (n)	Percent (%)
Age group (years)		
10 and <	2	2.0
10-15	18	18.2
16-20	56	56.6
21-25	19	19.2
26-30	2	2.0
>30	2	2.0
Sex		
Male	46	46.5
Female	53	53.5
Tribe		
Bini	29	29.3
Esan	18	18.2
Edo north	7	7.1
Igbo	25	25.3
Yoruba	8	8.0
Others	12	12.1
Religion		
Christian	99	100.0
Marital status		
Single	97	98.0
Married	2	2.0
Socioeconomic status		
High SES	23	23.2
Middle SES	13	13.1
Low SES	63	63.6
Total	99	100.0

There was a 94% retrieval rate for all questionnaires given. More than half of the study participants fell into the 16-20 years old age group (56.6%) with a mean age of 19.59 ± 5.05 , females made up (53.5%) and the Bini ethnic group were the most prevalent 23 (29.3%). The study population consisted of only Christians, majority were single 97 (98%) and of the low socioeconomic status 63 (63.6%). (Table 1).

At the baseline line of orthodontic treatment, less than half of the participants had physical pain caused by the presence of the orthodontic appliance 43 (43.4%) and the effect of orthodontic appliance use on comfort while eating 36 (36.4) was shown to reduce the quality of life of the patients more as compared to other domains. The study participants showed that more people had functional limitation 31 (31.3) due to presence of orthodontic appliance. Many of the participants had psychological discomfort 39 (39.4) due to the use of orthodontic appliance. For physical disability domain many participants had unsatisfactory diet due to the presence of orthodontic appliance use 37 (37.4), while a third of participants occasionally had meals interrupted due to use of orthodontic appliance 33 (33.3). Another third of study participants were often unable to relax due to presence of orthodontic appliance in the mouth and many 36 (36.4) occasionally felt embarrassed. More participants were occasionally

disabled socially and handicapped 36 (36.4) due to the presence of orthodontic appliance in the mouth. (Table 2).

The mean score for the physical pain domain (4.96 ± 1.99) in the OHIP-14 assessment of the study participants was higher than the mean score gotten from other domains with that of the handicap (2.91 ± 2.06) domain being the least at baseline. The total OHIP score at baseline was 28.74 ± 10.40 (Table 3).

There was a general reduction in the mean scores in all the domains of the OHIP-14 when compared to the oral health related quality of life at baseline of orthodontic treatment, physical pain also had the highest mean score during treatment (4.30 ± 1.46). The total OHIP score at follow up (T2) was 25.14 ± 8.83 (Table 4).

Comparing the mean scores at baseline (T₁) and at follow up (T₂) shows a reduction in scores across all domains and the total OHIP score. (Table 5). From this study, the age group of 10 years and below had more physical pain (5.50 ± 0.71) from orthodontic appliances while those within 11 to 15 years and above 30 years age group had more of physical disability (4.89 ± 1.84 , 5.50 ± 2.12) respectively and those within the 26-30 years age group had more psychological discomfort (5.50 ± 1.34). The total OHIP-14 score at baseline was highest in the participants that were within the 26-30 years age group (31.71 ± 8.51). (Table 6) Physical pain had the highest mean score among males (4.91 ± 2.02) while psychological discomfort had the highest mean score in females (5.08 ± 1.47) at baseline of orthodontic treatment although there was no statistically significant difference in domains between the sexes. The overall OHIP-14 score was higher for

females at baseline of orthodontic treatment, this was also not statistically significant. (Table 7)

Participants from the low socioeconomic status had more of physical disability (4.89 ± 1.69), physical pain (4.61 ± 2.25) and psychological discomfort (4.61 ± 2.15) at baseline of their orthodontic treatment. Participants from the middle socioeconomic group had more physical pain (5.31 ± 0.95), psychological discomfort (5.15 ± 1.14) and physical disability (5.15 ± 1.68). The overall OHIP-14 score was highest for the participants from the low socioeconomic status (30.26 ± 11.58) though it was not statistically significant. Table 8

Generally, the score in all the domains at follow up of orthodontic treatment including the overall OHIP score reduced when compared to the score at baseline of orthodontic treatment and this was statistically significant in all the domains. Table 9.

