OPEN ACCESS

Saudi Journal of Medicine
Abbreviated Key Title: Saudi J Med
ISSN 2518-3389 (Print) | ISSN 2518-3397 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Prevalence of Malocclusion and Occlusal Traits among Rivers State Residents (Children)

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DOI: https://doi.org/10.36348/sjm.2026.v11i03.003 | **Received:** 30.01.2026 | **Accepted:** 24.03.2026 | **Published:** 26.03.2026

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Abstract

The prevalence of malocclusion, a common dental condition characterized by misaligned teeth and jaws, has significant implications for oral health, aesthetics, and overall quality of life. This study investigated the prevalence of malocclusion in Rivers State, Nigeria, a region with diverse demographic and socio-economic characteristics. Using a cross-sectional design, a sample of participants- 310 (148 males and 162 females) from various communities was assessed clinically for malocclusion patterns, including spacing, crowding, crossbite. open bite, and overbite. Data were analyzed to identify the distribution of malocclusion and associated factors such as age, gender, and habits: like thumb-sucking or mouth breathing. Majority of the subjects were found to have Angle's Class 1 molar relationships (80.3%). There was a significantly larger proportion of females (52.2%) as compared with their male counterparts (47.8%). Majority of the children had normal overjet (69.2%) and overbite (55.5%). However significant gender differences were found More females were found to have normal overjet and overbites than their male counterparts, whilst males were found to have a larger proportion of reduced overjet's and overbites. A normal dentoalveolar relationship was a predominant finding. However, crowding of the arches was found in 14.4% whilst 59.5% had spaced arches. Anterior and posterior crossbite was found in 17.1% of the population, whilst open bite was seen in a smaller proportion of 7.1 % Findings revealed that malocclusion is prevalent among both children and adults in Rivers State, residents (children), with specific patterns correlating with socio-demographic variables and oral habits. The results emphasize the need for targeted orthodontic interventions and public health initiatives to address the burden of malocclusion in the region. This study contributes valuable data to the limited research on malocclusion in Nigeria, serving as a foundation for policy formulation and further investigations.

Keywords: malocclusion, prevalence spacing, crowding, crossbite. open bite, and overbite.

INTRODUCTION

Malocclusion is an abnormality of the teeth or a mal-relation between the dental arches. It represents a developmental irregularity of the craniofacial complex and is thus defined as a handicapping dentofacial anomaly" by the World Health Organization. [1] The etiology of malocclusion is multifactorial, including hereditary factors and environmental factors. Dental diseases such as dental caries, pulpal and periapical lesions and dental trauma significantly contribute to malocclusion [1]. Malocclusion is a problem that has been studied for long in various populations to understand its causes and magnitude, and hence be able to provide proper treatment.[2] It comes third after Caries and periodontal diseases, which are considered the most common problems in oral health; as proposed by the World Health Organization [2]. It is a morphological variation that may or may not be associated with a pathological condition.[3] The most common classification of malocclusion was made by Angle who considered the maxillary first molar to be the key of occlusion and made his classification accordingly.[4]

Tooth Malocclusion can cause psychosocial problems related to impaired dentofacial aesthetics disturbances of oral function, such as mastication, swallowing, speech, greater susceptibility to trauma and periodontal disease [5,6]. Malocclusion is not just a single set up but rather many factors interconnected with each other and complicated by various causes [7]. Angle's classification of malocclusion in 1899 was an important step in the development of orthodontics. [8] It

classified the major types of malocclusions, provided the first clear definition of normal occlusion in natural dentition and still remains the widest used and accepted method of assessment of malocclusion internationally [9]. The Index of Complexity Outcome and Need (ICON) is a recent orthodontic index which was developed in 2000 based on the expert opinions of ninety-seven practicing specialist orthodontists from Germany, Greece- Hungary, Italy, Netherlands, Norway, Spain, *UK* and USA [10] (Daniels C. 2000). This index assesses five components:

- The Aesthetic Component of the Index of Orthodontic Treatment Need
- The amount of maxillary crowding or spacing (mm)
- Presence or absence of crossbite
- Incisor open bite(mm) /overbite
- The left and right anteroposterior buccal relationship

A basic knowledge of the prevalence of malocclusion is needed in treating or carrying out the preventive or interceptive measures for the target population through a well-organized educational dental care program, the prevalence of malocclusion has been previously assessed in various countries with values ranging from around 40 -93% [11]. Also, in various Nigerian studies the distribution of various classes of malocclusion in the major ethnic groups of Yoruba and Igbo in South-Western and Eastern Nigeria, and Hausa in Northern Nigeria have been reported [12]. Therefore, the aim of this study is to use both Angle's classification and the ICON to determine the prevalence of malocclusions and occlusal traits in adolescents residing in Rivers State and to compare the findings with other ethnic groups in Nigeria to enable informed planning of orthodontic services and appropriate training of manpower in the State

MATERIALS AND METHOD

It was a cross-sectional study done on children enrolled in schools and also resides in iwofe, Rumuolumeni Port Harcourt Rivers State, aged 6 -18. These children represent the age when the majority of orthodontic patients are most likely to present and be managed.

