

Tooth Occlusion Patterns among Young Adults of Isoko and Urhobo Ethnic Groups in Delta State, Nigeria

Eloho Nyerhovwo Igbinedion¹, Efe Endurance Ahama², Onyinye Uwafili³, John Chinedu Obianke⁴, Kingsley Ovie Obie⁵

^{1, 2, 3, 5}Department of Human Anatomy and Cell Biology, Delta State University, Abraka, Delta State, Nigeria- 330106

⁴Department of Anatomy, University of Ibadan, Ibadan, Oyo State, Nigeria- 200284

Email address: enogboromorie(at)delsu.edu.ng

Abstract— Background: Occlusion of primary dentition plays a vital role in directing occlusion in the succession of permanent dentition. Dental occlusion surpasses the actual touch of the opposing teeth's biting surface or their substitutes; therefore, the current study evaluated tooth occlusion patterns among Isoko and Urhobo ethnic groups in Delta State, Nigeria. **Materials and Method:** This observational study comprised 384 subjects of both genders among Urhobo and Isoko in Delta State University, Abraka, who were within ages 18-32 years. Ethical approval was obtained from the Departmental Ethics and Research Committee in Human Anatomy and Cell Biology, Faculty of Basic Medical Sciences, Delta State University, Abraka. Tooth occlusion pattern was categorised following Eveleth's fourfold models into: edge to edge, mild overbite, severe overbite and negative overbite. Data obtained was analysed using Statistical Package for Social Sciences (SPSS, version 22). The independent sample *t*-test was helpful for determining gender differences while *p* value lesser than 0.05 was considered to be statistically significant. **Results:** The total prevalence of mild overbite, edge to edge, severe overbite and negative overbite were 56.5%, 29.2%, 8.6% and 5.7% respectively. Also, the incidence of mild overbite was utmost among both genders (females – 32%, males - 24.5%) in the studied population while the mean occlusion pattern was significantly higher in females than in males ($p < 0.05$) of the studied population. **Conclusion:** There were differences in the occlusion patterns among young adults of Isoko and Urhobo ethnic groups while the occlusion patterns among both ethnic groups were more common in females than in males. Thus, the association between age and teeth occlusion patterns should be looked into in future studies.

Keywords— Isoko: Mild overbite: Negative overbite: Tooth occlusion patterns:Urhobo.

I. INTRODUCTION

Orthodontics which is a division of dentistry, is related to the prevention and rectification of irregularities of the teeth which may include; the straightening or the correction of curved teeth or a poor bite, or malocclusion which remains the physiologically unacceptable connection of divergent dentition, that may be caused by faulty development, teeth removal, or an abnormal growth of the jaws [1].

Occlusion thus proposes that teeth are in contact when the jaws are not open (inactive occlusal connections) and amid different jaw movements (dynamic occlusal connections) in restricting dental arches [2]. Biologically, occlusion is

characterised more comprehensively as the facilitated functional link between the diverse cell populations that makes up the masticatory framework as they differentiate, repair, remodel, fail, and model [3].

Around 6 months of age, a child's (primary) dentition starts to erupt and the upper teeth and lower teeth start to occlude with each other [4-5]. Amid development; the lips, tongue and cheeks keep the erupting teeth in place. After two years, the lower and upper primary teeth become properly spaced and occluded [6]. They continue to develop and complete with full root growth by age three [2]. The jaws begin to expand one year after the completion teeth development to form "diastema," which is the spacing found between the teeth. The aforementioned effect is sturdiest in the front (anterior) teeth and could be seen by age four to five years. This spacing allows the adult (permanent) teeth to burst forth into the proper occlusion. Thus, without these gaps; the permanent dentition could be crowded [2].

Primary dentition occlusion plays is very vital in directing obstruction in the succession of permanent dentition [7]. To a great degree, the distinguishing features in primary dentition lays the basis for suitable eruption and orientation of the succeeding dentition. During the developmental years, the physical appearances of permanent dentition could be very well predicted based on the observation of occlusion patterns of the dentoalveolar system of the child [8]. This encourages permanent molars' medial drift into the cracks thereby creating a Class I occlusion [8].

There are many strategies that could be utilised for the evaluation, definition and taxonomy of occlusion. Different populaces have been examined to provide epidemiological data of the incidence of malocclusion [9-10]. Certain European populaces, such as the Swedish [11], British [12], German [13], French [14], Italian [15], and Nigerian [16-17] have been studied extensively. However, little research and/or published data that evaluated teeth occlusion pattern exists among Isoko and Urhobo ethnic groups in Delta State.

