Original Article

Cephalometric Findings In Pre-Treatment Orthodontic Patients In A Teaching Hospital

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ABSTRACT

The lateral cephalometric radiograph is a standard component of clinical records taken for orthodontic diagnosis and treatment planning. Cephalometric analyses were developed to characterize a patient's dental and skeletal relationships relative to population norms. The aim of this study was to evaluate the lateral cephalometric radiographs of pre-treatment adult orthodontic patients of Nigerian origin and compare the findings to normal cephalometric values of healthy Nigerians. This cross-sectional study was carried out at the orthodontic unit of the University of Benin Teaching Hospital after obtaining clearance from the Research and Ethics Committee of the Hospital. The lateral cephalometric radiographs were used to assess the skeletal patterns of each patient using Steiner's analysis. Data was computed and analyzed using the SPSS version 21.0 software. Data generated were subjected to statistical analysis to determine the variables (frequencies, percentages and means). Differences between variables were evaluated with Chi-square test. P values at <0.05 were set as significant. Eighty (80) pre-treatment lateral cephalometric radiographs of orthodontic patients of Nigerian origin at the orthodontic unit of the University of Benin Teaching Hospital were evaluated. 31(38.8 %) of the study population were males, while 49 (61.2 %) were females. Skeletal II constituted majority of the subjects, 48 (60.0 %) while Skeletal I was 22 (27.5 %) and Skeletal III was 10 (12.5 %). More females had Skeletal Class II jaw relationship. This study recorded higher Skeletal Class II jaw relationship among the study population, and more females recorded Class II Skeletal, base relationship.

Keywords: Cephalometric findings, pre-treatment, Orthodontic patients

INTRODUCTION

The lateral cephalometric radiograph is a standard component of clinical records taken for orthodontic diagnosis and treatment planning. [1-3] Radiographic cephalometry was introduced in 1934 by Hofrat in Germany and Broadbent in the United States.[4] Although its original intent was to longitudinally assess growth and development in the craniofacial complex, the cephalometric radiograph was adopted by clinical orthodontists to diagnose any skeletal imbalances underlying the dental features of a malocclusion. Cephalometric analyses were developed to characterize a patient's dental and skeletal relationships relative to population norrns.[5-7] The normative data on growth were derived from several longitudinal studies undertaken between the 1940s and I960s.[8-9]

In developing a treatment plan for a patient, the majority of orthodontist records of diagnostic casts, intraoral photographs, and radiography that typically includes a panoramic radiograph and a lateral cephalometric radiograph.[10,11] For the better half of a century, the lateral cephalometric radiograph has been a routine measure in orthodontic diagnosis and treatment planning.[10,11] The primary purposes of the lateral cephalornetric radiograph are to provide detailed views of the relationships between the patients skeletal, dental and soft morphology, and to evaluate a patient's progressive response to treatment.[12,13] Cephalometric radiographs also evaluate the relationship of the teeth as a result of orthodontic movement and the overall effects of the growth of the craniofacial complex.[1] Although not recommended as a screening tool, cephalometric radiographs have on occasion revealed anomalies or degenerative changes in the cervical vertebrae as well as pathologic conditions within the cranium[2,14,15].

The relative importance of cephalometric analysis in orthodontic planning has varied throughout the years. At the time of its introduction, the principal goal of orthodontic treatment was to obtain an ideal dental occlusion by the Angle paradigm. The cephalometric radiograph gradually became the cornerstone of orthodontic diagnosis and treatment objectives were basal

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in achieving certain final "numbers".[8,9] The purpose of this study was to evaluate the pre-treatment lateral cephalometric radiographs of adult orthodontic patients at the orthodontic unit of the Uniyersity of Benin Teaching Hospital and compare the findings to normal cephalometric values of healthy Nigerians.

