

Nigerian Journal of Research in Orofacial Infections & Oncology (NJROIO)

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Periodontal Status of Patients with Mandibular Anterior Crowding

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ABSTRACT

Objective: To determine the periodontal status among patients with mandibular anterior crowding and to determine the severity of periodontal diseases among patients with different severity of crowding.

Methods: The cross-sectional study was conducted among patients aged 18 and 40 years attending the Periodontology clinic of University of Benin Teaching Hospital with mandibular anterior crowding between April and July 2018. The controls group, without mandibular anterior crowding, were also selected. Malocclusion was assessed using Occlusion Feature Index by Poulton and Aaronson (1961), with a modification, while gingival status and oral hygiene was assessed with Sulcular Bleeding Index by Muhlemann and Son (1971) and Plaque Index by Loe and Silness (1964).

Results: A total of 36 patients with mandibular anterior crowding and 36 patients without crowding participated in this study. Three-quarter 27 (75.0%) of patients with crowding had poor oral hygiene and about half 19 (52.8%) of those without crowding had poor oral hygiene. Mean sulcular bleeding score and mean plaque score were significantly higher in participants with crowding than those without crowding. There was statistically insignificant increase in mean plaque score and mean sulcular bleeding score with corresponding increase in pattern of crowding.

Conclusion: Mandibular anterior crowding was associated with poorer oral hygiene assessed with plaque index and worse gingival status assessed with sulcular bleeding index. Severe crowding was seen to lead to poorer oral hygiene and higher periodontal diseases. Optimizing periodontal health will be a ranked reason for orthodontic correction of mandibular anterior crowding

Keywords: Crowding, Oral hygiene, Periodontal disease

INTRODUCTION

Periodontal disease, a chronic inflammatory disease of the supporting tissues around the teeth has affected mankind since the earliest of times (Offenbacher, 1996). It is a significant contributor to tooth loss among adults in Nigeria (Danielson et al., 2011). Evidence support that the elimination of all oral infections including periodontal disease, is important to overall health (Petersen, 2003). Periodontal disease, with its primary aetiology agent as plaque, can be worsened in the presence of secondary aetiological factors. The secondary aetiological factor can be local or systemic but the influence of local factors is dominant because they facilitate the accumulation of plaque and also limits the total removal. These local secondary aetiological factors are sometimes called plaque retentive factors and they include calculus, fracture, cracks, stains, enamel defects as in hypoplasia,

malocclusion, removable and fixed orthodontic appliances, removable dentures, overhanging restoration, poorly contoured crowns and bridges.

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Malocclusion, defined as an irregularity of the teeth or an incorrect placement of the dental arches that is outside the ideal range, is the third most important oral health problem in the world population (Nalcaci et al., 2012). It may occur in form of malposition, crowding, spacing, rotation, proclination, tipping, etc. which have been shown to interfere with proper home care plaque control thereby increasing the potential for periodontal disease (Bollen, 2008; Mtaya et al., 2009). Crowding as a form of malocclusion hampers optimal interdental cleaning,

plaque control and ultimately the maintenance of periodontal health. The implication is that most individuals with crowding have deficient oral hygiene and the accumulated plaque will cause periodontal disease, usually starting with gingival inflammation. When the periodontium is affected, the individual's genetic susceptibility may affect the chances of an increase in disease severity (Gusmão et al., 2011). There is paucity of research on the effect of malocclusion on the degree of periodontal disease in Nigeria. The objective of this study was to determine the periodontal status among people with mandibular anterior crowding and to determine the severity of periodontal diseases among patients with varying severity of crowding.

MATERIALS AND METHODS

The cross-sectional study was conducted among patients aged 18 and 40 years attending the Periodontology clinic of University of Benin Teaching Hospital with mandibular anterior crowding between April and July, 2018. A control group without mandibular anterior crowding was also selected. Patients with any systemic disease, on medications or had taken antibiotics within a month, had professional scaling within last six months, smokers, and ex-smokers, mouth breathers, had orthodontic treatment/ and are wearing appliances and did not consent to study were excluded. A convenient sampling technique was used to select the patients attending the clinic who meet the inclusion criteria. Informed consent was obtained from the patients. Data collection tools included interview and oral examination. A brief interview with pre-determined questions was carried out to assess teeth cleaning frequency and interdental cleaning practices. An intraoral examination was carried out to assess different forms of malocclusion using Occlusion Feature Index developed by Poulton and Aaronson in 1961 at the National Institute of Dental Research in the United States with a modification. Occlusion Feature Index, which is a simple to use, reliable, and reproducible index, is based on four primary features of occlusion which are important in an orthodontic examination. Each is assigned a value according to the following objective criteria. (Buckley, 2017).

