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Malocclusion and its Impact on Quality of Life of School Children in Nigeria

La Malocclusion dentaire et son impact sur la qualité de vie des enfants scolarisés au Nigéria

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ABSTRACT

BACKGROUND: **Malocclusion, though not life-threatening, is an important public health issue, which has a large impact on the individual, causing discomfort, social and functional limitations.**

OBJECTIVE: **To evaluate objectively orthodontic treatment needs in Nigerian schoolchildren and the impact of malocclusion on their quality of life.**

METHODS: **This cross-sectional study involved schoolchildren aged 12 to 16 years from four randomly selected secondary schools in Lagos, Nigeria. A prestructured questionnaire was administered and a clinical examination was conducted. Occlusal status was assessed for each subject using the Dental Aesthetic Index (DAI). Oral Health Impact Profile-14 (OHIP-14) was also evaluated.**

RESULTS: **There were 410 (50.9%) females and 395 (49.1%) males aged 12 to 16 years. Mean age was 14.5 ± 1.3 years. Irregularity of teeth was the most prevalent malocclusion. Generalised spacing and midline diastema were seen in 59% and 31% respectively; crowding in 43% of the schoolchildren. Other occlusal anomalies were recorded. There was no statistically significant difference between the sexes. Over one third of the study population did not need treatment, treatment was mandatory in 24.3%, elective in 21% and highly desirable in 17%. More females than males did not need orthodontic treatment. Oral conditions had no effect on the quality of life of 85.3% of the study sample.**

CONCLUSION: **Most Nigerian schoolchildren were found to have a dental appearance that needed orthodontic treatment. However, components of the oral conditions impacted on the quality of life of a few subjects. Psycho-social need is very important in orthodontic diagnosis. WAJM 2010; 29(6): 417–424.**

Keywords: **Malocclusion, school-children, quality of life, impact, treatment need, dental aesthetic.**

RÉSUMÉ

CONTEXTE: la malocclusion dentaire, bien que n'engageant pas le pronostic vital, constitue un important problème de santé publique, qui a un impact significatif chez la personne affectée, en provoquant un inconfort ainsi que des restrictions fonctionnelles et sociales.

OBJECTIF: Evaluer objectivement les besoins en traitement orthodontique chez les enfants nigérians en âge scolaire et l'impact de la malocclusion dentaire dans leur qualité de vie.

METHODES: Cette étude transversale randomisée a impliqué des enfants âgés de 12 à 16ans sélectionnés au hasard dans 4 écoles de Lagos, (Sud-ouest du Nigeria).Un questionnaire structuré a été administré avant de procéder à un examen clinique. Le statut occlusal a été évalué pour chaque sujet en s'aidant du DAI (Index d'Esthétique Dentaire). De même l'OHIP-14 (Profile d'Impact de Santé Oral) a aussi été évalué.

RESULTATS: il y avait 410 (50.9 %) sujets de sexe masculin et 395 (40.9%) de sexe féminin, tous âgés entre 12 et 16ans avec un âge moyen de 14.5 (+/- 1.3).

L'irrégularité des dents a été la malocclusion la plus répandue. L'espacement généralisé et le diastème de la ligne médiane ont été respectivement observés dans 59% et 31%, tandis que l'encombrement fut noté chez 43% des écoliers, en plus des autres anomalies occlusales enregistrées. Entre les 2 sexes, Il n'y avait pas de différence statistiquement significative, eu égard à l'apparition des anomalies occlusales. Plus d'un tiers de la population étudiée n'a pas besoin de traitement. Le traitement a été obligatoire dans 24,3% des cas ; au choix chez les 21% et fortement recommandé dans les autres 17%. Les garçons ont eu plus besoin de traitement orthodontique que les filles. Les états oraux n'ont eu aucun effet sur la qualité de vie de 85,3% de la population étudiée.

CONCLUSION: La plupart des enfants des écoles du Nigeria à Lagos ont une apparence dentaire qui nécessite un traitement orthodontique. Cependant, les composants des conditions orales n'ont eu un impact sur la qualité de vie que de seulement un petit nombre, parmi la population cible. Le besoin psycho-sociale est très important dans le diagnostic orthodontique. WAJM 2010; 29 (6): 417–424.

Mots-clés: Malocclusion, les écoliers, la qualité de vie, l'impact, le besoin d'un traitement, l'esthétique dentaire.

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Abbreviations: **DAI,** Dental Aesthetic Index; **OHIP-14,** Oral Health Impact Profile-14; **QOL,** Quality of Life.

