**Original Research Article**

# Is There A Relationship between the Facial and Nasal Height of the Ikwerre People?

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## Abstract

*Background*: Facial parameters such as facial, nasal, maxillary, mandibular and oro-facial change with age and are dependent on variations in the dimensions of the skeleton, development of muscles, sex and fat content and distribution in the body which are under the influence of climate, diet, health etc. these factors are important determinants of growth and development. Ethnicity is a variable that affects craniofacial dimensions. This study was done to determine whether there is a relationship between the facial height and nasal height of the Ikwerre people, establish a regression formula for predicting the facial height of the Ikwerre people using either nasal height or mandibular height and to examine if there are ethnic or racial differences when comparing the result in this study and previous studies. *Materials and Methods*: The study was cross-sectional that included males and females of the Ikwerre ethnicity of Rivers state of Nigeria. A total of 1,038 subjects comprising males (585) and females (453) aged between 5 – 45years were used for this study. The parents and grandparents were all from Ikwerre ethnic group. Each subject sat on a comfortable sitting position and then their facial measurements were taken including; facial height, nasal height, mandibular height, maxillary height and orofacial height. *Results and Discussions*: The facial height, nasal height, mandibular height, maxillary height and oro-facial height were measured using digital caliper and the results obtained showed that the males had mean facial height of 102.11± 9.07mm, nasal height of 37.07 ± 13.30mm, mandibular height of 45.10 ± 7.39mm, maxillary height of 20.85 ± 13.02mm, and oro-facial height of 65.91 ± 15.16mm while the females had mean facial height of 98.15 ± 6.96mm, nasal height of 36.65 ± 5.054mm, mandibular height of 41.43 ± 5.50mm, maxillary height of 19.43 ± 3.09mm, and oro-facial height of 60.86 ± 6.80mm. The result of the study showed that there is a progressive increase in the mean value of the facial height and nasal height with increase in age. This implies that there is an increase in the facial parameters with advancing age. This finding could be associated with natural growth and proportional body size increase i.e. facial growth. *Conclusion*: There is a relationship between the facial height and nasal height of the Ikwerre people which was seen as a positive correlation between the facial height and nasal height. It implies that for any increase in facial height, there is a resultant increase in nasal height amongst the Ikwerre people.
**Keywords:** Facial, Nasal, Maxillary, Height, Ikwerre people.

## INTRODUCTION

The Face is the anterior aspect of the head, between the ears and from the fore-head or hairline to the chin [1, 2]. The face provides our identity as an individual human and the basic shape of the face is determined by the underlying bones. The face also plays an important role in communication. Facial parameters such as facial, nasal, maxillary, mandibular and oro-facial change with age and are dependent on variations in the dimensions of the skeleton, development of muscles, sex and fat content and distribution in the body which are under the influence of climate, diet, health etc. these factors are important determinants of growth and development [3]. Ethnicity is a variable that affects craniofacial dimensions [4].

This study was done to determine whether there is a relationship between the facial height and nasal height of the Ikwerre people, establish a regression formula for predicting the facial height of the Ikwerre people using either nasal height or mandibular height and to examine if there are ethnic or racial

differences when comparing the result in this study and previous studies. There are researchers who have done similar studies with findings on other ethnic groups [4-10].

## MATERIALS AND METHODS

The study was cross-sectional that included males and females of the Ikwerre ethnicity of Rivers state of Nigeria. The communities sampled where Omuanwa town and Isiokpo town in Ikwerre local government area. Rumuchida community in Rumueme, Obioakpor local government area. The University of Portharcourt, Olobo premier college, Choba. Our lady of Lourdes, Ozuoba. Community secondary school, Aluu. State Primary School and Alakahia. A total of 1,038 subjects comprising males (585) and females(453) aged between 5 – 45years were used for this study. Subjects with facial problems such as those that have undergone facial surgery or those whose faces are deformed due to accident (accident victims) were excluded. The parents and grandparents were all from Ikwerre ethnic group. Each subject sat on a comfortable sitting position and then their facial measurements were taken including; facial height, nasal height, mandibular height, maxillary height and orofacial height. The volunteers were made to sit upright with the head unsupported, relaxed and breathing quietly facing forward to the researcher.

### Sample Size Determination

The sloven's formula or Taro Yamane was used to calculate the minimum sample size of subjects in the research.