MATERIALS AND METHODS

Study Setting

This study was carried out at the Orthodontic unit of the University of Benin Teaching Hospital, Benin City, Edo State, Nigeria . This cross sectional study was carried out in pre-treatment adult orthodontic patients of Nigerian origin at the orthodontic unit of the University of Benin Teaching Hospital after obtaining clearance with protocol number AMD/E22/A/VOL.VII/148301124 from the Ethics and Research Committee of the Hospital. The inclusion criteria included only adults of Nigerian origin with various types of malocclusion seeking orthodontic treatment at the orthodontic unit of the University of Benin Teaching Hospital. Patients with previous orthodontic treatment, those with congenital anomalies, those below 18 years of age and non Nigerians were also excluded from the study. The clearest resolution and detail on radiographs were analyzed with a total sample of 80.

Selection of subjects

The subjects were pre treatment orthodontic patients who presented in our department. Those who fulfilled the inclusion criteria and were willing to participate in the study were selected. This study was carried out between May 2024 and June 2025. A proforma (questionnaire) was used to compile information on each patient. Convenience sampling technique was used in this study.

The lateral cephalometric radiographs were taken by the same radiographic technician and machine in a standardized manner using a digital cephalometric machine (Pax-i-2D imaging systems Vatech 2017 PCH-2500version2.5.0) set at xl.25 magnification as recommended by the manufacturer. The images generated were stored directly in a computer data base created using the manufacturer's software (Dimax Pro 4.1.4; Planmeca, Helsinki, Finland). Conventional measurements were taken using hard-copy printouts of the digital images.

Method errors of the various cephalornetric variables were 1.2° for angular measurements. The systematic error of the angular and linear measurements was assessed with the student's t-test with no significance difference between measurements.

The lateral cephalometric radiographs was used to assess the skeletal patterns of each patient using Steiner's analysis[16], and the measurement of the ANB angle (point A to nasion to point B), this represents the antero-posterior jaw relationship or the skeletal pattern.

Class I Skeletal Pattern- ANB angle 2-4°

Class II Skeletal Pattern - ANB angle $>5^0$

Class III Skeletal Pattern - ANB angle $<1^0$

Measurement of Skeletal and dental problems:

The SNA; Sella-Nasion-A (the innermost and concave part of the bony maxilla), is to determine maxillary prognathism or retrognathism. The Nigerian values[17] of 82-89º were regarded as a normal maxilla. Values of <81º were regarded as a retrusive maxilla and >90º as maxillary prognathism. [17]

The SNB; Sella-Nasion-B point (the innermost and concave part of the bony mandible) is used to determine mandibular prognathism or retrognathism. Nigerian values[17] of 79.5-85.9º were regarded as a normal mandible. Values of <79.4º were regarded as a retrusive mandible and >86º as mandibular prognathism.

The interincisal angle is the angle formed between the upper and lower incisors. Nigerian values of l08-l16º were regarded as normal. Values of <107º were regarded as bimaxillary protrusion and >117º as bimaxillary retrusion[17]

Statistical Analysis

Data was computed and analyzed using the SPSS Version 21.0 software. Data generated were subjected to statistical analysis to determine the variables (frequencies, percentages and means) Differences between variables were evaluated with Chi-Square test. P values at <0.05 were set as significant.

RESULTS

Eighty (80) Lateral cephalometric radiographs of pre-treatment adult orthodontic patients of Nigerian origin were evaluated using Steiner's analysis.[16] The Skeletal base relationship was determined and the upper incisor to lower incisor angle was also assessed

Males were 31 (38.8%) While females were 49 (61.2 %). The minimum age was 18 while the maximum age was 22.78 ±5.73 Years

Table 1 shows the distribution of the skeletal base relationship in male and female subjects. Class I was found in 5 (16.1%) male and 17 (34.7%) females, class II was found in 22 (7.1%) males, and in 26 (53.1%) in females while Class III was found in 4 (12.9%) males and 6 (12.2%) in females. Class II Skeletal pattern was found in the majority of the subjects 48 (60.0%), Class I skeletal pattern was found in 22 (27.5%) and class III was found in 10 (12.5%) of the subject. There was no statistical significant difference between skeletal base relationship and sex (p>0.05).