Objectives

This study evaluated the tooth occlusion patterns among Isoko and Urhobo ethnic groups in Delta State, Nigeria. Therefore, the specific goals of this study were to; estimate the

occlusion patterns of teeth among subjects of Isoko and Urhobo origins in the Delta State University, Abraka; evaluate the occlusion patterns of teeth among both genders of Isoko and Urhobo ethnic groups in Delta State University, Abraka who were between ages 18 and 32years; determine the gender differences in tooth occlusion patterns; and to establish the ethnic differences in occlusion patterns of the teeth.

II. MATERIALS AND METHODS

Ethical Considerations - The study protocol was approved by the Ethics and Research Committee of Human Anatomy Department, Faculty of Basic Medical Sciences, Delta State University, Abraka (DELSU/CHS/ANA/2021/01). All subjects were verbally informed about the purpose of the survey and only those who gave their permission participated.

Research Design – This observational study comprised both genders among the Isokos and Urhobos in Delta state University, Abraka who were within ages 18-32years. A total of three hundred and eighty-four (384) subjects partook in this study.

Data Collection - Data were obtained utilising two digital phone cameras (iPhone Xs Max with a 6.5inch display, software version 14.6 and Infinix hot 6, software version 8.1) and data collection sheet. The age, gender, ethnicity and occlusion patterns of each individual were included in the data collection sheet. This study comprised 192 Urhobo and 192 Isoko subjects who attended Delta State University and were within the age range of 18-32 while the proportionate stratified sampling method was used. Each examination took place while the subject was sitting on a chair and was asked to expose the teeth. Each sampled tooth was also snapped with the Infinix hot 6 camera first and then with the iPhone Xs Max for double checks to confirm the data taken. Occlusion tooth pattern was categorised following Eveleth’s fourfold models [18]. Subjects’ tooth occlusion patterns were classified into: edge to edge, mild overbite, severe overbite and negative overbite [18] (see figure 1).



Fig. 1. Occlusion Patterns among Studied Subjects (A was edge to edge, B was mild overbite while C was severe overbite and D was negative)

make contact with those of the lower incisors. However, mild overbite was seen as the upper frontal teeth that lies over the lower frontal teeth creating a perpendicular overlap of the frontal teeth which is 2-3mm while Severe overbite was expounded when there was excess amount or percentage of perpendicular overlap of the inferior incisors (greater than 30% (3mm or 1/3rd) of the crown height of the lower incisors) by the superior incisors. Negative overbite was thus, observed as the intersection of the inferior frontal teeth over the upper anterior teeth.

Statistical Analysis - Data obtained were subjected to Statistical Package for Social Sciences (SPSS, V 22). Results were set out based on gender in order to verify the incident of sexual dimorphism. The student-test was helpful in this aspect. Difference in occlusion patterns between Isoko and Urhobo ethnic groups was determined using One-way Analysis of Variance (ANOVA) and p value lesser than 0.05 was considered to be statistically significant.

III. RESULTS

The various occlusion patterns observed were: mild overbite with occurrence of 217 (56.5%), Edge to edge with occurrence of 112 (29.2%), severe overbite with occurrence of 33 (8.6%) and negative overbite with occurrence of 22 (5.7%). Thus, the most occurring pattern was mild overbite (56.5%) while the least was negative overbite (5.7%) as shown in figure 2.

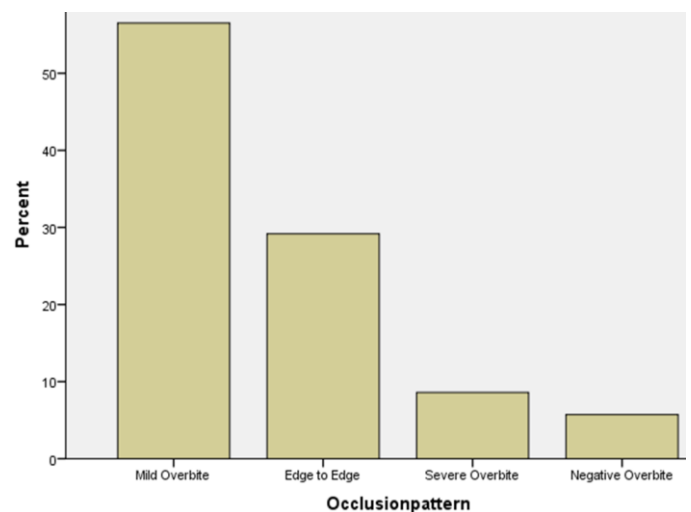


Fig. 2. Occlusion Patterns among Studied Subjects

Gender differences in tooth occlusion patterns were ascertained using the independent sample t-test. It was observed that the mean occlusion pattern was higher in females than in males and this difference was statistically significant (p< 0.05) as presented in table 1.