Table 2: Oral health related quality of life of study participants at baseline of orthodontic treatment.

Variable	Never n (%)	Rarely n (%)	Occasionally n (%)	Often n (%)	Very often n (%)	Mean \pm SD
Functional Limitation						
Trouble pronouncing words	7(7.1)	18(18.2)	31(31.3)	31(31.3)	12(12.1)	2.23 ± 1.10
Sense of taste	20(20.2)	21(21.2)	25(25.3)	25(25.3)	8(8.1)	1.80 ± 1.25
Physical Pain						
Painful aching	3(3.0)	14(14.1)	26(26.3)	43(43.4)	13(13.1)	2.50 ± 0.99
Uncomfortable to eat	8(8.1)	8(8.1)	35(35.4)	36(36.4)	17(17.2)	2.57 ± 0.97
Psychological discomfort						
Self-conscious	4(4.0)	14(14.1)	32(32.3)	33(33.3)	16(16.2)	2.43 ± 1.05
Tense	7(7.1)	11(11.1)	35(35.4)	39(39.4)	7(7.1)	2.28 ± 1.00
Physical disability						
Diet unsatisfactory	8(8.1)	20(20.2)	26(26.3)	37(37.4)	8(8.1)	2.17 ± 1.01
Interrupt meals	8(8.1)	14(14.1)	33(33.3)	25(25.3)	11(11.1)	2.30 ± 1.15
Psychological disability						
Difficult to relax	9(9.1)	24(24.2)	27(27.3)	33(33.3)	6(6.1)	2.03 ± 1.09
Feel a bit embarrassed	11(11.1)	16(16.2)	36(36.4)	25(25.3)	11(11.1)	2.09 ± 1.14
Social disability						
Irritable	11(11.1)	23(23.2)	33(33.3)	24(24.2)	8(8.1)	1.95 ± 1.15
Difficulty in doing unusual jobs	16(16.2)	29(29.3)	34(34.3)	17(17.2)	3(3.0)	1.62 ± 1.05
Handicap						
Life less satisfying	21(21.2)	23(23.2)	28(28.3)	22(22.2)	5(5.1)	1.67 ± 1.19
Totally unable to function	29(29.3)	29(29.3)	29(29.3)	10(10.1)	2(2.0)	1.26 ± 1.06

Table 3: Mean scores of domains and overall total OHIP- 14 score at baseline (T₁)

Variable	Mean score \pm SD at baseline of orthodontic treatment
Functional limitation	4.02 ± 1.99
Physical pain	4.96 ± 1.71
Psychological discomfort	4.81 ± 1.75
Physical disability	4.59 ± 1.92
Psychological disability	4.12 ± 1.96
Social disability	3.57 ± 1.91
Handicap	2.91 ± 2.06
Total OHIP score	28.74 ± 10.40

Table 4: Mean scores of domains and overall total OHIP- 14 score during orthodontic treatment (T2)

Variable	Mean score \pm SD during orthodontic treatment
Functional limitation	3.47 \pm 1.57
Physical pain	4.30 \pm 1.46
Psychological discomfort	4.00 \pm 1.64
Physical disability	3.71 \pm 1.86
Psychological disability	3.77 \pm 1.62
Social disability	3.25 \pm 1.67
Handicap	2.75 \pm 1.50
Total OHIP score	25.14 \pm 8.83

Table 5: Mean quality of life scores at baseline and follow up during orthodontic treatment

Variable	At baseline orthodontic treatment Mean score \pm SD	During orthodontic treatment Mean score \pm SD
Functional limitation	4.02 \pm 1.99	3.47 \pm 1.57
Physical pain	4.96 \pm 1.71	4.30 \pm 1.46
Psychological discomfort	4.81 \pm 1.75	4.00 \pm 1.64
Physical disability	4.59 \pm 1.92	3.71 \pm 1.86
Psychological disability	4.12 \pm 1.96	3.77 \pm 1.62
Social disability	3.57 \pm 1.91	3.25 \pm 1.67
Handicap	2.91 \pm 2.06	2.57 \pm 1.50
Total OHIP score	28.74 \pm 10.40	25.14 \pm 8.83

