

Malocclusion and occlusal traits among orthodontic patients seen at the University of Benin Teaching Hospital, Nigeria

*Ajayi EO, Ize-Iyamu IN

Orthodontic Unit, Department of Preventive Dentistry,
Faculty of Dentistry, University of Benin, Nigeria

*Correspondence: Ajayi EO

Email: buskyet@yahoo.com

Abstract

Objective: The aim of this study was to determine the prevalence and trend of malocclusion and occlusal traits among orthodontic patients in Benin City.

Method: One hundred and thirty one patients, consisting of 71 females (54.2%) and 60 males (45.8%) aged 5 - 44 years (mean 17.9 ± 7.5 years) who presented for orthodontic treatment at the University of Benin Teaching Hospital Dental Centre were assessed for sagittal molar occlusion, overjet, overbite, crossbite, open bite, crowding, spacing, median diastema, midline shift, malformed and supernumerary teeth, displaced, unerupted and impacted teeth. Statistical gender differences in the occlusal traits were evaluated with the chi-square test.

Result: The results revealed high prevalence of Angle's class I malocclusion (71.8%), while 9.9% of the subjects had Angle's Class II division 1, 7.6% had Angle's Class II division 2 and 10.7% had Angle's class III malocclusion. An increased overjet greater than 3.5mm was observed in 43.5% while increased overbite was observed in 25.2%. Anterior open bite was seen in 8.4% while 21.4% and 12.2% had anterior and posterior crossbites respectively. Midline shift was present in 29.8%, crowding of both upper and lower anterior segments was observed in 47.3%, spacing in the upper and lower anterior segments was present in 22.1%, and midline diastema was observed in 21.4%. No statistically significant gender differences were observed for any of the occlusal variables evaluated ($P > 0.05$).

Conclusion: This study revealed high prevalence of class I malocclusion, increased overjet and crowding among the orthodontic patients seen in Benin City, Nigeria.

Key words: Malocclusion, occlusal traits, orthodontic patients, Nigerian

Introduction

The availability of information on the prevalence of malocclusion and various occlusal traits existing among patients who presented for orthodontic treatment would facilitate efficient planning and provision of orthodontic care. It would also provide a database that will be useful in strategic planning and prioritization of orthodontic services. The determination of different malocclusion and their incidence will also facilitate arrangement of adequate and appropriate manpower and ensure judicious utilization of resources to provide effective orthodontic services for treatment of malocclusion within a population. Malocclusion describes a spectrum of deviation from the ideal or normal occlusion to very severe anomalies. Malocclusion was classified under the heading of Handicapping Dentofacial anomaly by the World Health Organisation⁽¹⁾ and was described as "an anomaly which causes disfigurement or which impedes function and which requires treatment if the disfigurement or functional defect is, or is likely to be an obstacle to the patient's physical or emotional well being." Several epidemiological studies have shown differences in the prevalence and distribution of malocclusion in different populations which could be attributed to the differences for specific ethnic and racial groups. However, variations due to possible

influences of differences in methods of registration of malocclusion and sample composition are also important factors to be considered in interpretation and comparison of reports⁽²⁾.

Epidemiological studies have also shown prevalence of malocclusion among Nigerian population. However, only few studies have analysed the distribution and pattern of malocclusion among Nigerian orthodontic patients and were limited to patients seen in Lagos and Ibadan in southwestern Nigerian with reported findings of high prevalence of class I malocclusion among the orthodontic patients⁽³⁻⁵⁾.

An earlier epidemiological survey has reported high prevalence of class I malocclusion among school children in Benin City, south-southern region of Nigeria⁽⁶⁾. However, there was no information available on the distribution of malocclusion and individual occlusal anomalies among orthodontic patients seen at the University of Benin Teaching Hospital Dental Centre that could provide information on the trend of malocclusion and occlusal traits in this region of the Country. The University of Benin Teaching Hospital Dental Centre is a foremost tertiary and referral Hospital in the south-southern region of Nigeria which now has a purposeful and functional Orthodontic unit since the past six years with the appointment of new consultant orthodontists at the Dental centre.