1. Lower anterior arch crowding in the canine-to-canine area.

0= None

1= Crowding of lower anterior teeth equivalent to one-half the width of the lower right central incisor

2= Crowding the width of one central incisor.

3= Crowding exceeding the width of one central incisor.

2. Cuspal interdigitation, observed in occlusion when the right premolar to molar area is viewed from the buccal aspect.

0= Cusp to groove.

1= Between cusp and groove.

2= Cusp to cusp.

3. Vertical overbite, measured by that portion of the lower incisor covered by the upper central incisor in occlusion.

0= Incisal third of lower incisors.

1= Middle third of lower incisors.

2= Gingival third of lower incisors.

4. Horizontal overjet, measured in occlusion with a small ruler from labial surface of upper incisors to labial surface of lower incisors.

0= 0 to 1.5 mm.

1= 1.5 to 3 mm.

2= 3 mm. and over

The number for each of the four categories is recorded, and a total score is obtained by adding them together. The possible range is from 0 to 9. The higher the values, the more the crowding.

The modifications applied in this study as follows:

Score 0 in mandibular anterior arch crowding in the canine-to-canine area was considered as no crowding while score 1 to 3 was considered as crowding of varying severity. Score is considered as mild crowding, score 2 as moderate crowding and score 3 as severe crowding.

Score 0 in cuspal interdigitation, observed in occlusion when the right premolar to molar area is viewed from the buccal aspect was considered as neutroccclusion, score 1 as Distocclusion and score 2 as Mesioocclusion.

Score 0 in horizontal overjet, measured in occlusion with a small ruler from labial surface of upper incisors to labial surface of lower incisors was considered as reduced overjet, score 1 as normal overjet and score 2 as increased overjet

Scoring of vertical overbite, measured by that portion of the lower incisor covered by the upper central incisor in occlusion was not done

Sulcular Bleeding Index by Muhlemann and Son (1971) and Plaque Index by Loe and Silness (1964) were carried out to assess periodontal diseases (gingivitis and periodontitis) and oral hygiene around the crowded teeth. Scoring of sulcular bleeding index is done on the criteria, which ranges from 0 to 5. Adding the scores of the undivided teeth and dividing them by the number of teeth can determine the sulcus bleeding index. The examined and assessed teeth for sulcular bleeding were all the mandibular anterior teeth (incisors and canines)

0 – Normal appearing gingival, no bleeding on probing

1 – No colour or contour changes, but bleeding on probing

2 – Bleeding on probing, colour change (reddening), no edema and contour changes

3 – Bleeding on probing, colour change, mild inflammatory edema

4 – Bleeding on probing, color change, severe inflammatory edema

5 – Spontaneous bleeding on probing, colour change, very severe inflammatory edema with or without ulceration

Scoring of plaque Index is done on the criteria, which ranges from 0 to 3. The score for the area is obtained by totaling the four scores per tooth and dividing it by four.

The Plaque Index score for the person is obtained by adding the plaque index scores per tooth and dividing by the number of teeth examined (Silness & Loe, 1964). The examined and assessed teeth for plaque were all the mandibular anterior teeth (incisors and canines)

0 – No plaque in the gingiva area

1 – A film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be recognized only by running a probe, across the tooth surface.

2 – Moderate accumulation of soft deposits within the gingival pocket and on the gingival margin and/or adjacent tooth surface that can be seen by naked eye.

3 – Abundance of soft matter within the gingival pocket and/or on the gingival margin, and adjacent tooth surface.

Data collected was analyzed using IBM SPSS version 21.0. Test for association between crowding, oral hygiene and periodontal diseases was done using chi-square test, Fisher exact test, independent t-test and one-way ANOVA Statistical significance was set at $P < 0.05$.