$N = N/1+N(e)^2$
n = sample size (minimum); N = population size; e = significant level (0.05)
N = Population size of Ikwerre ethnic group
[Ikwerre(188,930) + Obioakpor(462,350) + Emohua(201,057) + Portharcourt city(538,558)]

National Population Commission (2010)

That is N = 1,390,895
$N = 1390895/1 + 1390895(0.05)^2 \approx 399.88$

Using the digital caliper, facial dimensions or parameters were taken;

### Facial Height

This was measured as the distance between the nasion of the nose and the menton of the mandible also called the gnathion (A+B+C)
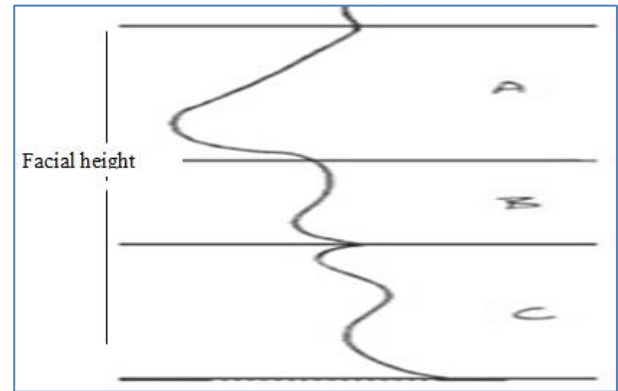


**Fig-1: Measurement of facial parameters (Didia and Dapper, 2005).**

### Nasal Height

This was measured as the distance between the nasion and anterior nasal spine (A).



**Fig-2: Measurement of nasal height**

### Maxillary Height

This was measured as the distance between the anterior nasal spine and the junction between the upper and lower lips (B).

### Mandibular Height

Was measured as the distance between the junction of the upper and lower lips and the menton (C)

### Oro-Facial Height

This was determined by measuring the distance between the anterior nasal spine and the menton. This is also gotten as the sum of maxillary and mandibular heights (B+C).

| | |
|---|---|
| Nasal Height | A |
| Maxillary Height | B |
| Mandibular Height | C |
| Oro-facial Height | B + C |
| Facial Height | A + B + C |

**Precaution**

We ensured that the instrument used for the measurement was not in bad shape, that is rusted, bent, and broken or has a dead battery in order to avoid wrong results or readings, errors due to parallax was avoided while taking the readings from the digital caliper, new measurement were taken while the caliper was set back to its zero(0) point, and the external jaw of the vernier caliper was cleaned with wool damped with methylated spirit to keep it sterile, prior to next measurement.

Verbal informed consent was sort from subjects before measurements were taken. Subjects were comfortably positioned, sitting upright with the head unsupported during measurements, the subject face was cleaned or dried from sweat or water when necessary to avoid slipping of the digital caliper from the right position before and during reading and made sure the subject in question was not chewing or eating when measuring. All linear measurements were in millimeters for each parameter. The data on the measured parameters were analyzed using the z-test to determine the sex differences and (P < 0.05) was taken as being statistically significant. The actual ranges for the male and female sexes were found out.

## STATISTICAL ANALYSIS

A correlation study was also carried out between the facial heights of subjects (males and females) and their nasal heights and mandibular heights respectively. A regression analysis was also carried out

to predict the facial height of the Ikwerre adult males and adult females from their nasal height and mandibular height.

## RESULTS

Table 1: The mean and standard deviation of facial parameters of Ikwerre males

Table 2: The mean and standard deviation of facial parameters of Ikwerre females

Table 3: shows statistical comparison of mean and standard deviation of previous studies on facial dimensions and present study. There were ethnic and racial differences as well as sexual dimorphism.

Table 4: shows regression equation for predicting the facial height from nasal height or mandibular height of males and females of Ikwerre ethnic group.

Figure 1: shows pearson correlation between facial height and nasal height for males. There was a positive correlation (P<0.05).

Figure 2: shows pearson correlation between facial height and mandibular height for males. There was also a positive correlation (P<0.05).

Figure 3: shows pearson correlation of facial height and nasal height for females and a positive correlation was observed (P<0.05).