The orthodontic unit has since assumed full responsibility for the prevention, diagnosis and management of malocclusion of teeth and malrelationship of the dental arches in this region and neighboring states. It is therefore desirable to obtain information by analysis of the pattern of malocclusion observed among the patients who presented for orthodontic treatment in this orthodontic unit.

Therefore, the aim of this study was to determine the prevalence of malocclusion and occlusal traits existing among the patients who presented for orthodontic treatment at University of Benin Teaching Hospital Dental Centre between January 2004 - December 2009.

Materials and method

The dental records of patients who presented for treatment in the Orthodontic unit of the Dental Centre of the University of Benin Teaching Hospital, Benin City between January 2004 and December 2009 were analysed retrospectively.

The clinical examinations of all the patients were carried out in the Orthodontic unit of the Dental centre with the use of mouth mirror, graduated probe and a millimeter ruler. The patients were examined for occlusal traits which included the occlusal antero-posterior molar relationship, overjet, overbite, openbite, crossbite, spacing, crowding, midline diastema, midline shift and dental anomalies of prolonged retention of deciduous teeth, missing permanent teeth or unerupted teeth, malformed and supernumerary teeth.

Angle's classification⁽⁷⁾ was used to assess the buccal sagittal anteroposterior relationship of the upper and lower dental arches using the first permanent molars to determine molar occlusion. Assessment was made only on incisors and canines where the first molars were missing.

Overjet was defined as the horizontal measurement between the labio-incisal edges of the most prominent maxillary central incisors to the labial surface of the corresponding mandibular central incisors. It was measured with a graduated probe and millimeter ruler and evaluated to the nearest 0.5mm. An overjet value greater than 3.5mm was considered to be increased and less than 1mm to be reduced. The overjet was considered to be reversed when the maxillary central incisors were biting in lingual occlusion, which were further described as anterior crossbite.

Overbite, which is the vertical relationship of the maxillary and mandibular incisors, was recorded as normal when the degree of overlap of the maxillary central incisors was between one third and one half of the clinical crown of the mandibular central incisors. The overbite was considered increased when the degree of overlap of maxillary central incisors was greater than one half of the clinical crown of the mandibular central incisors and reduced if the degree of overlap was less than one third. An edge to edge incisor relationship was recorded when the maxillary and mandibular incisors occluded on their incisal edges.

Anterior open bite was recorded when incisal edges of the maxillary incisors did not overlap the incisal edges of the mandibular incisors.

Posterior crossbite was considered lingual when the buccal cusp of the maxillary tooth occluded lingual to the maximum height of the buccal cusp of the opposing mandibular tooth. Buccal posterior crossbite (scissors bite) was recorded when the lingual cusp of the maxillary tooth

occluded buccal to the maximum height of the buccal cusp of the opposing mandibular tooth.

Crowding was defined as overlapping of erupted teeth as a result of insufficient space or lack of space for teeth to erupt in a segment.

Spacing was recorded to be present when there was no approximal contact between teeth in a range of 1mm or more within a segment.

Maxillary median diastema was recorded when a space of 2mm or more existed between the maxillary central incisors.

Midline shift was recorded when the maxillary and mandibular midlines were not coincident, with the displacement of 2mm or more when the posterior teeth were in maximum intercuspation.

Malformed tooth was recorded for any erupted incisor of abnormal size or shape whose mesiodistal width was reduced or increased by 2mm or more.

The re-examination of 15 randomly selected patients' records 3 weeks after initial examination indicated good intra examiner reliability as there was no statistically significant differences between the initial and repeated data ($p > 0.05$).

The data analysis was carried out with Statistical Package for Social Sciences software version 16 (SPSS, Chicago, Illinois). Statistical significance between frequencies and gender differences were evaluated with the chi-square test and $p < 0.05$ was regarded as significant.