INTRODUCTION

Any irregularity in the occlusion beyond the accepted range of normal is regarded as a malocclusion.[1] It could occur as a result of hereditary, genetic, or environmental factors causing psycho-social problems, problems with oral functions and greater susceptibility to trauma and dental disease problems in the affected individual.[2] However, the effects of malocclusion differ individually and as a result the objective assessment of malocclusion may not correlate with the subjective assessment. Malocclusion may not be life-threatening but it is an important public health issue, which has a large impact on the individual and society in terms of discomfort, social and functional limitations.[3] Therefore, the impact of malocclusion on the quality of life of individuals may differ due to perceived needs.

While the use of health status measures to assess health related quality of life is well established in many areas of medicine, their use in dentistry has not been widespread. Traditionally, dentists are trained to recognize and treat diseases such as caries, periodontal disease and tumors. Consequently, various indices have been used to describe the prevalence of these diseases in the population. However, important as these objective measures are, they only reflect the end-point of the disease processes. They give no indication of the impact of the disease process on function or psychosocial well-being.[4] Clinical indices of use in ortho-dontics in particular do not give adequate information on how malocclusion, though not life-threatening impacts on the quality of life of an individual. Therefore, indicators need to be further developed for use in orthodontics.

The need to develop patient-based measures of oral health status was first recognized by Cohen and Jago,[5] who indicated the lack of data relating to psychosocial impact of oral health problems at that time.

The aim of this study was to investigate malocclusion; to evaluate objectively orthodontic treatment needs in Nigerian schoolchildren using the Dental Aesthetic Index (DAI) and the impact malocclusion had on their quality of life.

SUBJECTS, MATERIALS, AND METHODS

The study conducted in Lagos, Nigeria, involved 805 children 410 (50.9%) females and 395 (49.1%) males) aged 12 to 16 years, from four randomly selected secondary schools obtained from the list of secondary schools, Local Educative District in Lagos State and the State Ministry of Education authorities respectively. Ethical approval was sought and obtained from the Ethics Committee of the Lagos University Teaching Hospital. Before the study commenced, written consent was obtained from the Ministry of Education and Local Education District in charge of the secondary schools in Lagos State. Consent was also obtained from parents/ guardians of the selected schoolchildren.

Inclusion criteria were age at the time of the study of 12 to 16 years, of Nigerian origin, subjects, who were not receiving or had not received any form of orthodontic treatment previously and subjects in permanent dentition stage of dental development. Subjects aged 12 to 16 years in mixed dentition stage of dental development and subjects who have received any form of orthodontic treatment were excluded from the study.

A pilot study was carried out on 20 schoolchildren under similar conditions to that used in the study. The data obtained was however not included in the final analysis. A prestructured question-naire in English was administered to the schoolchildren in their classrooms.

One investigator (A.A.N) adminis-tered the questionnaire in the classroom on the scheduled days. Subsequently, the investigator (A.A.N) conducted a clinical examination of the participating schoolchildren for the occlusal status using the Dental Aesthetic Index (DAI) parameters according to Cons et al.[6] The following 10 components were measured:

1. Number of missing permanent incisors, canine and premolars teeth on the maxillary and mandibular arches.
2. Both maxillary and mandibular incisal segments assessed for crowding (0 = no segment crowded; 1 = 1 segment crowded; 2 = 2 segments crowded).
3. Both maxillary and mandibular incisal segments assessed for spacing (0 = no segments spaced; 1 = 1 segment spaced; 2 = 2 segments spaced).
4. The diastema in millimeters between the two permanent maxillary central incisors.
5. The largest irregularity in millimeters between anterior teeth in the maxillary arch.
6. The largest irregularity in millimeters between anterior teeth in the mandibular arch.
7. The largest anterior maxillary overjet was measured from the labio-incisal edge of the most prominent maxillary incisor to the labial surface of corresponding mandibular incisor in whole millimetres.
8. The largest anterior mandibular overjet was measured from the labio-incisal edge of the most prominent mandibular incisor to the labial surface opposing maxillary incisor in whole millimetres
9. The largest anterior open bite to the nearest whole millimetres.
10. The antero-posterior molar relation: the largest deviation from normal on either side was assessed (0 = normal molar relation, 1 = mandibular first molar on either side ½ cusp either mesial or distal to maxillary first molar, 2= mandibular first molar on either side is one full cusp or more either mesial or distal to maxillary first molar).

