Malocclusion and Orthodontic Treatment Needs of Public and Private Secondary School Students in North-Eastern Nigeria using the Dental Aesthetic Index (DAI)

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Abstract

Background: To determine the status of malocclusion and the orthodontic treatment needs among 12-18 year-old adolescents in Maiduguri, Northern Nigeria.

Method: The examined population comprised of 339 subjects from two socio-economically different communities in the city using Dental Aesthetic Index (DAI). Data was collected using specially designed recording chart. The chart included the age as at last birthday, the school, gender and all 10 parameters of the DAI. Intra and inter examiners' errors were very negligible. Analysis of variance (ANOVA) was used to assess differences between variables

Results: Overjet of 3mm or more was the most prevalent malocclusion trait. Most of the children (67%) had dental appearance where no orthodontic treatment was indicated. Over 18% of the subjects fell into malocclusion group where treatment is considered 'elective'. The rest of the sample had severe to handicapping malocclusion where treatment is considered 'highly desirable' (8.3%) and 'mandatory' (6.2%). There were no statistically significant differences (P>0.05) between DAI scores and age groups, gender and socioeconomic background of the students

Conclusion: The study showed that over two-thirds of the population had dental appearance that did not require orthodontic treatment. A significant proportion (14.5%) had severe to handicapping malocclusion where treatment is considered mandatory. Background of the subjects may not necessary have any bearing with developing malocclusion

Keywords: Malocclusion, Orthodontic treatment, Secondary School

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Introduction

Maiduguri, the capital of Borno state in North Eastern Nigeria is one of the largest cities in the Northern part of the country with an estimated population of 540,016 based on the 2006 national census[1]. It is located on the north bank of the seasonal Ngadda (*Alo*) River, the waters of which disappear in the *firki* ("black cotton") swamps just southwest of Lake Chad, about 113 km northeast. Its residents are mostly Muslims belonging to Kanuri, Shuwa, Babur-Bura and Fulani ethnic groups with a considerable Christian population.

There has been very little or no information on the orthodontic status in the entire North-eastern Nigeria. A search through the literature showed that only one descriptive epidemiological study was reported on the prevalence of malocclusion in the Northern part of the country which is mainly qualitative[2]. No previous attempt has been made to quantitatively assess the orthodontic treatment needs in the region. This investigation was facilitated by the creation of Faculty of Dentistry, College of Medical Sciences University of Maiduguri, first dental programme in the whole of Northern Nigeria. Since the establishment of their undergraduate dental programme, there has been a gradual increase in oral health personnel in the state with its attendant increase in oral health education and awareness among its citizenry. Sequel to this, there is a need for basic information on oral health burdens especially with regards to orthodontic status and treatment needs among various groups that would eventually lead to comprehensive oral health policy for the region.

The aim of the study was therefore to determine the status of malocclusion and the orthodontic treatment needs among 12-18 year-old adolescents in Maiduguri, a major trading hub in Northern Nigeria. It was also to identify whether age, gender and socio-economic class has any relationship with developing malocclusion in the region.

Subjects and Methods

The sample population comprised of 12-18 year-old secondary schoolchildren in two socio-economically different communities in the city. Approval to conduct the study was sort from the various school authorities.

Participants were selected through multistage random sampling. A list of all secondary schools within the metropolis was obtained from the Ministry of Education and was stratified into 2 groups; public and private. Three schools were randomly selected from each of the groups. In each school, 10 students were randomly selected from each academic year with a total of 60 students from the 6 junior and senior sections. Of the total number of 360 students selected, 339 (94.2%) students were eventually examined. Twenty-one students were eliminated from the study as a result of age discrepancies. To the best of our knowledge, none of the students has had any form of orthodontic treatment.

Data was collected through the use of a specially designed recording chart and intra oral clinical examination and recording was done by two members of the researchers. The recording chart included the age as at last birthday, the school, gender and all 10 parameters of the DAI. The authors were calibrated on 20 *Tsangaya* (*Almajiri System*) school children aged between 12-18 years and the intra and inter- examiners' errors were very negligible.

A validation exercise had already been carried out in a previous Nigerian study[3] using a randomly selected subset of 25 stimuli from the 200 stimuli used in the development of the standard DAI. These were rated by 200 rural and urban Nigerian secondary school students aged 12-18 years using a semantic differential instrument consisting of five pairs of polar adjectives separated by a six point scale. The rank-order correlation ($r = 0.84$; $P<0.001$) showed that the perceptions of dental aesthetics by the Nigerian students were similar to those of students in the United State of America where the index was developed.

The data collected in this study was coded and entered into a computer and analyzed using Statistical Package for Social Sciences (SPSS for windows, version 16.0 by IBM, Chicago.). Analysis of Variance (ANOVA) was used to assess statistical significance between variables, while taking P values less than 0.05 as significant values.