Result

A total of 131 patients, 71 females (54.2%) and 60 males (45.8%) aged 5 - 44 years with a mean age of 17.9 years \pm 7.5 were analyzed.

Table 1 shows the age and sex distribution of the subjects. Angle's class I malocclusion (71.8%) was most prevalent among the patients, 9.9% had Angle's Class II division 1, 7.6% had Angle's Class II division 2 while 10.7% of the patients had Angle's class III malocclusion as shown in **Table 2**.

Increased overjet was observed in 43.5% of the patients and overjet was decreased in 4.6% tending towards edge

Table 1. Age and sex distribution of subjects in the study

Age(years)	Females		Males		Total	
	N	(%)	N	(%)	N	(%)
5 - 9	8	(11.3)	8	(13.3)	16	(12.2)
10 - 14	14	(19.7)	18	(30.0)	32	(24.4)
15 -19	19	(26.8)	18	(30.0)	37	(28.2)
20 - 24	19	(26.8)	5	(8.3)	24	(18.3)
25 - 29	6	(8.5)	6	(10.0)	12	(9.2)
30 - 34	3	(4.2)	4	(6.7)	7	(5.3)
35 - 39	1	(1.4)	1	(1.7)	2	(1.5)
40 - 44	1	1.4	0	(0.0)	1	(0.8)
Total	71	(100)	60	(100)	131	(100)

Mean age = 17.9, Standard deviation = 7.47

to edge in 2.3% as shown in **Table 3**. Increased overbite was present in a quarter of the patients (25.2%) while 8.4% had decreased overbite. Anterior open bite was present in 8.4% of the patients and ranged from 2 to 10mm. An anterior crossbite was found in one fifth of the patients (21.4%) while posterior crossbite was observed in 12.2% which was evenly distributed lingually and buccally (scissor bite) **Table 4**.



Table 2. Gender distribution of molar relationship using Angle's classification

Angle's classification	Females		Males		Total	
	N	(%)	N	(%)	N	(%)
Class I	52	(73.2)	42	(70.0)	94	(71.8)
Class II Div. I	5	(7.0)	8	(13.3)	13	(9.9)
Class II Div. 2	5	(7.0)	5	(8.3)	10	(7.6)
Class III	9	(12.7)	5	(8.3)	14	(10.7)
Total	71	(100)	60	(100)	131	(100)

$\chi^2 = 1.989$ **P value > 0.05**

Table 3. Distribution of overjet and overbite

Overjet	Females		Males		Total	
	N	(%)	N	(%)	N	(%)
Normal	37	(52.1)	28	(46.7)	65	(49.6)
Increased	28	(39.4)	29	(48.3)	57	(43.5)
Decreased	5	(7.0)	1	(1.7)	6	(4.6)
Edge to Edge	1	(1.4)	2	(3.3)	3	(2.3)
Total	71	(100)	60	(100)	131	(100)

$\chi^2 = 3.364$ **P > 0.05**

Overbite	Females		Males		Total	
	N	(%)	N	(%)	N	(%)
Normal	43	(60.6)	34	(56.7)	77	(58.8)
Increased	13	(18.3)	20	(57)	33	(25.2)
Decreased	8	(11.3)	3	(5.0)	11	(8.4)
Edge to Edge	7	(9.9)	3	(5.0)	10	(7.6)
Total	71	(100)	60	(100)	131	(100)

$\chi^2 = 5.53$ **P > 0.05**

Table 4. Distribution of open bite and crossbite among the subjects

Overbite	Females		Males		Total	
	N	(%)	N	(%)	N	(%)
Anterior open bite						
Absent	66	(93.0)	54	(90.0)	120	(91.6)
Present	5	(7.0)	6	(10.0)	11	(8.4)
Total	71	(100)	60	(100)	131	(100)

$\chi^2 = 0.370$ **P value > 0.05**

Anterior cross bite	Females		Males		Total	
	N	(%)	N	(%)	N	(%)
Absent	55	(77.5)	48	(80.0)	103	(78.6)
Present	16	(22.5)	12	(20.0)	28	(21.4)
Total	71	(100)	60	(100)	131	(100)