The parameters measured from each subjects were multiplied by their rounded regression coefficients (weight), the addition of their products and addition of a constant number, the resulting sum is the Dental Aesthetic Index score.[7]

The regression equation for obtaining a Dental Aesthetic Index (DAI) score is: DAI score = 6 x Missing Visible Teeth + 1x Crowding + 1 x Spacing + 3 x Diastema + 1 x Largest upper anterior irregularity + 1 x Largest lower anterior irregularity + 2 x anterior maxillary overjet + 4 x largest mandibular overjet + 4 x vertical anterior open bite + 3 x antero-posterior molar relation + 13 (constant number).[8] The Dental Aesthetic index is scored based on groups of severity of malocclusion and treatment need.

The social-economic status was based on Warner's six social classes[9] and the characteristic of each class was according to Edward's occupational index[10] evaluated according to the occupation of the father. In the analysis, the following four social classes were used:[29]

Social Class 1: Senior and Inter-mediate Professional Workers
Social Class 2: Junior Professional Workers
Social Class 3: Skilled Workers
Social Class 4: Semi skilled and Un-skilled workers.

The OHIP-14[11] was scored using simple count method (OHIP-SC) and the sum OHIP-14. OHIP"SC was counting the number of items to which a subject responded 'occasionally', 'fairly often' and 'often' regarded as impacts and 'hardly ever' and 'never' regarded as no impact. Sum OHIP is to sum the numeric response codes (0 for 'never', 1 for 'hardly ever', 2 for 'occasionally', 3 for 'fairly often' and 4 for 'very often') for all 14 items to produce single summary score for an individual. The sum OHIP score of 14 or less is indicative of no impact while score of 15 or more is indicative of impact.[12]

Data processing and analysis were carried out with Epi-Info 2002 statistical software. Frequency tables were created for categorizing variables. Chi-square values was estimated and p-value was set at $p = \leq 0.05$.

RESULTS

Socio-Demographic Characteristics

A total population of 805 school children participated in this study. There were 410 (50.9%) females and 395 (49.1%) males, with the ages ranging from 12 to 16 years and a mean age of 14.5 ± 1.3 years. The mean age for the female was 14.5 ± 1.3 years and for the males 14.6 ±1.3 years. The distribution of the subjects according to age and sex is shown in Table 1. None of the schoolchildren had been treated orthodontically.

The social class groups were reduced from six to four classes. Social class 2 represented the largest socio-economic group constituting 31.9% while

the social class 1 was the smallest (18.6%), Table 1.

Prevalence of Malocclusion

Irregularity of teeth was the most prevalent malocclusion trait among the study population with values of 78.9% and 72.2% for the maxillary and mandibular arches respectively. Dentoalveolar disproportion, manifesting as spacing and midline diastema accounted for about 59% and 31% respectively, while crowding was seen in 43% of the children. Other occlusal anomalies recorded were increased overjet (32.5%), reversed overjet (5%), and open bite (7%). Deviation from normal molar relationship was observed in 18.0% of the schoolchildren.

Maxillary irregularity was the most prevalent component seen in social classes 1, 2 and 3 (82.7%, 82.5% and 76.6%

respectively) and in all the age groups (78.3%, 80.0%, 80.6%, 77.6% and 78.8% in ages 12, 13, 14, 15 and 16 years respectively). Mandibular irregularity was the most prevalent in social class 4 (78.4%). Missing teeth was the least prevalent component in social classes 1 (5.3%) and 3 (3.5%); while reversed overjet was the least prevalent component in social classes 2 (3.5%) and 4 (4.8%).There was a statistically significant age difference in the prevalence of increased maxillary overjet (> 3 mm) (p < 0.05) showing increased occurrence in 12 year olds (51.8%).

There was an almost equal distribution of prevalence of malocclusion in both sexes. Maxillary irregularity was the most frequently occurring component seen in both females and males (78.3% and 79.5% respectively), while missing teeth (3.9% and 5.1% in females and males

Table 1: Distribution of Study Subjects by Age, Sex, and Socioeconomic Status of Parents

Age (Yrs)	Number (%)		
	Females	Males	Total
12	45 (11.0)	38 (9.6)	83 (10.3)
13	56 (13.7)	59 (14.9)	115 (14.3)
14	68 (16.6)	71 (17.8)	139 (17.3)
15	123 (30.0)	100 (25.3)	223 (27.7)
16	118 (28.8)	127 (32.2)	245 (30.4)
Total	**410 (50.9)**	**395 (49.1)**	**805 (100.0)**
Social Class of Parents			
Class 1			150 (18.6)
Class 2			257 (31.9)
Class 3			231 (28.7)
Class 4			167 (20.8)
Total			**805 (100.0)**

Sample mean age – 14.5 ± 1.3; Male mean age – 14.6 ± 1.3; Female mean age –14.5± 1.3.