Inclusion Criteria:

- Currently enrolled children.
- Children willing to participate and provide informed consent.

Exclusion Criteria:

- Children with a history of orthodontic treatment (if not relevant to the study).
- Children with severe craniofacial anomalies (if not relevant to the study).

Methods of data collection

Clinical dental examination: systematic oral examinations was carried out using dental mirrors, probe and rulers to measure and observe dental alignment and occlusal traits.

A complete oral examination using the ICON protocol and Angles Classification was carried out on each child. The children were examined for occlusal traits which includes the occlusal antero-posterior relationship, overjet. overbite. open bite, crossbite. spacing and crowding. This examination was done with the subject seated in a straight back chair with the teeth in centric occlusion using orthodontic millimeter rulers under natural illumination,

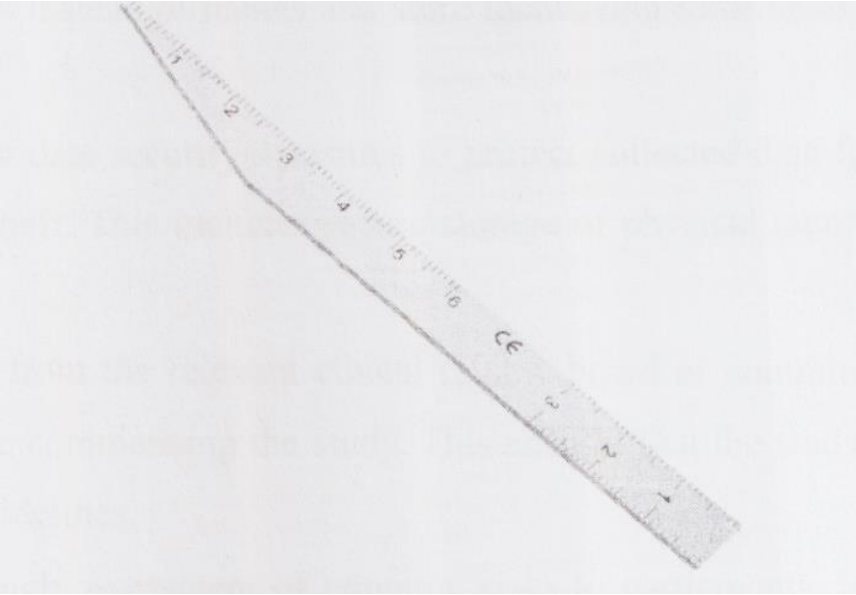

Fig. 1: Orthodontic Ruler

• **Questionnaires and surveys:** Questionnaires were used to gather demographic information (age, sex, Parental background and oral habits (thumb sucking, mouth breathing), oral hygiene practices, dental history and awareness of dental issues.

Fig. 2: over bite

Fig 3: open bite

Fig. 4: Cross bite

METHODS OF DATA ANALYSIS

The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 25.0. Descriptive statistics (e.g. mean, median, standard deviation) was calculated for quantitative survey data on the prevalence of malocclusion. Inferential statistical tests (e.g., t-tests, ANOVA and correlation analysis) was done to compare

means between different groups, such as comparing the average severity of malocclusion across different age groups. correlation analysis was done to examine relationships between variables, such as the correlation between oral hygiene practices and severity of malocclusion.

Ethical Considerations

- Obtained informed consent from all participants before data collection, ensuring voluntary participation and confidentiality of responses.
- Provided detailed information about the study, including its purpose, procedures, potential risks and benefits, and the time commitment required.
- Obtained approval from the faculty of basic medical science ethical review committee, River State University Portharcourt.