Results

A total number of 339 students were examined and data collected as seen in Table 1, 48% were males and 51% were females. Whilst one hundred and eighty students were examined at various public funded schools, 159 were from private schools. The age groups were grouped according to the most prevalent age groups in the junior (12-15) and senior (16-18) with the frequency of 172 and 167 respectively.

Table I Distribution of subjects according to their socio-demographic variables

	Frequency	Precentage
Gender		
Male	164	48.4
Female	175	51.6
School		
Public	180	53.1
Private	159	46.9
Age		
12-15	172	50.7
16-18	167	49.3

All the components of the Dental Aesthetic Index (DAI) were measures in all the patients. Frequencies of distribution of the various malocclusion traits according to DAI components are shown in Table 2. Eighteen percent and 34% of the students had crowding and spacing in more than one or more segments respectively, 23% had midline diastema. There were more irregularities in the maxillary arch than the mandibular arch with 37% of the subjects exhibiting 1mm or more discrepancies in the maxillary arch as against 24% seen in the mandible. Over jet of 3mm or more was the most prevalent malocclusion trait found in this study with 67% and the least was reversed overjet with 0.6%. Open bite was observed in 4.7% and molar relationship of one-half a cusp or more was observed in 7.4%.

Table II: Frequency distribution of malocclusion traits according to DAI components

DAI Component		Freq	%
Missing teeth (Incisors, Canines and Premolars)	≥1	4	1.2%
Crowding (Incisal segment)	1-2	61	18%
Spacing (Incisal segment)	1-2	116	34.2%
Midline Diastema (mm)	≥1	79	23.3%
Anterior Maxillary irregularity (mm)	≥1	127	37.5%
Anterior Mandibular irregularity (mm)	≥1	83	24.5%
Overjet (mm)	≥3	227	67%
Reversed Overjet (mm)	≥0	2	0.6%
Openbite (mm)	≥0	16	4.7%
Molar relationship	≥½ Cusp	26	7.4%

Table III shows the level of severity and orthodontic treatment needs of adolescents in Maiduguri according to the DAI. Most of the children (67%) had dental appearance where no orthodontic treatment need was indicated. Over eighteen percent of the subjects fell into malocclusion group where treatment is considered 'elective'. The rest of the sample (14.5%) had severe to handicapping malocclusion where treatment is considered 'highly desirable' (8.3%) and 'mandatory' (6.2%)

Table IV shows the results of analysis of variance of means DAI scores of Nigerian students according to socio-demographic variables. No statistically significance difference ($p>0.05$) were found in DAI scores between age groups, gender and

Table III: Orthodontic treatment needs of 12-18 year old school children in Maiduguri metropolis according to DAI

DAI Score	Severity levels	Freqency	%
<25	Normal or Minor malocclusion No treatment needed	227	67%
26-30	Definite malocclusion Treatment needed	63	18.6%
31-35	Severe malocclusion Treatment highly desirable	28	8.3%
>36	Very severe (Handicapping) malocclusion Treatment mandatory	21	6.2%

Table IV: Mean, standard deviations, and confidence intervals of DAI scores of 12-18 year olds in Maiduguri according to socio-demographic variables.

Variable	Num	Mean ± SD	95%CI	df	F ratio	P value
Age (years)						
12-15	172	1.55 ± 0.880	1.42-1.68	1;337	0.106	0.745
16-18	167	1.52 ± 0.897	1.38-1.66			
Gender						
Male	164	160 ± 0.981	1.46-1.74	1;337	1.487	0.223
Female	175	1.48 ± 0.857	1.35-1.61			
School funding						
Public	180	1.57 ± 0.891	1.44-1.70	1;337	0.432	0.512
Private	159	1.50 ± 0.885	1.36-1.64			

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Discussion

Nigeria is a culturally and socially diverse country with varying degree of oral health challenges. In recent times, there have been several reported studies on oral health status and needs among different Nigerian populations with some focused on the orthodontic status[4-8]. Due to multiplicity of measurement methods and difficulty in standardizing criteria, it has been difficult to have a uniform method of epidemiological assessment and grading of malocclusion.

McLain and Profitts[9] reported that occlusal problems cannot be defined solely in physical terms. The psychosocial consequences of malocclusion due to unacceptable dental aesthetics may be as serious or even more serious than the biological problems. With increasing accountability of health care services, a reproducible and valid malocclusion index like DAI used in this study is advantageous for determining treatment needs, service planning and evaluation in this Nigerian population. Shaw et al.[10] outlined the advantages of a standardized criteria for assessment which included uniformity in treatment prescription, safeguard for patients and the monitoring and promotion of standards.