Table 2: Distribution of Subjects by Orthodontic Treatment Needs and Sex

Orthodontic Treatment Need*	DAI Score	Number (%)		
		Female	Male	Total
No Treatment Needed	≤25	158 (38.5)	145 (36.7)	303 (37.6)
Treatment Elective	26 – 30	86 (21.0)	83 (21.0)	169 (21.0)
Treatment Highly Desirable	31– 35	68 (16.6)	69 (17.5)	137 (17.0)
Treatment Mandatory	>35	98 (23.9)	98 (24.8)	196 (24.3)
Column Total		**410 (100.0)**	**395 (100.0)**	**805 (100.0)**

** No treatment; normal or minor malocclusion; treatment elective; definite malocclusion; treatment highly desirable, severe malocclusion; treatment mandatory, very severe malocclusion. $\chi^2 = 0.34$; p value = 0.95. **DAI**, Dental Aesthetic Index.*

respectively), accounted for the least component. However, there was no statistically significant difference between the sexes.

Orthodontic Treatment Needs

The orthodontic treatment needs were assessed using the Dental Aesthetic Index (DAI). The orthodontic treatment needs of the study population had a total mean score of 30.1 ± 9.7, with mean scores of 30.13 ± 9.8 and 30.11 ± 9.7 for females and males respectively.

Twelve-year-olds and social class 1 had the highest mean score of 30.6 ± 11.2 and 31.7 ± 10.4, respectively while the least mean scores were in 13 year olds (28.8 ± 8.4) and social class 3 (29.2 ± 9.1). There were no statistically significant differences among gender, age, social class and mean DAI scores (χ^2=0.04, p-value = 0.83; χ^2=2.20, p-value=0.70; χ^2=5.93, p-value=0.12 respectively).

Over one third (37.6%) of the study population were observed to have normal or minor malocclusions that did not need

treatment. In 24.3% of the study sample, treatment need was mandatory. Treatment need was elective in 21%, and highly desirable in only 17%. About 39% of the females did not need orthodontic treatment, as against 36.7% of the males (Table 2). Generally, gender distribution in treatment need categories was almost equal.

Oral Health Related Quality of Life

The majority of the population studied (85.3%) showed that the oral conditions had no effect on their quality of life, while in the minority (14.6%) there were some effects shown. The Likert scale response codes on OHIP and the frequency of reported impacts on the 14 activities of the OHIP – 14 are reflected in Table 3. The mean OHIP-14 was 6.48 ± 7.98, also showing that the oral health status of the study population had no impact on their quality of life. The distribution of impact on OHIP-14 items (questions) using the simple count scoring methods ranked from the most impact of 46.2%

(painful aching 2–a) to least impact of 7.7% (life less satisfying 7–a).

There were statistically significant gender differences (p< 0.05) in relation to the effect of some oral-health related quality of life (Table 4). Males were found to have more trouble pronouncing words because of their teeth (23.3%). They were also more self conscious (22.3%), felt more tense (17.0%) and felt embarrassed more (18.7%) than females.

Table 5 shows a statistically significant decrease in some oral health - related quality of life with increasing age of the study population. The questions that had significant differences were "Have you been self conscious?" (Psychological discomfort), "Have you felt a bit embarrassed?" (Psychological disability) and "Have you been totally unable to function?"(Handicap).

There were also statistically significant differences on the impact of some Oral health related Quality of life in relation to the socio-economic status of the study population. The children of

Table 3: Response to Oral Health Impact Profile-14

OHIP-14 Questions	Response, N(%)				
	Never	Hardly Ever	Occasionally	Fairly Often	Very Often
1. Have you had problems pronouncing words because of your teeth?	604 (75.0)	38 (4.7)	105 (13.0)	28 (3.5)	30 (3.7)
2. Have you had worsening sense of taste?	649 (80.6)	45 (5.6)	72 (8.9)	25 (3.1)	14 (1.7)
3. Have you had painful aching from your teeth?	380 (47.2)	53 (6.6)	276 (34.3)	46 (5.7)	50 (6.2)
4. Have you found it uncomfortable to eat due to your teeth?	593 (73.7)	43 (5.3)	114 (14.2)	31 (3.9)	24 (3.0)
5. Have you been self-conscious of your teeth?	631 (78.4)	32 (4.0)	76 (9.4)	23 (2.9)	43 (5.3)
6. Do you feel tense due to problems with teeth?	651 (80.9)	39 (4.8)	73 (9.1)	22 (2.7)	20 (2.5)
7. Do you find your diet unsatisfactory because of your teeth?	674 (83.7)	36 (4.5)	62 (7.7)	11 (1.4)	22 (2.7)
8. Have your meals been interrupted due to your teeth?	628 (78.0)	46 (5.7)	92 (11.4)	18 (2.2)	21 (2.6)
9. Do you find it difficult to relax because of your teeth?	686 (85.2)	40 (5.0)	45 (5.6)	19 (2.4)	15 (1.9)
10. Do you feel a little embarrassed because of your teeth?	641 (79.6)	43 (5.3)	71 (8.8)	27 (3.4)	23 (2.9)
11. Do you feel a little irritable because of your teeth?	661 (82.1)	50 (6.2)	49 (6.1)	23 (2.9)	22 (2.7)
12. Do you find it difficult doing usual activities because of your teeth?	697 (86.7)	36 (4.5)	37 (4.6)	20 (2.5)	14 (1.7)
13. Do you find life less satisfying because of your teeth?	701 (87.1)	42 (5.2)	25 (3.1)	22 (2.7)	15 (1.9)
14. Do you find it totally unable to function because of your teeth?	682 (84.7)	27 (3.4)	56 (7.0)	24 (3.0)	16 (2.0)

