

# Cephalometric Characteristics of Cameroonian Adults: Dimensional Analysis of 80 Cases

Ongolo-Zogo Pierre<sup>1</sup>, Bengondo Charles<sup>2</sup>, Endalle Catherine<sup>3\*</sup>, Onana Jules<sup>4</sup>

<sup>1</sup>Department of Radiology and Imaging, Yaoundé Central Hospital, Cameroon; <sup>2</sup>Odontostomatology/Maxillofacial Surgery Department, Yaoundé Tcheatching Hospital, Cameroon; <sup>3</sup>Odontostomatology Department, Yaoundé Tcheatching Hospital; <sup>4</sup>Yaoundé Military Hospital, Cameroon

## ABSTRACT

**Introduction and Objectives:** The reference values used in Cephalometry to determine the orthodontic treatment to be realized are mostly of Caucasian origin. In Cameroon, the need for care is growing; but little information is available in Cephalometry. Should we treat with imported cephalometric standards? To answer this question, we conducted this study in order to determine the craniofacial morphological characteristics of a sample of Cameroonian subjects in the Yaounde Central hospital having high health standard in Cameroon.

**Methodology:** We carried out an analytical study at the Yaoundé Central Hospital from January to March 2016, on scout view scanographic images of patients, aged 20 to 50 years. 15 cephalometric variables were measured and their mean values and standard deviation calculated. To determine the reference values, we used indicator means with their 95% confidence interval as the best estimator of our population measures.

**Results:** We included 80 subjects with an average age was 32.3 years. Cameroonian subjects have sex differences only for SNB and SND measures that were higher in men. Compared with Caucasian values according to Steiner, the Cameroonian population had a protrusive dento-alveolar structure with higher average values except for inter-incisal angles 119.3° and SND 78.8° which showed a lower value against 1310 and 790 for Steiner.

**Conclusion:** Differences between Cameroonian men and women were in SNB and SND measurements that were higher in men. The averages of the Cameroonian sample are significantly different from the Caucasian averages in most measurements. Considering these differences, this work enabled us to propose a charter of cephalometric values, thus providing clear indications as to the type of Cameroonian.

**Keywords:** Cephalometry; Cameroonians; Steiner

## INTRODUCTION

Cephalometry uses angular and linear measurements obtained from images of the lateral and frontal view of the head to determine the nature of the orthodontic treatment to be carried out [1]. The reference values used are of Caucasian origin mostly [2-6]. In Cameroon, care needs are becoming increasingly important; but little information is available in Cephalometry. Should we deal with imported cephalometric standards? To answer that question, we proposed to study the cephalometric measurements according Steiner of a sample of Cameroonian

adults, more specifically, to describe and define the cephalometric profile of this sample, compare Cameroonian cephalometric proportions by sex and to compare the cephalometric profile between Cameroonian and Caucasian. Finally, the question for us was to suggest cephalometric reference values for Cameroonian subjects.

## PATIENTS AND METHODS

We conducted an analytical study in the Radiology Department at the Yaounde Central Hospital from January to March 2016.

**Correspondence to:** Endalle Ewoudou Catherine, Department of Radiology and Imaging, Yaoundé Central Hospital, Cameroon, Tel: (237) 697269811; E-mail: endallecathy@yahoo.fr

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We worked on the CT-images of patients in that service. Thus, we included topograms of 80 patients, including 35 females and 45 males, having done a Craniofacial CT-scan and having all teeth, with a sex ratio of 1.3 in favor of men. The patients in our sample had a mean age of 32.3 years aged 20 to 50 years. All cases with maxillofacial pathology or malformation or skeletal abnormalities identified on CT-scan at the time of the review and any patient with unexploitable CT-scans were excluded.

Fifteen cephalometric variables of bony, dental and cutaneous bases were measured; their mean values and standard deviations calculated using SPSS Version 20.0 software. The reproducibility of measurements within and between observers [3] measures were evaluated. To determine reference values, we used the average of the indicators with their confidence interval of 95% as the best estimator of our measurements in the population. For all statistical tests, the threshold value was set at  $p=0.05$ . A Student t-test was used to compare mean values according to the Cameroonian gender, then between Cameroonians and Caucasians.