Table 6: Relationship between age group and OHIP-14 at baseline

Dimension	Age (years)						P value
	10 and < Mean \pm SD	11-15 Mean \pm SD	16-20 Mean \pm SD	21-25 Mean \pm SD	26-30 Mean \pm SD	30and > Mean \pm SD	
Functional limitation	3.00 \pm 4.24	3.83 \pm 1.98	3.70 \pm 1.84	4.53 \pm 1.98	4.86 \pm 2.21	3.00 \pm 1.41	0.310
Physical Pain	5.50 \pm 0.71	4.83 \pm 2.48	4.93 \pm 1.65	4.84 \pm 1.68	5.36 \pm 0.93	4.50 \pm 0.71	0.939
Psychological discomfort	5.00 \pm 0.00	4.72 \pm 2.32	4.80 \pm 1.61	4.43 \pm 1.89	5.50 \pm 1.34	4.50 \pm 0.71	0.673
Physical Disability	5.50 \pm 2.12	4.89 \pm 1.84	4.45 \pm 2.00	4.26 \pm 2.10	4.79 \pm 1.63	5.50 \pm 2.12	0.822
Psychological disability	3.00 \pm 1.41	4.50 \pm 2.23	4.02 \pm 2.14	4.05 \pm 1.58	4.36 \pm 1.69	3.00 \pm 1.41	0.812
Social Disability	2.00 \pm 0.00	4.06 \pm 2.04	3.43 \pm 1.95	3.37 \pm 1.64	3.79 \pm 2.19	4.00 \pm 1.41	0.675
Handicap	2.00 \pm 0.00	3.67 \pm 2.61	2.45 \pm 2.11	3.11 \pm 1.56	2.93 \pm 1.59	5.00 \pm 1.41	0.206
Overall OHIP score	26.00 \pm 4.24	30.44 \pm 12.51	27.43 \pm 10.56	28.52 \pm 10.06	31.71 \pm 8.51	28.50 \pm 10.61	0.790

Table 7: Relationship between sex and OHIP-14 at baseline

Dimension	Male Mean \pm SD	Female Mean \pm SD	P value
Functional limitation	4.15 \pm 1.83	3.91 \pm 2.14	0.542
Physical pain	4.91 \pm 2.02	5.00 \pm 2.01	0.803
Psychological discomfort	4.50 \pm 2.01	5.08 \pm 1.47	0.104
Physical disability	4.26 \pm 2.15	4.87 \pm 1.66	0.118
Psychological disability	4.07 \pm 2.19	4.17 \pm 1.75	0.793
Social disability	3.93 \pm 1.94	3.25 \pm 1.85	0.073
Handicap	2.65 \pm 1.95	3.13 \pm 2.15	0.250
Overall OHIP score	28.20 \pm 11.53	29.30 \pm 9.40	0.600

Table 8: Relationship between socioeconomic status and OHIP-14 at baseline

Dimension	Low SES Mean \pm SD	Middle SES Mean \pm SD	High SES Mean \pm SD	P value
Functional limitation	4.17 \pm 2.01	4.46 \pm 2.50	3.87 \pm 1.89	0.577
Physical pain	4.61 \pm 2.25	5.31 \pm 0.95	5.02 \pm 1.61	0.461
Psychological discomfort	4.61 \pm 2.15	5.15 \pm 1.14	4.81 \pm 1.71	0.674
Physical disability	4.89 \pm 1.69	5.15 \pm 1.68	4.37 \pm 2.03	0.294
Psychological disability	4.39 \pm 2.04	3.85 \pm 1.57	4.08 \pm 2.02	0.701
Social disability	3.91 \pm 1.93	3.38 \pm 2.18	3.48 \pm 1.87	0.607
Handicap	3.61 \pm 2.39	2.92 \pm 1.66	2.65 \pm 1.98	0.162
Overall OHIP score	30.26 \pm 11.58	30.15 \pm 9.30	28.00 \pm 10.25	0.589