Sum OHIP score is the response codes for 14 items to produce a single summary score for an individual

Table 4: Comparison of Oral Health Impact Profile by Sex

Subscale Domain	Question	Impact on QOL	Number (%) Female	Male	χ^2	P
1. Functional Limitation	1a. Had problems pronouncing words?	0	339 (82.7)	303 (76.7)		
		1	71 (17.30)	92 (23.3)	4.45	0.03*
	1b. Had worsening sense of taste?	0	352 (85.9)	342 (86.6)		
		1	58 (14.1)	53 (13.4)	0.09	0.76
2. Physical pain	2a. Had painful aching?	0	211 (51.5)	222 (56.2)		
		1	199 (48.5)	173 (43.8)	1.82	0.18
	2b. Uncomfortable to eat any food?	0	324 (79.0)	312 (79.0)		
		1	86 (21.0)	83 (21.0)	0.00	0.99
3. Psychological discomfort	3a. Have you been self-conscious?	0	356 (86.8)	307 (77.7)		
		1	54 (13.2)	88 (22.3)	11.49	0.00*
	3b. Felt tense?	0	362 (88.3)	328 (83.0)		
		1	48 (11.7)	67 (17.0)	4.54	0.03*
4. Physical disability	4a. Had an unsatisfactory diet?	0	366 (89.0)	344 (87.1)		
		1	44 (10.7)	51 (12.9)	0.92	0.34
	4b. Had to interrupt meals?	0	345 (84.1)	65 (15.9)		
		1	329 (83.3)	66 (16.7)	0.11	0.74
5. Psychological disability	5a. Found it difficult to relax?	0	374 (91.2)	352 (89.1)		
		1	36 (8.8)	43 (10.9)	1.01	0.32
	5b. Have felt a bit embarrassed?	0	363 (88.5)	321 (81.3)		
		1	47 (11.5)	74 (18.7)	8.33	0.00*
6. Social disability	6a. Have been irritable?	0	366 (89.3)	345 (87.3)		
		1	44 (10.7)	50 (12.7)	0.72	0.40
	6b. Had difficulty doing usual activities?	0	376 (91.7)	358 (90.6)		
		1	34 (8.3)	37 (9.4)	0.29	0.59
7. Handicap	7a. Felt life less satisfying?	0	384 (93.7)	359 (90.9)		
		1	26 (6.3)	36 (9.1)	2.18	0.14
	7b. Totally unable to function?	0	367 (89.5)	342 (86.6)		
		1	43 (10.5)	53 (13.4)	1.64	0.20

*QOL, Quality of Life; * p, Significant; 0, no impact on quality of life;   1, impact on quality of life*

skilled workers group (social class 3) had more painful aching in their mouth (53.2%) and had been a bit irritable with other people because of their teeth (16.9%) than children of other workers. The children of senior professionals group were found to be more self conscious because of their teeth (25.3%).

Orthodontic Treatment Needs and its Impact on Oral Health Related Quality of Life

Table 6 shows the relationship between orthodontic treatment need (DAI) and oral health related quality of life (OHIP-14). It reveals that 27.0% of the children with mandatory treatment (> 35) reported that their oral conditions had impact on their quality of life while the least impact on oral condition (16.0%) was

observed in children with elective treatment needs (26–30).

Table 6 shows the relationship of the prevalence of malocclusion using the DAI components and its effects on their quality of life, the impact was most prevalent in maxillary irregularity (85.4%) and least prevalent with reversed overjet (7.6%). There were statistically significant differences (p < 0.05) in the occurrences of missing teeth, diastema, maxillary irregularity and mandibular irregularity.