### Determining the cephalometric characteristics

Cephalometric parameters were determined from the CT-scans. All acquisitions of CT data in 2D were performed on one device. The acquisition for each exploration performed for

**Table 1:** Results of the analysis of sagittal and vertical measurement.

Sagittal	Male	Female	Total	p
<b>Skeletal measurements</b>	<b>Mean [IC (95%)]</b>	<b>Mean [IC (95%)]</b>	<b>Mean [IC (95%)]</b>	
SNA (°)	88,3 [87,2-89,5]	87,2 [86,1-88,3]	87,8 [87-88,6]	0,175
SNB(°)	83,4 [82,3-84,6]	81,7 [80,5-82,9]	82,7 [81,9-83,5]	0,043
SND (°)	79,6 [78,6-80,6]	77,7 [76,5-78,9]	78,8 [78-79,6]	0,016
ANB (°)	5,0 [4,2-5,8]	5,5 [4,7-6,2]	5,2 [4,6-5,7]	0,408
GOGN/SN (°)	15,3 [13,9-16,7]	16,2 [14,6-17,8]	15,7 [14,7-16,7]	0,397
SL (mm)	52,3 [50,2-54,4]	48,1 [46,1-50,1]	56 [43,4-68,5]	0,280

**B) Alveolar bases parameters: analysis of dento-dental and dento-skeletal ratios:** The means and standard deviations of parameters relating to the position of the upper and lower incisors in relation to skeletal bases figure on the Table 2 above.

**C) Aesthetic analysis: analysis of soft tissue:** The standard for subjects belonging to our population was respectively 6 mm for the upper lip and 6.7 mm for the lower lip (Table 3).

## DISCUSSION

The overall aim of our study was to determine the craniofacial morphological characteristics of a sample of 80 Cameroonian subjects in Yaoundé. This research, which lasted four months was specifically to describe and define the cephalometric profile of this sample, compare cephalometric Cameroonian proportions by sex and to compare the cephalometric profile between Cameroonian and the other Caucasian.

diagnosis was conducted on subjects in the supine position. The subjects were asked by the operator to remain still and keep the teeth in maximum intercuspation. The outlines of CT-scans were made by a single operator. The numerical method that involves computers and specialized cephalometric outline software was used. Once the image of a patient was selected, cephalometric points were localized and marked using Steiner's analysis, and then proceeded to angular and linear measurements with the help of our computer mouse, from a marked point to another. The distances and angles appeared automatically once the line was drawn from one point to another. A protractor was used to confirm the angular measurements.

## RESULTS

### Cephalometric variables of the study population

**A) Parameters of bone bases: sagittal and vertical skeletal analysis:** SNA and SNB angles respectively indicate the positions of the maxilla and mandible in relation to the base of the skull significantly between the 2 sexes. The shift of the maxillary and mandibular bone bases in the midsagittal plane, objectified by measuring ANB angle (Table 1).

**Table 2:** Results of dento-dental and dento-skeletal analysis.

Alveolar bases	Male	Female	Total	p
	Mean [IC (95%)]	Mean [IC (95%)]	Mean [IC (95%)]	
I/NA (mm)	5,6 [5,0-6,3]	5,3 [4,7-5,8]	5,5 [5-5,9]	0,397
I/NA (°)	22,5 [20,6-24,4]	22,6 [20,8-24,5]	22,6 [21,2-23,9]	0,914
i/NB(mm)	8,1 [7,4-8,7]	8,3 [7,6-9]	8,2 [7,7-8,6]	0,677
i/NB (°)	33,1 [31,1-35,2]	34,2 [32,1-36,4]	33,6 [32,1-35,1]	0,479

It was equally for us to suggest cephalometric reference values for Cameroonian subjects. A numerical method was used because the traditional method is more difficult and time-consuming than methods that involve specialized software.

**Table 3:** Results of the analysis of soft tissue.

Variables of soft tissues	Male	Female	Total	P
	Mean [IC (95%)]	Mean [IC (95%)]	Mean [IC (95%)]	
Upper Lip Le/s (mm)	+6,2 [5,5-6,9]	+5,7 [5-6,4]	+6 [5,5-6,5]	0,367
Lower Lip Le/i (mm)	+6,7 [5,9-7,5]	+6,7 [6,2-7,3]	+6,7 [6,2-7,2]	0,946

**Clinical features**

With regards to the sagittal and vertical skeletal analysis, the comparison between the genders of our population showed a statistically significant difference for the SNB and SND measurements, which were higher in men. These results of SNA, SNB, and ANB were closed to the results obtained by Ajaiyi et al. [7] in Nigeria; the rest of skeletal measurements were comparable between the sexes (Table 4).