$\chi^2 = 0.724$ **P value > 0.05**

Posterior crossbite	Females		Males		Total	
	N	(%)	N	(%)	N	(%)
Absent	63	(88.7)	52	(86.7)	115	(87.8)
Present	5	(11.3)	8	(13.3)	16	(12.2)
Total	71	(100)	60	(100)	131	(100)

$\chi^2 = 0.129$ **P value > 0.05**

Crowding of maxillary and mandibular anterior segments was present in 47.3% of the patients while crowding limited only to the maxillary or mandibular arch was less frequent. (Table 5). Spacing of both the maxillary and mandibular anterior segments was seen in 22.1% of the patients, 12.2% had spacing limited to the maxillary arch while less than 1% had spacing only in mandibular anterior segments. Maxillary median diastema was observed in one fifth of the patients (21.4%) while midline shift was found in 29.8% (data not shown).

Table 6 shows the assessment of some dental anomalies evaluated; 12.2% had prolonged retention of deciduous teeth, which were mostly primary canines in maxillary and mandibular arches in patients above 13 years old. Buccal displacement of canine was observed in almost one fifth of the patients. Microdont teeth were rare among the patients and malformed teeth due to hypoplasia were seen in 6.9%. Supernumerary teeth were found in (3.8%). Unerupted canine was clinically and radiographically diagnosed in 7.6% of the patients above 13 years old (data not shown), while 14.5% of the patients had oral habits with thumb sucking and lip sucking being most prevalent (4.6%)

Discussion

The Angle's class I malocclusion was most prevalent among the subjects (71.8%) and was fairly distributed among the sexes ($P > 0.05$). The highest distribution of class I malocclusion observed among these patients seen at the University of Benin Teaching Hospital Dental centre is consistent with previous findings among school children in Benin City⁽⁶⁾ and also the report of highest prevalence of class I malocclusion of 76.5% and 48% among orthodontic patients seen at the Dental centres of the University College Hospital⁽⁵⁾ and Lagos University Teaching Hospital⁽⁴⁾ respectively. There was low prevalence of class II and class III malocclusions and both classes accounted for just slightly over a quarter of all the malocclusions seen among the orthodontic patients at Benin City. This observation was also consistent with lower prevalence of class II and class III malocclusions reported among Nigerian subjects^(6,8,9) but in contrast to high prevalence of class II malocclusion among Iranian children⁽¹⁰⁾, Swedish adolescents and Asian immigrants⁽¹¹⁾ and English children⁽¹²⁾ which could be attributed to racial differences in

Table 5. Distribution of crowding in the anterior segments

Crowding in the anterior segments	Females		Males		Total	
	N	(%)	N	(%)	N	(%)
Crowding in						
Upper arch	5	(7.0)	5	(8.3)	10	(7.6)
Lower arch	4	(5.6)	3	(5.0)	7	(5.3)
Upper & Lower	35	(49.3)	27	(45.0)	62	(47.3)
Absent	27	(38.0)	25	(41.7)	52	(39.7)
Total	71	(100)	60	(100)	131	(100)

$\chi^2 = 0.331$ **P value > 0.05**

Spacing in the segments	Females		Males		Total	
	N	(%)	N	(%)	N	%
Crowding in						
Upper arch	9	(12.7)	7	(11.7)	16	(12.2)
Lower arch	1	(1.4)	0	(0.0)	1	(0.8)
Upper & Lower	14	(19.7)	15	(25.0)	29	(22.1)
Absent	47	(66.2)	38	(63.3)	85	(64.9)
Total	71	(100)	60	(100)	131	(100)

$\chi^2 = 1.323$ **P value > 0.05**

prevalence of malocclusion. An increased overjet which ranged above 3.5mm to 15mm was observed among 43.5% of the orthodontic patients and this frequency was higher than 28.1% reported among