RESULTS

A total of 72 respondents participated in the study, 36 cases of anterior crowding and 36 without crowding. Majority of the participants 12(33.3%) with crowding and 15(41.7%) without crowding were aged 21-25 years. A total of 13.9% of the participants had mesiocclusion with one quarter (25.0%) of participants with crowding and 2.8% of participants without crowding having mesiocclusion (Table 1). A total of 8.3% of the participants increased overjet with 16.7% in participants with crowding and no participant without crowding (Table 2). The participants with crowding was equally divided into mild, moderate and severe crowding (Table 3). About one-third (36.1%) of the participants clean their teeth twice daily with no difference in participants with or without crowding. Overall, 41.7% indulge interproximal cleaning/flossing. One third (33.3%) of participants with crowding and half (50.0%) of participants without crowding indulge interproximal cleaning/flossing (Table 4).

Table 1: Demographic characteristics of the participants

Characteristics	With crowding n (%)	Without crowding n (%)	Total n (%)
Age (years)			
18-20	8 (22.2)	4 (11.1)	12 (16.7)
21-25	12 (33.3)	15 (41.7)	27 (37.5)
26-30	8 (22.2)	9 (25.0)	17 (23.6)
>30	8 (22.2)	8 (22.2)	16 (22.2)
Sex			
Male	18(50.0)	18(50.0)	36(50.0)
Female	18(50.0)	18(50.0)	36(50.0)
Total	36(50.0)	36(50.0)	72(100.0)

Table 2: Occlusal traits of the participants

Occlusal trait	With crowding n (%)	Without crowding n (%)	Total n (%)	Fisher's P-value
Cuspal interdigitation in premolar molar relation				0.001
Neutroclusion	23 (63.9)	35 (97.2)	58 (80.6)	
Distocclusion	9 (25.0)	1 (2.8)	10 (13.9)	
Mesioclusion	4 (11.1)	0 (0.0)	4 (5.6)	
Horizontal overjet				<0.001
0 to 1.5mm	14 (38.9)	35 (97.2)	49 (68.1)	
1.5 to 3mm	16 (44.4)	1 (2.8)	17 (23.6)	
>3mm	6 (16.7)	0 (0.0)	6 (8.3)	
Total	36 (100.0)	36 (100.0)	72 (100.0)	

Table 3. Pattern of Crowding among the participants

Pattern of crowding	Frequency (n)	Percent (%)
Up to one half width of one central incisor	12	33.3
Up to width of one central incisor	12	33.3
Exceeding the width of one central incisor	12	33.3
Total	36	100.0

Table 4: Oral Hygiene Practices among the participants

Oral hygiene practices	With crowding n (%)	Without crowding n (%)	Total n (%)	P-value
Daily teeth cleaning frequency				1.000
Once-daily	23 (63.9)	23 (63.9)	46 (63.9)	
Daily-daily	13 (36.1)	13 (36.1)	26 (36.1)	
Interproximal cleaning Flossing				0.232
Yes	12 (33.3)	18 (50.0)	30 (41.7)	
No	24 (66.7)	18 (50.0)	42 (58.3)	
Total	36 (50.0)	36 (50.0)	72 (100.0)	

About two thirds (63.9%) of the participants had poor oral hygiene status. Three quarters (75.0%) of participants with crowding and 52.8% of participants without crowding had poor oral hygiene status (Table 4). Sulcular bleeding score in participants with crowding and those without crowding was 2.99 ± 0.20 and 2.00 ± 0.23 respectively. Plaque score in participants with crowding and those without crowding was 2.21 ± 0.10 and 1.79 ± 0.12 respectively (Table 5). Three quarters (75.0%) of

participants with crowding had poor oral hygiene status. Those with more severe crowding had poorer oral hygiene status but there was no statistically significant association between crowding severity, plaque index ($P=0.887$) (Table 7). Those with more severe crowding had higher mean plaque index score and sulcular bleeding index score but there was no statistically significant association between crowding severity, plaque index ($P=0.216$) and sulcular bleeding index ($P=0.361$) (Table 8).