With regard to dental measurements, women's measurements were found superior to that of males without significant gender difference except for the inter-incisal angles. For angular and

linear measurements of INA, our results were closed to those obtained in African studies, but nevertheless with slightly higher values than those of studies done in the year 2000 in Ivory Coast by N'dindin et al., [8] and the one made in Morocco in the year 2014 [9] concerning the Hausa population.

Regarding the respective measurements of the distance i-NB and the angle i/NB, for the averages of 8.1 mm and 33.1° for men; and of 8.3 mm and 34.2° for women, the values of our results were found superior to those of other African studies including those found in the Ivory Coast [8] (boy: 5 mm and 18°; girl: 7 mm and 22°), and that concerning the Hausa population [9] due to a mean value (6.2 mm and 35.6°); this difference could be explained by the interracial heterogeneity.

For the inter-incisal angle, with an average of 119.3° in our sample, the study Manan in India in the year 2014 [10] found: 124° in men and 120.2° in women. We noted that the average value of this angle and that obtained by Ousehal et al. in Morocco in the year 2012 [11], amounting to 124.65° were superior to that of our study, favoring a proclination of the upper and lower incisors of our sub-Saharan populations as found in the Hausa population by Abdoulaye M. Similarly, for this measurement interincisal angle by Huda et al. in the Emirates [12] in the year 2011 was 120° for men (value similar to that found in our study of the male gender) and 121° for women values greater than those found in our study.

According to Steiner, well-balanced lips must touch a line from the contour of the soft tissues of the chin to the middle of an S formed by the lower edge of the nose [3]. Lips located beyond

**Table 4:** Study on the impact of ethnicity in aesthetic evaluation.

Measurements	Cameroonian	Ivoirian	Haussa	Indiens	Steiner
SNA (°)	87,8	85,5	86,2	84,3	82
SNB (°)	82,7	81,2	82,1	82,8	80
SND (°)	78,8		78,3	79	79
ANB (°)	5,2	4,3	4,1	2	2,5
I/i (°)	119,3		114,1	122	131
I/NA (°)	22,6		27,4	28	22
I/NA mm	5,5		4,5	8	4
i/NB (°)	33,6		35,6	28	25
i/NB mm	8,2		6,2	6,5	4
Occ/SN (°)	15,7		15,6	12	14
GOGN/SN (°)	30,8		30,6	15,7	32
SL (mm)	56		40,7	56	51
SE (mm)	21,6				22

and behind this line tend to be respectively protrusive and retrusives. Our study showed that in the study population, the upper and lower lips were protrusive in men as well as in women, being well ahead of the aesthetic line of Steiner. Results similar to those of N'dindin et al. [8] in Ivory Coast in the year 2000, we talk of biprocheilia. Measurements of Cameroonian subjects were respectively 6 mm for the upper lip and 6.7 mm for the lower lip. This thus demonstrates that the Cameroonian adults have a high tendency to a protrusive lip profile compared to Caucasian samples. This finding is the same as that made by Assor, who conducted a study on the impact of ethnicity in aesthetic evaluation in ODF [13].

In line with the present findings, it is evident that there are some fundamental variations in the craniofacial structure when compared to Steiner's norms in the Caucasians. These results would be beneficial for appropriate diagnosis and orthodontic treatment for Cameroonians.

The results of the present study also support the idea that a single standard of facial aesthetics should not be applied to all racial and ethnic groups. The following differences and similarities were demonstrated in the Cameroonian, African and other ethnic samples as compared to the Caucasian samples.

## CONCLUSION

The mean values of our sample parameters were increased in dental parameters as well as skeletal, except for the interincisal angle that showed a smaller value. We can say that, like other Africans, they have a tendency to prognathism of both jaws with respect to measures of SNA and SNB. This should be kept in mind when making the skeletal diagnostic of Cameroonian subjects. Also, we can say that the transposition of the reference values established by Steiner intended a Caucasian population in Cameroon's population does not seem suitable. Comparisons of our sample with other ethnic groups show the need to develop separate standards knowing that ethnicity and even a racial issue and its cephalometric characteristics play a critical role in the planning of orthodontic treatment.

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