Table 6. Distribution of dental anomalies among the subjects

	Females		Males		Total	
	N	(%)	N	(%)	N	(%)
Prolonged retention of deciduous teeth						
Absent	59	(83.1)	56	(93.3)	115	(87.8)
Present	12	(16.9)	4	(6.7)	16	(12.2)
$\chi^2 = 3.177$ P value >0.05						
Displaced canine						
Absent	59	(83.1)	47	(78.3)	106	(80.9)
Present	12	(16.9)	13	(21.7)	25	(19.1)
$\chi^2 = 0.478$ P value >0.05						
Malformed teeth						
Absent	66	(93.0)	56	(93.3)	122	(93.1)
Present	5	(7.0)	4	(6.7)	9	(6.9)
$\chi^2 = 0.007$ P value > 0.05						
Supernumerary teeth						
Absent	67	(94.4)	59	(98.3)	126	(96.2)
Present	4	(5.6)	1	(1.7)	5	(3.8)
$\chi^2 = 1.394$ P value > 0.05						

Table 7. Distribution of habits among the subjects

Oral habits	Females		Males		Total	
	N	(%)	N	(%)	N	(%)
Thumb sucking	2	(2.8)	4	(6.7)	6	(4.6)
Finger sucking	1	(1.4)	2	(1.7)	2	(1.5)
Tongue thrusting	2	(2.8)	3	(5.0)	5	(3.8)
Lip sucking	4	(5.6)	2	(3.3)	6	(4.6)
Absent	62	(87.3)	50	(83.3)	112	(85.5)
Total	71	(100)	60	(100)	131	(100)
$\chi^2 = 1.909$ P value > 0.05						

Iranian children using same registration method for overjet⁽¹⁰⁾. An increased overbite was observed in a quarter of the orthodontic patients assessed. Decreased overjet and overbite tending towards edge to edge incisor relationship was less than ten percent among these subjects. However, the frequency of normal overjet and overbite obtained in this study were lower than 68.3% and 81.8% previously reported in Benin school children⁽⁶⁾ as normal overjet and overbite values respectively. This could be attributed to the composition of this present sample who were mostly patients who presented for orthodontic treatment because of their malocclusion. Further evaluation of vertical anomalies in the incisor region revealed symmetrical anterior open bite which was twice more than frequency previously reported among Benin children⁽⁶⁾ and consistent with findings among urban Iranian children⁽¹⁰⁾ but lower than prevalence of 15% reported among Tanzanian children^(6,10,13). Anterior cross bite was found in one fifth of the patients and distribution between unilateral and symmetrical crossbite were even. The evaluation of the frequency of anterior crossbite in this study in relation to the percentages of the patients who had class III malocclusion showed that some of the patients only had anterior crossbite that were limited to the labial segment and associated more with class I malocclusion and as such could benefit from early interceptive orthodontic therapy. The prevalence of posterior crossbite among the orthodontic patients was higher than 4.5% previously

reported⁽⁶⁾ but similar to findings among Italian children⁽¹⁴⁾. The frequency of lingual and buccal (scissor) crossbite among the patients were also evenly distributed. The evaluation of dentoalveolar relationship showed the prevalence of crowding was twice as common as spacing in the upper and lower anterior segment among the orthodontic patients. A similarly higher prevalence of crowding (52.1%) was reported among Colombian children compared to spacing in a just a quarter of the children⁽²⁾. However in the present study, crowding and spacing limited to only upper and lower segment independently was relatively few especially spacing of the lower arch that was less than one percent. Crowding of upper anterior teeth could therefore be one of the probable reasons for seeking orthodontic treatment among these patients even though the reasons for seeking orthodontic treatment was not within the scope of the present study. Midline diastema was observed in one fifth of the patients and was slightly higher than 19.8% previously reported in Benin school children⁽⁶⁾. Midline shift was observed in 29.8% and was higher than 22.5% reported among Tanzanian children⁽¹³⁾. The evaluation of prolonged retention of deciduous teeth among the patients who were above 13 years old revealed that just slightly over ten percent presented with prolonged retention of deciduous canine especially the upper left canine while radiographically confirmed unerupted canine in the same age group was observed in 7.6% which was predominant among the females. The displacement of canine buccally was observed in almost one fifth of the subjects and possibly contributed further to the crowding and impaired dental aesthetics observed in the anterior segment and probably also motivated patients for orthodontic treatment. Microdont teeth including peg shaped lateral incisors were rare among these patients and malformed teeth essentially due to hypoplasia were observed in 6.9%. Supernumerary teeth were also rare in these patients. Oral habits were rare among these orthodontic patients and were observed in 14.5% with the thumb sucking and lip sucking being the commonest oral habits reported.