Table 5: Oral Hygiene status among the participants

Status	With crowding n (%)	Without crowding n (%)	Total n (%)	Fisher's P-value
Good	0 (0.0)	1 (2.8)	1 (1.4)	0.085
Fair	9 (25.0)	16 (44.4)	25 (34.7)	
Poor	27 (75.0)	19 (52.8)	46 (63.9)	
Total	36 (100.0)	36 (100.0)	72 (100.0)	

Table 6: Association between occlusal status and mean periodontal parameters of the participants

Variable	Status	Mean \pm SEM	T	P-value
Sulcular bleeding score	With crowding	2.99 ± 0.20	3.264	0.002
	Without crowding	2.00 ± 0.23		
Plaque score	With crowding	2.21 ± 0.10	2.675	0.009
	Without crowding	1.79 ± 0.12		

SEM=Standard error of mean

Table 7. Relationship between Oral Hygiene Status and pattern of crowding

Oral hygiene status	Up to one half width of one central incisor	Up to width of one central incisor	Exceeding the width of one central incisor	Total	Fisher's P-value
Fair	4 (33.3)	3 (25.0)	2 (16.7)	9 (25.0)	0.887
Poor	8 (66.7)	9 (75.0)	10 (83.3)	27 (75.0)	
Total	12 (100.0)	12 (100.0)	12 (100.0)	36(100.0)	

Table 8. Association between pattern of crowding, mean plaque and sulcular index score

Pattern of crowding	Plaque score Mean±SEM	Sulcular bleeding score Mean±SEM
Up to one half width of one central incisor	1.97±0.16	2.59±0.40
Up to width of one central incisor	2.29±0.18	3.15±0.32
Exceeding the width of one central incisor	2.38±0.17	3.25±0.32
F	1.604	1.050
P-value	0.216	0.361

SEM= Standard error of mean

DISCUSSION

Sulcular bleeding index score which is a measure of gingival status was statistically higher in participants with crowding than those without crowding. This essentially means that mandibular anterior teeth crowding was associated with higher degree of gingival inflammation. This is in tandem with findings of previous studies (Buckley, 1972; El-Mangoury et al., 1987; Stauffer and Landmesser, 2004; Abdulwahab, 2008; Gusmão et al., 2011). Gusmão et al. (2011) reported that various types of tooth position anomalies were significantly associated with periodontal changes, such as chronic marginal gingivitis, gingival enlargement, gingival recession and chronic periodontitis. However, contrasting findings were reported in Goel et al. (2018) in India and Kolawole & Folayan (2019) in Nigeria among children where periodontal disease was assessed with gingival index and Community Periodontal Index of Treatment Need respectively. The higher degree of periodontal disease among participants with crowding is related to the significantly higher plaque index scores in participants with crowding and those without crowding. Additional explanation may be related to interproximal cleaning/flossing and poorer oral hygiene status among participants with crowding. The likely sequence is that crowded and irregular teeth facilitate the accumulation of plaque which then contributes to gingival inflammation (Jolanta et al, 2007). Although not assessed in this study, patients with malocclusion may be affected psychologically due to poor self-esteem (Taibah and Al-Hummayani, 2017) leading to lack of motivation to practice effective oral hygiene habits and this may lead to

periodontal diseases (Pazos et al., 2019). Malocclusion in form of crowding cause occlusal traumatism and this excessive functional stress may initiate inflammatory changes in the periodontium which will then enhance plaque bacterial induced destructive processes (Hallmon, 1999).

Participants with severe crowding had higher sulcular bleeding index score than those with mild crowding which may be explained by higher mean plaque index score. Similarly, mandibular incisor crowding severity has been reported to be associated with significant periodontal disease progression (Alsulaiman et al., 2018). The plaque retention, altered topography of gingiva, septum and orofacial alveolar bone and difficulty in periodontal therapy delivery substantiate for orthodontic correction of crowding to improve periodontal health (Diedrich, 2000).

CONCLUSION

Mandibular anterior crowding was associated with poorer oral hygiene assessed with plaque index and worse gingival status assessed with sulcular bleeding index. Severe crowding was seen to lead to poorer oral hygiene and higher periodontal diseases. Optimizing periodontal health will be a ranked reason for orthodontic correction of mandibular anterior crowding.

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Conflict of interest

The authors declare that they have no conflicts of interest.