RESULTS AND ANALYSIS

Presentation of Results

Table 1: Gender Distribution of anteroposterior molar relationship (Angle's classification)

Malocclusion Type	Male	Female	Total	Percentage %
Normal	17	19	36	11.8
Class I	119	130	249	80.3
Class II Division I	7	6	13	3.9
Class II Division II	3	4	7	2.4
Class III	2	3	5	1.6
Total	**148**	**162**	**310**	**100**
P < 0.05 Significant				

Table 2: Gender Distribution of Overjet and Overbite

	Male	Female	Total	Percentage %
Overjet				
Normal	96	118	214	69.2
Increased	25	24	49	15.6
Reduced	27	20	47	15.2
Total	**148**	**162**	**310**	**100**
Overbite				
Normal	77	95	172	55.5
Increased	54	53	107	34.3
Reduced	17	14	31	10.2
Total	**148**	**162**	**310**	**100**

Table 3: Gender Distribution of Maxillary arch crowding and spacing

	Male	Female	Total	Percentage %
Crowding				
Normal	128	140	268	85.6
Crowding	20	22	42	14.4
Total	**148**	**362**	**310**	**100**
Spacing				
Normal	60	66	126	40.5
Spacing	88	96	184	59.5
Total	**148**	**162**	**310**	**100**
P > 0.05				

Table 4: Gender Distribution of Open bite and Crossbite

	Male	Female	Total	Percentage %
Openbite				
Absent	136	152	288	92.9
Present	12	10	22	7.1
Total	**148**	**162**	**310**	**100**
Crossbite				
Absent	120	137	257	82.9
Present	28	25	53	17.1
Total	**148**	**162**	**310**	**100**
P > 0.05 Significant				

Data Analysis

Table 1 shows the gender distribution of Angle's Class I, II and III respectively. Majority of the subjects were found to have Angle's Class 1 molar relationships (80.3%). There was a significantly larger proportion of females (52.2%) as compared with their male counterparts (47.8%).

Majority of the children had normal overjet (69.2%) and overbite (55.5%). However significant gender differences were found (Table 2). More females were found to have normal overjet and overbites than their male counterparts, whilst males were found to have a larger proportion of reduced overjet's and overbites.

A normal dentoalveolar relationship was a predominant finding. However, crowding of the arches was found in 14.4% whilst 59.5% had spaced arches as depicted in Table 3. Anterior and posterior crossbite was found in 17.1% of the population, whilst open bite was seen in a smaller proportion of 7.1 % (Table 4).

DISCUSSION

In the present prevalence study of 310 participant (148 males and 162 females, age 6-18-years old were selected to provide preliminary information on the prevalence of malocclusion and specific occlusal traits in Rivers State residents (Children). As the prevalence of malocclusions in different studies varies according to the methods of assessment, racial differences, and the chronological age of the sample. [11]

Normal occlusion in this study was found in 11.8% of the population. This is similar to 12.2% observed in children in Northern Nigeria [12] but lower than the findings of 24.4%, 27% and 15.9% reported among the children from south-western, eastern and south-south Nigeria (20,21-23) respectively. [5,13,14] It is also lower than that reported among Iranian children (22.9%).[15]

Angle's Class I malocclusion was predominant in the present study (80.3%), which is a finding consistent with the previous reports from Nigerian populations [16]. However, the findings in the present study was closer to 80.7% that was obtained in Benin City [14] South-South Nigeria, but not consistent with the lower values of 61.5%, 65.5% and 50.0% assessed in previous surveys carried out in other parts of Nigeria [13]. This is probably due to ethnic differences (as well as differences in registration methods).

An interesting finding in the present study was the gender differences obtained. There was a significantly greater proportion of females (52.2%) with Class I malocclusion when compared with their male counterparts (47.8%) (p 0.05). Earlier studies carried out amongst British school children and Eskimos also showed female predominance in Class I malocclusions [17]. Contrary to the present result, in a study carried out in Iran more males were found to have Class I malocclusion than females, although the difference was not significant [15]. This finding is inconsistent with other studies carried out in Nigeria where gender differences were not obtained [16]. However, no reason could be adduced to the gender differences that we obtained. Angle's class II malocclusion was found in 6.3%. (division 1,3.9 % and division 2, 2.4%). This is lower than 14% obtained in South west Nigeria [13] and higher than 1.6% in South- South [14]and 1.7% in Northern Nigerian children.[12]

This result is comparable to earlier studies carried out amongst American Indians, Eskimos, and native Australians [18]. It is also lower than that found in white Americans western Europeans and Iranian children [19]. The prevalence of Angles Class III malocclusion found in this study (1.6%) is similar to that found in Benin City (1.8%) [14] Tanzania (1%) [20] and Northern Nigeria (2%) [12], but much lower than 12% in South Western Nigeria. This is also similar to the prevalence of Class III malocclusion in Caucasians (1-4%) [21]. However, the Japanese and Chinese have a much higher prevalence of Class III malocclusion than found in this study [22]. Racial and ethnic differences seem to play a role in the prevalence of Class III malocclusion.