TABLE 1: Gender Differences in Teeth Occlusion Patterns

	Gender	N	Mean	Std. Dev.	t	df	p - value
Occlusion Patterns	Female	254	1.73	0.86	3.10	382	0.002
	Male	130	1.45	0.85			

Edge to edge occlusion pattern was the intimation for an occlusion in which the boundaries of the maxillary incisors

The total prevalence of mild overbite, edge to edge, severe overbite and negative overbite were 56.5%, 29.2%, 8.6% and 5.7% respectively. Also, the prevalence of mild overbite (32.0%) was highest while negative overbite (3.6%) was least among the females. However, among the males, mild overbite (24.5%) had the highest prevalence while severe overbite (1.6%) was least prevalent (see table 2).

TABLE 2: Prevalence of Teeth Occlusion Patterns based on Gender

Occlusion Patterns				
Gender	Mild Overbite	Edge to Edge	Severe Overbite	Negative Overbite
Female	123	90	27	14
	(32.0%)	(23.4%)	(7.0%)	(3.6%)
Male	94	22	6	8
	(24.5%)	(5.7%)	(1.6%)	(2.1%)
Total	217	112	33	22
	(56.5%)	(29.2%)	(8.6%)	(5.7%)

The prevalence of mild overbite (28.1%) was highest while negative overbite (1.3%) was least among the Urhobos. Also, among the Isokos, mild overbite (28.4%) had the highest prevalence while negative overbite (4.4%) was least prevalent as shown in table 3.

TABLE 3: Prevalence of Teeth Occlusion Patterns based on Ethnicity

Occlusion Patterns				
Ethnicity	Mild Overbite	Edge to Edge	Severe Overbite	Negative Overbite
Urhobo	108	64	12	5
	(28.1%)	(16.7%)	(3.1%)	(1.3%)
Isoko	109	48	21	17
	(28.4%)	(12.5%)	(5.5%)	(4.4%)
Total	217	112	33	22
	(56.5%)	(29.2%)	(8.6%)	(5.7%)

The difference in occlusion patterns between the two tribes was determined using one-way analysis of variance. The mean occlusion pattern for Isoko (1.72±0.73) was significantly higher than that of Urhobo (1.54±0.97) at p<0.05 level [F(1,382) = 4.096, p = 0.044] as presented in table 4.

TABLE 4: Differences in Teeth Occlusion Patterns based on Ethnicity

Ethnic Group	N	Range	Mean	Std. Dev.	F	p-value
Urhobo	189	1-4	1.54	0.732		
Isoko	195	1-4	1.72	0.971	4.096	0.044
Total	384	1-4	1.64	0.866		

IV. DISCUSSION

In the present study, the various occlusion patterns were: mild overbite with the utmost occurrence (56.5%), next to by edge to edge (29.2%), then severe overbite (8.6%) and negative overbite (5.7%). This result was comparable to that of some previous studies. One of the studies had mild overbite as the highest tooth occlusion pattern in both genders (male - 33.6% and female - 32.6% respectively), succeeded by edge-to-edge (13.3% and 10.4% respectively), extreme overbite (3.4% and 2.1% respectively) and negative overbite (1.8% and 2.9%) [16]. In addition, another study also found that the level of mild overbite was the highest tooth occlusion pattern in their study (m male - 26.13%, female - 25.39%) which