Table 2 shows the distribution of upper to lower incisor angle (interincisal angle) in male and female. The interincisal angle was normal in 5 (16.1 %) males and 14 (28.6%) Female. There was bimaxillary protrusion (interincisal angle $<107^0$) was observed in 17 (54.8 %) male and 26 (53.0%) female. There was bimaxillary retrusion (interincisal angle >117º) in 9 (29.0%) males and 9 (18.4%) females. There was normal interincisal angle ($108\text{-}116^0$) in 19 (23.8%) of the Subjects. Bimaxillary protrusion was observed in 43 (53.7%) of the subjects, while bimaxillary retrusion was observed in 18 (22.5%) of the subjects. There was no statistical significant difference between interincisal angle and sex (P>0.05).

Table 1: Distribution of Skeletal base Relationship in Male and Female

Skeletal Pattern	Male	Female	Total (%)
Skeletal Class I	5 (16.10%)	17 (34.7%)	22(27.5%)
Skeletal Class II	22 (71.0%)	26(53.1%)	48(60.0%)
Skeletal Class III	4 (12.9%)	6(12.2%)	10(12.5%)
Total	31 (100.0%)	49(100.0%)	80(100.0%)

Chi Square 3.401, P = 0.183

Table 2: Distribution of Upper Incisor to Lower Incisor Angle in Male and Female

Upper Incisor to Lower Incisor Relationship	Male	Female	Total (%)
Normal	5 (16.1%)	14 (28.6%)	19 (23.8%)
Bimaxillary Protrusion	17 (54.8%)	26 (53.0%)	43 (53.7%)
Bimaxillary Restrution	9 (29.0%)	9(18.4%)	18(22.5%)
Total	31 (100.0%)	49(100.0%)	80(100.0%)

Chi Square 2.209; P = 0.331

DISCUSSION

Cephalometric analyses was developed to characterize patient's dental and skeletal relationships relative to population norms.[8,9]

This study showed that the most common type of skeletal malocclusion determined by angular measurement (ANB) was skeletal II 48 (60.0 %), followed by Class I 22 (27.5 %) and Class III 10 (12.5 %). This was similar to findings from a previous study.[18] Another previous study however differed from this study as they observed that the most common skeletal malocclusion among Saudi orthodontic patients were Class I(46.4 %), followed by Class II (27.5 %) and Class III (26.1 %)[19].

In another study[20] which showed the majority of Saudi Arabian patients with Class I skeletal pattern (50.20 %), followed by Class II (40.98 %) and Class III (8.82 %),Farawana[21] on the other hand found Class I(74.5 %) skeletal relationships as the most predominant in Iraqi population, followed by Class II(15.0 %) and Class III (10.0 %). Zhou et al[22] reported Class I skeletal pattern in 69.3 % followed by Class III in 16.3 % and Class II in 14.4 % among the Chinese samples. Previous study[23] reported that patients with severe sagittal Class II malocclusion had a higher motivation for orthodontic treatment than Class III.

This study also assessed the interincisal angle from the lateral cephalometric radiographs of the subjects. This study showed that majority of the study population had bimaxillary protrusion, which was a similar finding from a previous Nigerian study which showed that majority of Nigerians with malocclusion had bimaxillary proclination.[17]

CONCLUSION

This study carried out in a Nigerian population showed that majority of the subjects recorded Class II skeletal pattern, and bimaxillary protrusion was predominant among the study population which was a similar finding in a previous study among Nigerians.

RECOMMENDATIONS

1. This study showed that the occurrence of Class II malocclusion and Bimaxillary protrusion in the Nigerian population is quite high. More emphasis should be placed on preventive and interceptive orthodontics in order to reduce it to the barest minimum.
2. Government should provide further assistance to the health sector and enhance training of more orthodontists to cope with treatment demands.

Conflict of Interest: None

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QUESTIONNAIRE

SECTION A: BIODATA

1.Age (yrs) …….

2.Gender Male ……; Female ……..

3.Nationality Nigerian ……..; Non Nigerian

SECTION B: LATERAL CEPHALOMETRIC MEASUREMENTS

4.SNA ANGLE ……..

5.SNB ANGLE …….

6.UI-FP ……..S