High prevalence of normal overjet (69.2%) and overbite (55.5%) were found in this study, however there were significantly more females with normal overjet and overbites as compared to the males. This is contrary to the lack of gender difference that has been reported from other parts of Nigeria and cannot be explained but may be due to study sample differences. Also, studies in other parts of Nigeria found majority of Nigerians to have normal overjet and overbites [13]. In Benin City, 23 (68.3%) [14] amongst Yoruba adolescents (65.7%) [13] and Northern Nigerians 69.5%) [12] similar proportions of the sample had a normal overjet [12].

Isiekwe [23] suggested that the high prevalence of normal overjet values in Nigerians may be due to the possibility of bimaxillary protrusion which is commonly found in the African race. Although majority of the sample had normal overbite values, a deep bite was seen in 34.3% which is almost equal to the proportion of Iranian children with deep bites (34.5%). However, less than 1% was found to have very deep bites, with the lower incisors fully covered by the upper incisors and associated palatal trauma, which is much less than that obtained in Iran (2.2%) [15]. Amongst Northern Nigerians a low proportion of 1.6% were also found to have very deep bites [12]. In this study7.1% of the sample had an anterior open bite (AOB), which is similar to values obtained in studies carried out in Iran 37.38[15] with values of 6.6% and 7.3% respectively, while in Benin City, an AOB was seen in a lower proportion of the population [14]. The figure obtained is closer to that found in black adolescents (10%) than in Caucasians which has been reported to be less than 5% [24]. Anterior

and posterior crossbite was seen in 17.1% of our studied population, this is comparable to values obtained in Iranian studies [15] but higher than that obtained in Benin City [14]. The prevalence of crowding and spacing in different populations provides valuable information about the characteristics of malocclusions and treatment strategies. In the present study, maxillary arch spacing was found to be more prevalent than crowding, which is consistent with the findings of other Nigerian studies [3, 5,12, 13, 14] and with that obtained among Tanzanian [20] children but contrary to another study in Tanzanian [25] where crowding was more prevalent as seen in Caucasian populations

Severe spacing of more than 6mm was seen in over 20% of the population studied. This may be due to increased prevalence of the midline diastema which is seen in Africans. The gender differences found in this study seem to suggest that females in River State have less malocclusion than their male counterparts, however the results should be interpreted with caution and we recommend that further studies be carried out in order to study this further. This gender difference was not found in any other study in Nigeria. The results of this study may be useful for public health planning and for the generation of hypotheses for future studies, especially in this region of Nigeria where the practice of orthodontics is relatively new [25]. As the incidence of malocclusion may change or fluctuate in populations with time, follow-up studies are required. [15]

CONCLUSION

Malocclusion is a prevalent dental issue with significant implications for oral health, aesthetics, and psychosocial well-being. This study highlights the need to address the gap in data specific to Rivers State, Nigeria, where the prevalence and patterns of malocclusion remain under-researched. Existing studies in other regions of Nigeria reveal that Class I malocclusion is the most common type, with variations influenced by genetic, environmental, and socioeconomic factors.

By systematically assessing the prevalence of malocclusion in Rivers State residents (Children), this research will provide critical insights to inform public health strategies, promote early orthodontic interventions, and improve access to dental care. These findings are expected to contribute to better oral health outcomes and overall well-being for children and adolescents in the region. Angle's Class I malocclusion is the predominant occlusal pattern among these students, which is consistent with other studies in Nigeria. This pattern of occlusion bears more of a similarity to that obtained in Benin City than that obtained in the North East and West of Nigeria suggesting possible ethnic similarities. We recommend that other studies be carried out in Rivers State to investigate further the significant of gender differences found in this study.

RECOMMENDATIONS

- **Early Diagnosis and Intervention:** Establish routine dental screening programs in schools across Rivers State to identify and manage malocclusion cases early, preventing long-term complications.
- **Public Health Campaigns:** Increase awareness of malocclusion and its effects on oral health through targeted campaigns, emphasizing the importance of regular dental check-ups and early treatment.
- **Accessible Orthodontic Care:** Expand access to affordable orthodontic services, particularly in underserved areas, to address socioeconomic barriers to treatment.
- **Further Research:** Conduct more comprehensive studies to identify risk factors and trends specific to Rivers State, helping to tailor public health strategies and resource allocation.

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