DISCUSSION

In this cross-sectional study, malocclusion and its impact on the quality of life were evaluated in randomly selected schoolchildren aged 12 to 16 years in Lagos, Nigeria. The study was conducted in public schools, which generally have children from a wide range of social

background. The sample gave an overview of the potential Nigerian orthodontic service consumers in an urban area. The response rate to the questionnaire was 100% and all the responses of the questionnaires were used in the data analysis.

Orthodontic Treatment Needs

In this study, irregularity of teeth was the most common form of malocclusion seen and this was more common in the maxilla (78.9%) than in the mandible (72.8%). In a study in South Africa,[3] both maxillary (59.5%) and mandibular (53.1%) irregularities accounted for the most common forms of malocclusion. However the only difference between the prevalence of irregularity in the present study and the South African study[3] could be due to the difference between popula-

Table 5: Relationship between Oral Health Impact Profile and Age in the Population Studied

Subscale Domain	Question	Impact	12	13	14	15	16	χ^2	p
1. Functional imitation	1a. Had problems pronouncing words?	No	56 (67.5)	95 (82.6)	112 (80.6)	182 (81.6)	197 (80.4)		
		Yes	27 (32.5)	20 (17.4)	27 (19.4)	41 (18.4)	48 (19.6)	8.94	0.06
	1b. Had worsening sense of taste?	No	71 (85.5)	91 (79.1)	119 (85.6)	194 (87.0)	219 (89.4)		
		Yes	12 (14.5)	24 (20.9)	20 (14.4)	29 (13.0)	26 (10.6)	7.12	0.13
2. Physical pain	2a. Had painful aching?	No	42 (50.6)	63 (54.8)	70 (50.4)	119 (53.4)	139 (56.7)		
		Yes	41 (49.4)	52 (45.2)	69 (49.6)	104 (46.6)	106 (43.3)	1.91	0.75
	2b. Uncomfortable to eat any food?	No	59 (71.1)	88 (76.5)	115 (82.7)	169 (75.8)	205 (83.7)		
		Yes	24 (28.9)	27 (23.5)	24 (17.3)	54 (24.2)	40 (16.3)	9.35	0.05
3. Psychological discomfort	3a. Have you been self-conscious?	No	61 (73.5)	86 (74.8)	116 (83.5)	188 (84.3)	212 (86.5)		
		Yes	22 (26.5)	29 (25.2)	33 (16.5)	35 (15.7)	33 (13.5)	12.66	0.01*
	3b. Felt tense?	No	64 (77.1)	99 (86.1)	120 (86.3)	193 (86.5)	214 (87.3)		
		Yes	19 (22.9)	16 (13.9)	19 (13.7)	30 (13.5)	31 (12.7)	5.74	0.22
4. Physical disability	4a. Had an unsatisfctory diet?	No	67 (80.7)	99 (86.1)	123 (88.5)	198 (88.5)	233 (91.0)		
		Yes	16 (19.3)	16 (13.9)	16 (11.5)	25 (11.2)	22 (9.0)	6.91	0.14
	4b. Had to interrupt meals?	No	67 (80.7)	95 (82.6)	120 (86.3)	181 (81.2)	211 (86.1)		
		Yes	16 (19.3)	20 (17.4)	19 (13.7)	42 (18.8)	34 (13.9)	3.45	0.49
5. Psychological disability	5a. Found it difficult to relax?	No	72 (86.7)	103 (89.6)	126 (90.6)	201 (90.1)	224 (91.4)		
		Yes	11 (13.3)	12 (10.4)	13 (9.4)	22 (9.9)	21 (8.6)	1.62	0.81
	5b. Have felt a bit embarrased?	No	61 (73.5)	93 (80.9)	116 (83.5)	191 (85.7)	223 (91.0)		
		Yes	22 (26.5)	22 (19.1)	23 (16.5)	32 (14.3)	22 (9.0)	17.43	0.00*
6. Social disability	6a. Have been irritable?	No	69 (83.1)	105 (91.3)	121 (87.1)	197 (88.3)	219 (89.4)		
		Yes	14 (16.9)	10 (8.7)	18 (12.9)	26 (11.7)	26 (10.6)	3.65	0.46
	6b. Had difficulty doing usual activities?	No	73 (88.0)	105 (91.3)	127 (91.4)	199 (89.2)	230 (93.9)		
		Yes	10 (12.0)	10 (8.7)	12 (8.6)	24 (10.8)	15 (6.1)	4.35	0.36
7. Handicap	7a. Felt life less satisfying?	No	77 (92.8)	103 (89.6)	124 (89.2)	206 (92.4)	233 (95.1)		
		Yes	6 (7.2)	12 (10.4)	15 (10.8)	17 (7.6)	12 (4.9)	5.81	0.21
	7b. Totally unable to function?	No	65 (78.3)	100 (87.0)	122 (87.8)	203 (91.0)	219 (89.4)		
		Yes	18 (21.7)	15 (13.0)	17 (12.2)	20 (9.0)	26 (10.6)	9.94	0.04*