preceded edge to edge (male - 16.28%, female - 18.75%). Also, extreme and negative overbites were reported in their study [19]. Also, another study [20] that established the prevalence of various forms of malocclusion among Iranian children, reported that the mild overbite was highest in prevalence. Furthermore, a previous research [21] that ascertained the arrangement of occlusion among Niger Deltans has also recognised that the mild overbite was highest in prevalence (male - 26.13%, female - 25.39%), next to the edge to edge occlusion form (male - 16.28%, female - 18.75%). Another study [22] that conducted a similar analysis on dental occlusion among the Binis also reported the mild overbite as being highest in occurrence. The similarities seen between the current and previous studies shows that mild overbite is the highest prevalent tooth occlusion pattern irrespective of the age group and race used for the study. This could be due to the fact that having a slight overbite is normal, being one of several common bite issues that people experience. The current study reported a statistically significant gender difference (p< 0.05) in the mean occlusion pattern which was greater in females than in males. This finding was in agreement with some previous studies that were conducted among different populations including: Brazilian Amazon population [23] that determined the prevalence of malocclusion in deciduous dentition; Bini ethnicity in Nigeria [22] that conducted a similar analysis on dental occlusion; Italian students [10] which was conducted to assess the predominance and sex dissemination of occlusal characteristics; Chinese children in Xi'an [24] that ascertained the incidence and associated malocclusion factors among primary dentition; and Indian children [25] that determined the occurrence of malocclusion and management needs in major transfusion-dependent β -thalassemia major children in Chandigarh. Each of the studies found that there was a statistically significant gender difference (p<0.05) in the tooth occlusion pattern. The similarities seen in this study could be due to similarities in methodology as well as age group of the study participants. The various studies utilised subjects who were between children and young adults. However, the finding of the current study was at variance with some other previous studies that studied occlusion pattern among the: school-going children aged 6-13 years in India [26] that reported the mean occlusion pattern was higher among males than females; Germans with a mean age of 35.7 years [27] that stated that there was no significant difference in the occlusion pattern of the study participants also disagreed with this study finding. The different studies compared and discussed above portrayed differences in the tooth occlusion considered. This may be due to differences in racial origin, age group and methodology of the various studies. Compared to the current study that employed Eveleth's fourfold classification models, the previous studies utilised angles for assertion of tooth occlusion patterns as well as use of class I-III as the method of classification. Also, one of the previous studies [27] used adults for their study.

This study showed that the prevalence of mild overbite was highest in both males (24.5%) and females (32.0%). However, negative overbite (3.6%) was least prevalent among

the females while severe overbite (1.6%) was least prevalent among the males. A previous study [16] that reported mild overbite as being highest in prevalence among both genders (males - 32.6%, females - 33.6% respectively) supported this study finding. This study finding is also in agreement with another study [28] that was conducted among the Assamese Sikhs in India who showed that the frequency of mild overbite was the highest in occurrence among both genders (male - 44.9%, female - 54.0%). These similarities could be as a result of similarities in the study methodology that employed the Eveleth's fourfold classification models for use. However, the current finding was not in line with a study [22] that showed the edge to edge tooth occlusion pattern as being highest in males. The differences seen may be due to ethnic differences.

V. CONCLUSION

In conclusion, the patterns of occlusion among the Isoko and Urhobo in Delta State, Nigeria, were significantly different and were shown to be moderately more common among the females than in males. The mild overbite was the foremost occlusion pattern, whereas, the negative overbite was the least, among both the Isoko and Urhobo subjects.