It is worthy of note that of all the studies carried out in Nigeria, none has focused on the severity of malocclusion and treatment needs of the Northern population of the country. However, this study showed that two-thirds of the subjects examined had a dental appearance that required no need for orthodontic treatment. This is comparable with the findings of Otuyemi et al [7] using the same index in the same age group in southwest Nigeria. They observed that 77% of the subjects examined required no orthodontic treatment need. This is quite high when compared with studies in the US [11], Japan [12] and Australia [13].

There seems to be a considerable proportion of the population (14.5%) with severe to handicapping malocclusion where treatment is mandatory based on DAI scores. This figure appears to be slightly higher than the previously reported study[7] in the southwest Nigeria (9.2%).

With regards to different malocclusion traits, it is interesting to note that overjet of 3mm or greater appears to be the most predominant trait (67%) in this study. This is significantly different from the findings in the southwest Nigeria[7] which reported incisal spacing as the most common malocclusion trait. It is notable from this study that malocclusion and orthodontic treatment need vary significantly between the Southern and Northern part of the country according to the DAI scores.

Like many other reported studies [7, 12, 14, 15], this investigation did not demonstrate any significant differences in socio-demographic variables. This implies that the socio-demographic background of individuals such as age, gender and socio-economic status may not necessary have any bearing with developing malocclusion.

Conclusion

This investigation showed that over two-thirds of the population had dental appearance that did not require orthodontic treatment. However, a significant proportion of the population had severe to handicapping malocclusion (14.5%) where treatment is considered mandatory. The most common malocclusion trait was increased overjet.

The study also showed that the socio-demographic background of individuals may not necessary have any bearing with developing malocclusion.

Contributors

Disa HA, was responsible for study design, data collection, statistical analysis, interpretation of results critical review and editing. Modu MA, was responsible for study design, data collection, statistical analysis, interpretation of results critical review and editing. Sukai SS, was responsible for study design, data collection, statistical analysis, interpretation of results critical review and editing. Ligali TO, was responsible for conceptualization of research topic, study design, interpretation of results critical review and editing. Otuyemi OD was responsible for Conceptualization of research topic, study design, critical review and editing.

References

1. Nigerian Population Census 2006. Federal Republic of Nigerian Official Gazette Abuja. 2009; 96 (2): B1-42
2. daCosta O.O. The prevalence of malocclusion among a population of northern Nigerian school-children. West Afr J Med. 1999; 18:91-96
3. Otuyemi OD, Ogunyinka A., Dosumu O Cons NC, Jenny J. Perceptions of dental aesthetics in the USA and Nigeria. Community Dent Oral Epidemiol.1998; 26:418-420.
4. Akpata ES Jackson D. Overjet values in children and young adults in Lagos. Community Dent Oral Epidemiol 1979; 7: 174-176
5. Isiekwe MC. Malocclusion in Lagos. Community Dent Oral Epidemiol. 1983; 11:59-62
6. Otuyemi OD, Abidoye RO. Malocclusion in 12 year-old suburban and rural Nigerian children. Community Dent Health. 1993;10:375-380.
7. Otuyemi OD, Ogunyinka A, Dosumu O, Cons NC, Jenny J Malocclusion and orthodontic treatment need of secondary school students in Nigeria according to the dental aesthetic index (DAI). Int Dent J 1999; 49: 203-210
8. Onyeaso CO, Prevalence of malocclusion among adolescents in Ibadan, Nigeria. Am J Orthod 2003 125:604-607
9. McLain JB, Profitt WR. Oral health status in the United States. Prevalence of malocclusion. J Dent Edu 1985; 49:386-396
10. Shaw WC, Richmond S, O'Brien KD, Brook PH, Stephen CD. Quality control in orthodontics: indices of treatment need and treatment standards, Br Dent J 1991; 170:107-112.
11. Cons NC, Jenny J et al. Comparing perceptions of dental aesthetics in the USA with those in eleven ethnic groups. Int Dent J. 1994; 44:489-494.
12. Ansai T, Miyazaki H, Katoh Y, et al. prevalence of malocclusion in high school students in Japan according to the Dental Aesthetic Index. Community Dent Oral Epidemiol 1993; 21: 303-305
13. Estioko LJ, Wright FAC, Morgan MV. Orthodontic treatment need of secondary school children in Heidelberg, Victoria: an epidemiological study using the Dental Aesthetic Index, Community Dent Health 1994; 11: 147-15
14. Corrucini RS, Whiley LD, Occlusal variation in Kentucky Community. Am J Orthod 1981; 79: 250-262
15. Corrucini RS, Koul S, Chopra SRK, et al. Epidemiological survey of occlusion in North India. Br J Orthod 1983; 10: 44-47

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