tion groups studied. In comparison, spacing was mostly recorded[13] while crowding was mostly prevalent.[14, 15] Missing teeth (4.5%) and reversed overjet (5.3%) were less prevalent in this study, which is similar to the findings by Otuyemi et al.[13]

In the present study, tooth size " arch length discrepancy, which is said to be common among Nigerian adolescents – has spaced arches accounting for 58.8% and 43.2% for crowding.[16] Spacing conditions in Nigerians are commonly manifested as maxillary midline diastema which is often regarded as a sign of personal and natural beauty.[16,17] Similarly in this study, midline diastema was seen in almost one third of the study population. The high prevalence of midline diastema in the Nigerian population, compared to the low prevalence seen

in Caucasians, had been earlier reported.[3,14,18–21]

In the present study, there was a statistically significant difference reported in malocclusion when relating maxillary overjet with age, showing a higher prevalence of increased maxillary overjet in 12-year-olds (51.8%). In this age group, a South African[3] study reported significantly a higher prevalence of normal maxillary overjet (1–3mm) in permanent dentition stage than in mixed dentition stage. It is suggested that the morphological variation observed with age may not relate to chronological age but to the stages of dental development.[2] Another study[21] comparing two age groups (11–13 and 14–16 year olds) found improvement of maxillary overjet, anterior crowding and anterior irregularity with age. These temporary malocclusions

(example maxillary overjet, anterior crowding and anterior irregularity) are corrected with age because the child outgrows deforming habits and dental relationship.[21] There was no other statistically significant difference in malocclusion reported with socio demographic variables in this study.

About 38% of the population examined had a dental appearance that required slight or no orthodontic treatment. This prevalence is low when compared to other Nigerian studies.[13,22,23] The difference in prevalence values may be due to the genetic disposition and geographical location, Lagos being a cosmopolitan state with its different ethnic groups and interethnic marriages

There was no statistically significant relationship between DAI score and age in this study. This finding is similar to the

Table 6: The Relationship Between Orthodontic Treatment Needs and Oral Health Related Quality of Life

Orthodontic Treatment Need	DAI scores	Number (%) OHRQOL	Impact	χ^2	p
No treatment need or slight	0 – 25	63 (20.8)	240 (79.2)	6.83	0.078
Treatment elective	26 – 30	27 (16.0)	142 (84.0)		
Treatment highly desirable	31 – 35	28 (20.4)	109 (79.6)		
Treatment mandatory	>35	53 (27.0)	143 (73.0)		
DAI Components					
Missing teeth		16 (9.4)	24 (3.8)	8.85	0.00*
Crowding		70 (46.2)	275 (43.4)	0.44	0.51
Spacing		107 (62.6)	371 (58.5)	0.92	0.34
Diastema		65 (38.0)	190 (30.0)	4.03	0.05*
Maxillary irregularity		146 (85.4)	494 (77.9)	4.60	0.03*
Mandibular irregularity		136 (79.5)	455 (71.8)	4.16	0.04*
Maxillary overjet > 3mm		60 (35.1)	203 (32.0)	0.58	0.45
Reversed overjet		13 (7.6)	35 (5.5)	1.04	0.31
Openbite		14 (8.2)	45 (7.1)	0.24	0.63
Molar relationship		29 (17.0)	121 (19.1)	0.40	0.53

*OHRQOL, Oral Health Quality of Life; *, Significant; p, Value*

works of Otuyemi et al [13] and Baca–Garcia et al [14] but is in contrast to the findings of Estioko et al [21] who found a decrease in DAI scores with age. There was also no statistically significant gender difference seen in this study as has been reported in the literature on Nigerians.[13,23] However, some studies found gender to be significantly related to DAI, with girls having lower DAI than boys.[3, 15, 23] There was also no statistically significant socioeconomic difference found in this study which is also similar to other studies.[13,21,23] However a significant socio-economic difference was observed in studies carried out by Baca–Garcia [14] and Onyeaso.[25] The study by Onyeaso [25] was on a demand population and not an epidemiological study.