REFERENCES

- Abdulwahab B (2008). Lower arch crowding in relation to periodontal disease. *Mahidol Dental J* 2008; 5(2):154-158
- Alsulaiman AA, Kaye E, Jones J, et al (2018). Incisor malalignment and the risk of periodontal disease progression. *Am J Orthod Dentofacial Orthop*;153(4):512–522.
- Bollen AM (2008). Effects of malocclusions and orthodontics on periodontal health: evidence from a systematic review. *J Dent Educ*; 72(8):912-918.
- Buckley LA (1972). The relationship between malocclusion and periodontal disease. *J Periodontol*; 43:415-417.
- Danielson OE, Chinedu AC, Oluyemisi EA, Bashiru BO, Ndubuisi OO (2011). Frequency, causes and pattern of adult tooth extraction in a Nigerian rural health facility. *Odontostomatol Trop*; 34(134):5-10.
- Diedrich P (2000). Periodontal Relevance of Anterior Crowding *J Orofac Orthop*; 61(2):69-79.
- El-Mangoury NH, Gaafar SG, Mostafa YA (1987). Mandibular anterior crowding and periodontal disease. *Angle Orthod*; 85:35-38.
- Geiger AM, Wasserman BH (1976). Relationship of occlusion and periodontal disease: part IX – incisor inclination and periodontal status *Angle Orthod*; 46(2):99-110.
- Goel S, Singh A, Chaudhary G, Kalsi D S, Sood A, Marria G (2018). The relationship of malocclusion with periodontal status, dental caries, and sociodemographic factors in school children of Ludhiana. *Indian J Dent Sci*; 10:87-91
- Gusmão ES, Queiroz Roberlene Deschamps Coutinho de, Coelho Renata de Souza, Cimões Renata, Santos Rosenês Lima dos (2011). Association between malpositioned teeth and periodontal disease. *Dental Press J Orthod*; 16(4):87-94.
- Jolanta P, Ilga U, Andra L, Zane L (2007). The relationship between the severity of malposition of the frontal teeth and periodontal health in age 15-21 and 35-44 *Stomatologija, Baltic Dent Maxillo J*; 9:86-90.
- Kolawole,KA, Folayan, M.O(2019). Association between malocclusion, caries and oral hygiene in children 6 to 12 years old resident in suburban Nigeria. *BMC Oral Health*; 19:262. doi.org/10.1186/s12903-019-0959-2
- Mtaya M, Brudvik P, Astrøm AN (2009). Prevalence of malocclusion and its relationship with socio-demographic factors, dental caries, and oral hygiene in 12- to 14-year-old Tanzanian schoolchildren. *Eur J Orthod*; 31(5):467-76.
- Muhlemann, HR, Son, S (1971). Gingival bleeding-a leading symptom in initial gingivitis. *Helvetica Odontologica Acta*, 5: 107- 113
- Nalcaci R, Demirel S, Ozturk F, Altan BA, Sokucu O, Bostanci V (2012). The relationship of orthodontic treatment need with periodontal status, dental caries, and sociodemographic factors. *Sci World J* :498012. doi: 10.1100/2012/498012.
- Offenbacher, S (1996). Periodontal diseases: Pathogenesis. *Ann Periodontol*; 1(1):821-878.
- Pazos, Carolina Thaiza Costa, Austregésilo, Silvia Carréra, & Goes, Paulo S. A. de. (2019). Self-esteem and oral health behavior in adolescents. *Ciência & Saúde Coletiva*; 24(11):4083-4092.
- Petersen PE (2003). The World Oral Health Report 2003: continuous improvement of oral health in the 21st century--the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol*; 31 Suppl 1:3-23.
- Poulton DR, Aaronson SA (1961). The relationship between occlusion and periodontal status. *Am J Orthod Dentofac Ortho*; 47(9):690-699.
- Silness J, Loe H (1964). Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand*; 22:121-135.
- Stauffer K, Landmesser H (2004). Effects of crowding in the lower anterior segment--a risk evaluation depending upon the degree of crowding. *J Orofac Orthop*; 65(1):13-25.
- Taibah SM, Al-Hummayani FM (2017). Effect of malocclusion on the self-esteem of adolescents. *J Orthod Sci*; 6(4):123-128.