Conclusion

This study revealed high prevalence of Class I malocclusion, increased overjet and crowding as the common features of malocclusion among the orthodontic patients seen in Benin City, south-southern region of Nigeria with no statistically significant gender difference observed for any occlusal traits. This study therefore provided essential baseline data on the prevalence of malocclusion that will aid in further planning and provision of orthodontic care and service in this region of Nigeria.

References

1. Standardisation of reporting of dental diseases and condition. The assessment of handicapping dentofacial anomalies. Technical Reporting Series, No. 242 Geneva, World Health Organisation, 1962.
2. Thilander B, Pena L, Infante C, Parada SS, De Mayorga C. Prevalence of malocclusion and orthodontic treatment in children and adolescents in Bogota, Colombia. An epidemiological study related to different stages of dental development. *Eur J Orthod* 2001; 23: 153 - 167.



3. Richardson A, Ana RR. Occlusion and malocclusion in Lagos. *J Dent* 1973; 1: 134 - 139.
4. Isiekwe MC, Logan W W. An analysis of the first 100 orthodontic patients treated in Lagos University Teaching Hospital. *Nig Dent J* 1981; 2: 1 - 5.
5. Onyeaso CO, Aderinokun GA, Arowojolu MO. The pattern of malocclusion among orthodontic patients seen in Dental Centre, University College Hospital, Ibadan, Nigeria. *Afr J Med Sci* 2002; 31:207 - 211.
6. Ajayi EO. Prevalence of malocclusion among school children in Benin City, Nigeria. *J Med Biomed Res* 2008; 7: 58 - 65.
7. Angle EH. Classification of malocclusion. *Dental Cosmos* 1899; 41: 248 - 264.
8. Onyeaso CO Prevalence of malocclusion among adolescents in Ibadan, Nigeria. *Am J Orthod Dentofacial Orthop* 2004; 126: 604 - 607.
9. daCosta OO. The prevalence of malocclusion among a population of northern Nigeria school children. *West Afr J Med* 1999; 18: 91 - 96.
10. Borzabadi-Farahani A, Borzabadi-Farahani A, Eslamipour F. Malocclusion and occlusal traits in an urban Iranian population. An epidemiological study of 11- to 14-year-old children. *Eur J Orthod* 2009; 31: 477 - 484.
11. Josefsson E, Bjerklín K, Lindsten R. Malocclusion frequency in Swedish and immigrants adolescents - influence of origin on orthodontic treatment need. *Eur J Orthod* 2007; 29: 79 - 87.
12. Haynes S. The prevalence of malocclusion in English school children aged 11 - 12 years. *Eur Orthod Soc Trans* 1970, 89-98.
13. Mtaya M, Brudvik P, Lstrím AN. prevalence of malocclusion and its relationship with socio-demographic factors, dental caries, and oral hygiene in 12- to 14-year-old Tanzanian school children. *Eur J Orthod* 2009; 31: 467 - 476.
14. Ciuffolo F, Manzoli LM, D'Attilio M et al. Prevalence and distribution by gender of occlusal characteristics in a sample of Italian secondary school students: a cross-sectional study. *Eur J Orthod* 2005; 27: 601 - 606.