Table 9: Change in Oral Health related Quality of life among the participants

Dimension	At baseline Mean \pm SD	During treatment Mean \pm SD	P value
Functional limitation	4.02 \pm 1.99	3.47 \pm 1.57	0.001
Physical pain	4.96 \pm 1.71	4.30 \pm 1.46	0.001
Psychological discomfort	4.81 \pm 1.75	4.00 \pm 1.64	0.001
Physical disability	4.59 \pm 1.92	3.72 \pm 1.86	0.001
Psychological disability	4.12 \pm 1.96	3.77 \pm 1.62	0.026
Social disability	3.57 \pm 1.91	3.25 \pm 1.67	0.015
Handicap	2.91 \pm 2.06	2.57 \pm 1.51	0.014
Overall OHIP score	28.79 \pm 10.41	25.14 \pm 8.83	0.001

DISCUSSION

Many of the study participants fell within the 16-20-year-old age group, this may be because adolescents are usually more conscious of their appearance as growth tends to throw new challenges for them and makes them more self-conscious among their peers. Majority were also females this is similar to other studies which reported the same finding (Ama et al, 2015; Shaw 2015), they also demonstrated that females were more dissatisfied with the appearance of their dentition and perceived a need for braces more often than males. The female gender had a significantly positive correlation in participants who believed that the treatment could make finding a partner easier. Women were more likely to have esthetic concerns and possibly felt that braces placed during treatment affect their smile esthetics. Majority of the study population were single and concerned about their aesthetics, they believed that the treatment would improve their looks (Liu et al, 2009), and that the treatment could help them find a partner. Another possible reason is that married couples satisfied with their married life are more likely satisfied with their appearance (Liu et al, 2009). Socioeconomic status is a predominant factor affecting the patients' motivation. People of high socioeconomic status are usually more motivated to undergo orthodontic treatment, but was in contrast to this study which showed more participants of the low socioeconomic status undergoing orthodontic treatment. Many of the participants in this study were above 16 years of age and categorized as students/unemployed hence more participants were categorized

as low socioeconomic status and this may not be a true representation of their socioeconomic class.

Self-perceived oral health related quality of life is not always a reflection of malocclusion severity (Liu et al, 2009). Patients with severe malocclusions may not report a negative impact on quality of life, whereas others with minor irregularity report high negative impacts on quality of life (Klages et al., 2005). Quality of life is a multidimensional concept that includes subjectively perceived physical, psychological, and social functions, as well as a sense of subjective well-being. Previous research supports the finding of an association between malocclusion and psychological discomfort (Helm et al, 1985). Orthodontic treatment initially worsened the participants overall oral health related quality of life but got better with time during the treatment, this was showed by the statistically significant improvement of the overall OHIP score as treatment progressed when compared with baseline overall OHIP score. This may have been a result of having to adjust to new appliances in the mouth, initial pain from moving teeth during orthodontic therapy and other peoples' perception of the patients with the appliance in their mouth. However, over time the patients adapted or grew accustomed to these appliances, and the pain became more tolerable as treatment progressed.

Certain aspects of patient's daily activities appeared to be more affected by the treatment and thus had a negative impact on the overall oral health related quality of life and these included physical pain, psychological discomfort and physical disability

domains which were more affected in relation to age and sex. Statistically significant changes were observed among all seven domain scores. Similar results reported by Liu and coworkers, found that the greatest deterioration on oral health related quality of life occurred in the early phase of fixed orthodontic treatment but with ongoing treatment, the detrimental effects in oral health related quality of life were reduced. The results from the current study showed that there was a significant positive impact of fixed, functional and removable orthodontic appliance therapy on the overall oral health related quality of life as treatment progressed.

CONCLUSION

There was a positive impact of fixed, functional and removable orthodontic appliance on oral health related quality of life of patients and this improved significantly as treatment progressed when compared to the beginning of orthodontic treatment.

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