REFERENCES

- [1]. G. Lotha, E. Rodriguez, K. Rogers. "Orthodontics," in Encyclopedia Britannica. 2018 Jan [cited 2021 Nov11]. Available from: <https://www.britannica.com/science/orthodontics>.
- [2]. S. J. Nelson. "Wheeler's Dental Anatomy," in Physiology and Occlusion. 7th ed. Elsevier, 2009.
- [3]. E. D. Peter. "Functional Occlusion," in TMJ to Smile Design. 1st ed. Elsevier, 2007.
- [4]. American Dental Association. Eruption Charts (<http://www.mouthhealthy.org/en/az-topics/e/eruption-charts>) Accessed 11/5/2019.
- [5]. American Academy of Pediatrics. A Pediatric Guide to Children's Oral Health. (https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Oral-Health/Documents/OralHealthFCpagesF2_2_1.pdf) Accessed 11/5/2019.
- [6]. M. Vegesna, R. Chandrasekhar, V. Chandrappa. "Occlusal Characteristics and Spacing in Primary Dentition: A Gender Comparative Cross-Sectional Study". Int Scholarly Res Notices, 1-7, 2006.
- [7]. P. F. Infant. "An epidemiologic study of deciduous molar relations in pre-school children". J Dent Res, 54:723-7, 2005.
- [8]. S. Hedge, S. Panwar, D. R. Bolar, M. Bharat. "Characteristics of occlusion in primary dentition of pre-school children of Udaipur, India". Eur J Dent, 6:51-5, 2012.
- [9]. E. Tausche, O. Luck, W. Harzer. "Prevalence of Malocclusions in the Early Mixed Dentition and Orthodontic Treatment Need". Eur J Orthod, 26(3):237-44, 2004.
- [10]. F. Ciuffolo, L. Manzoli, M. D'Attilio, S. Tecco, F. Muratore, F. Festa. "Prevalence and Distribution by Gender of Occlusal Characteristics in a Sample of Italian Secondary School Students: A Cross-Sectional Study". Eur J Orthod, 27(6):601-6, 2005.
- [11]. E. Josefsson, K. Bjerklind, R. Lindsten. "Malocclusion Frequency in Swedish and Immigrant Adolescents: Influence of Origin on Orthodontic Treatment Need". Eur J Orthod, 29(1): 79-87, 2007.
- [12]. K. F. Krey, C. Hirsch. "Frequency of Orthodontic Treatment in German Children and Adolescents: Influence of Age, Gender, and Socio-Economic Status". Eur J Orthod, 34(2):152-7, 2012.
- [13]. M. Souames, F. Bassigny, N. Zenati, P. J. Riordan, M. L. Boy-Lefevre. "Orthodontic Treatment Need in French Schoolchildren: An Epidemiological Study Using the Index of Orthodontic Treatment Need". Eur J Orthod, 28(6):605-9, 2006.
- [14]. C. G. Nobile, M. Pavia, L. Fortunato, I. F. Angelillo. "Prevalence and Factors Related to Malocclusion and Orthodontic Treatment Need in Children and Adolescents in Italy". Eur J Public Health, 17(6):637-41, 2007.
- [15]. E. Anibor. "Tooth Occlusion Pattern of the Hausas in Zaria, Nigeria". Ana J Afr, 9:1-5, 2020.
- [16]. O. O. Chukwudi. "Prevalence of malocclusion among adolescents in Ibadan, Nigeria". Am J Orthod Dentofacial Orthop, 126(5):604-7, 2004.
- [17]. P. B. Eveleth. "An anthropometric study of North Eastern Brazilians". Ame J Phys Anthropol, 37:223, 1972.
- [18]. L. Shen, F. He, C. Zhang, H. Jiang, J. Wang. "Prevalence of malocclusion in primary dentition in mainland China, 1988–2017: a systematic review and meta-analysis". Sci Rep, 8:4716, 2018.
- [19]. M. Akbari, K. B. Lankarani, B. Honarvar, R. Tabrizi, H. Mirhadi, M. Moosazadeh. "Prevalence of malocclusion among Iranian children: A systematic review and meta-analysis". Dent Res J, 13:387-95, 2016
- [20]. E. Anibor. "The Tooth Occlusion Pattern among the Niger Deltans in Nigeria." Nig Biomed Sci J, 12:10-12, 2016.
- [21]. E. Anibor, O. Edjomariogwe, A. Ajayi. "Genetic and Morphological Traits Among the Binis". Int J Curr Res, 6(11):10222-7, 2014.
- [22]. T. S. Normando, R. F. F. Barroso, D. Normando. "Influence of the socioeconomic status on the prevalence of malocclusion in the primary dentition". Dental Press J Orthod, 20(1):74-8, 2015.
- [23]. Z. Zhou, F. Liu, S. Shen, L. Shang, L. Shang, X. Wang. "Prevalence of and factors affecting malocclusion in primary dentition among children in Xi'an, China". BMC Oral Health, 16(1):91, 2016.
- [24]. D. K. Gupta, S. P. Singh, A. Utreja, S. Verma. "Prevalence of malocclusion and assessment of treatment needs in β -thalassemia major children". Prog Orthod, 17:7, 2016.
- [25]. K. Mukesh, B. Prasenjit, G. Rajesh, G. Rajeshri, L. Rajeev, P. Rajkumae. "Dental Occlusion among School Going Children of Maharashtra". J Int Oral Health, 6(4):53-5, 2014.
- [26]. G. Slavicek, C. Schimmer, M. I. Soikher, M. G. Soikher, A. Gritzenko, I. Makarevitch. "Angle classification of occlusion and human mastication pattern: an explorative study using planar calculations of fragmented chewing sequences". J. Stomat. Occ. Med, 3:95–105, 2010.
- [27]. J. Singh, S. Sengupta. "Some Morpho-genetic and Behavioural Traits among the Assamese Sikhs". Anthropologist, 6(4):253-5, 2004.
- [28]. J. Tao, J. Wu, X. Zhang. "Mandibular condylar morphology for bruxers with different grinding patterns". Cranio, 34(4):219-26, 2016.