Oral Health Related Quality of Life

In the present study, 15.0% of the population experienced an impact on their oral health related quality of life, which is lower than that reported by Oliveira et al.[26] Questions on physical pain were ranked the highest impacts, especially with painful aching (46.2%). This shows that many of the subjects had impacts on the Oral Health Related Quality of Life due to possibly decayed teeth and other painful oral conditions and not necessarily due to the malocclusion. Physical pain, functional limitation and psychological discomfort impact were the most frequently reported problems that affected

people.[12] However, sight must not be lost of the very severe impact that mal-occlusion can have on some people's life to the extent that they feel totally unable to cope. This cannot readily be appreciated simply from knowledge of the clinical conditions that exist in a population. There is a need for dentists to consider how people live with their oral health state through the use of measures such as OHIP in order to appreciate where a person is so adversely affected by their dental condition that they are handicapped by it.

It was observed that there was statistically significant sex difference to the questions: "Had problems pronouncing words?", "Have you been self-conscious?", "Felt tense?" and "Have felt a bit embarrassed?" The boys had more impacts than girls. This could be associated with the fact that adolescence is an impressionable age for boys in terms of meeting girls, as it has been observed that at this stage in their lives most of them are concerned about the impression girls have about them in terms of outward appearance and speech. This is in contrast to the reports by Oliveira et al [26] and Steele et al [27] who found that females had more dental impact than males. Cultural differences could also account for the differences noted in the present Nigerian study and those of Oliveira et al [25] and Steele et al.[27]

There was also statistically significant age difference to the questions "Have you been self-conscious?", "Have felt a bit embarrassed?" and "Have been totally unable to function?"; showing an increase in the quality of life (that is decrease in impact) with increasing age. This finding is similar to the report by Steele et al [27] who carried out a study in two countries, in the United Kingdom and Australia. The data from both countries showed a general trend towards lower OHIP scores with increasing age. These findings are also similar to the study by Oliveira et al [26] who reported increase in dental impact in 15-year-olds than those aged 16 years.

A statistically significant difference was observed on impact in relation to socio-economic status, showing a higher prevalence of impact in the social class 3 (Skilled workers) to the questions "Have been irritable?" and "Had painful aching?", while a higher prevalence of impact was found in social class 1 (Senior professionals) to the question "Have been self conscious?". This greater degree of self consciousness amongst the high social class is not a surprise, since children of higher socio-economic class have a higher expectation of themselves and from their peers and possibly they have increased awareness of how good occlusion should be. To maintain that social class they have to keep up with their appearance and they are always conscious of how they are portrayed by others. However, Oliveira et al [26] reported that adolescents from low social class experienced more dental impacts than those from high social class.

Quality of life of patients is not closely related to the orthodontic treatment needs of the patient assessed by the clinicians.[26] In this study, it was found that the impact on the oral health related quality of life was highest (27%) in the group that required mandatory treatment and lowest (16%) in the group that had elective treatment needs. An interesting observation noted was that in the group that did not require orthodontic treatment, the impact on their quality of life was 20.8%. This shows that patient's desire for treatment may not correlate with those of orthodontists whose assessments may be biased. This is similar to a study by

Kok *et al* [28] who reported that children with a need for orthodontic treatment did not have a worse quality of life. Also Klages *et al* [29] reported that minor differences in dental aesthetics may have a significant effect on perceived Oral Health Related Quality of Life. There was a statistically significant difference ($p < 0.05$) on the impact of missing teeth, diastema, maxillary irregularity and mandibular irregularity on their quality of life. This shows that some form of malocclusion has an impact on their quality of life.

Reports on perception of malocclusion in Nigeria show that adolescent's consciousness of their malocclusion did not agree with their objectively determined orthodontic need.[22, 23, 30] This may indicate the patient's level of awareness in the population especially in the low socio-economic class. This suggests that if orthodontic treatment needs were based solely on orthodontic treatment need indices, many patients who do not actually have a psychosocial need for treatment would be treated. This has implications in any situation of prioritising patients for free or subsidised treatment. The results of the present study strongly suggest that it is more appropriate to supplement professionally determined orthodontic treatment needs, using indices such as Dental Aesthetic Index with an orthodontic quality of life measure for a better wholistic care for these patients.

Conclusion

Most Nigerian schoolchildren were found to have a dental appearance that needed orthodontic treatment, ranging from 'elective' to 'mandatory' treatment need. However, very few of them had components of the oral conditions that impacted on their quality of life. Adverse psycho-social effect on dental appearance may be a deterrent affecting quality of life of the individual even though orthodontic treatment is not required. This suggests that pscho-social need is very important in diagnosing patients for orthodontic treatment in addition to their treatment needs. More studies involving children from different areas of the country, especially rural settings are recommended.

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