**Table-1: The mean and standard deviation of facial parameters of Ikwerre males**

|  | Male Age (5-14yrs) | Male Age (15-24yrs) | 25yrs and above |
|---|---|---|---|
|  | Mean ± SD (mm), N=289 | Mean ± SD (mm), N=243 | Mean ± SD (mm), N=214 |
| F.H | 97.770±6.581 | 104.76±11.22 | 106.81±11.58 |
| N.H | 35.96±18.10 | 37.568±5.628 | 37.991±6.126 |
| MAN. H | 42.698±6.798 | 46.831±7.483 | 47.511±8.016 |
| MAX. H | 19.870±2.999 | 21.86±19.83 | 22.08±21.16 |
| O.H | 62.498±7.712 | 68.69±21.45 | 69.59±22.76 |

(P<0.05), Data are mean ± SD. N, number of subjects, F.H, facial height, N.H, nasal height, MAN. H, mandibular height, MAX.H, maxillary height, O.H, orofacial height

**Table-2: The mean and standard deviation of facial parameters of Ikwerre females**

|  | Female Age (5-14yrs) | Female Age (15-24yrs) | Female 25yrs and above |
|---|---|---|---|
|  | Mean ± SD (mm), N=192 | Mean ± SD (mm), N=238 | Mean ± SD (mm), N=176 |
| F.H | 95.876±5.728 | 99.129±7.006 | 101.24±6.98 |
| N.H | 35.398±3.829 | 36.665±3.662 | 38.344±6.255 |
| MAN. H | 40.591±3.983 | 42.322±6.035 | 41.975±7.018 |
| MAX. H | 18.912±2.546 | 19.852±3.378 | 20.107±3.667 |
| O.H | 59.504±5.562 | 62.174±6.937 | 62.083±8.013 |

(P<0.05), Data are mean ± SD. N, number of subjects, F.H, facial height, N.H, nasal height, MAN. H, mandibular height, MAX.H, maxillary height, O.H, orofacial height

**Table-3: Mean and standard deviation from previous studies and the present study.**

| Ethnic group | F.H | N.H | MAN. H | MAX. H | O.H | N |
|---|---|---|---|---|---|---|
| Adult males in Nigeria by Didia and Dapper,2005 | 12.23±3.39 | 40.50±1.23 | 4.49±1.23 | 2.44±0.66 | 6.90±1.89 | 110 |
| Adult females in Nigeria by Didia and Dapper, 2005 | 11.77±3.53 | 4.48±1.37 | 4.20±1.26 | 2.30±0.69 | 6.32±1.91 | 90 |
| Adult Ijaw males, Nigeria by Oladipo et al., 2006 | 1.87±1.59 | 4.71±0.63 | 4.60±0.61 | 2.40±0.033 | 7.12±0.95 | |
| Adult Ijaw females, Nigeria by Oladipo et al., 2006 | 10.71±1.43 | 4.43±0.59 | 4.28±0.57 | 2.39±0.32 | 6.50±0.87 | |
| Young adult Males Urhobos, Nigeria (Ebeye et al., 2009 ) | 12.61 | 4.56 | 4.52 | 2.68 | 6.75 | 60 |
| Young adult females Urhobos, Nigeria (Ebeye et al., 2009 ) | 11.91 | 4.27 | 4.14 | 2.21 | 6.36 | 80 |
| Male Ibibios in Nigeria by Isong et al., 2010 | 11.14±0.77 | 4.15±0.34 | 4.46±0.43 | 2.53±0.38 | 6.99±0.59 | 400 |
| Female Ibibios in Nigeria by Isong et al., 2010 | 10.55±0.74 | 3.93±0.35 | 4.14±0.33 | 2.48±0.49 | 6.63±0.60 | 400 |
| Adult male Indians (Babel et al., 2013) | 11.731 | 4.761 | 4.599 | 2.011 | 6.610 | 500 |
| Adult female Indians (Babel et al., 2013) | 10.559 | 4.570 | 4.002 | 1.987 | 5.989 | 500 |
| Adult Ikwerre males (present study) | 106.81±11.58 (mm) | 37.99±6.13 (mm) | 47.51±8.02 (mm) | 22.08±21.16 (mm) | 69.59±22.76 (mm) | 214 |
| Adult Ikwerre females (present study) | 101.24±6.98 (mm) | 38.34±6.26 (mm) | 41.98±7.02 (mm) | 20.107±3.67 (mm) | 62.08±8.01 (mm) | 176 |

Data are mean ± SD. N, number of subjects, F.H, facial height, N.H, nasal height, MAN. H, mandibular height, MAX.H, maxillary height, O.H, orofacial height

**Table-4: Regression equation for adult males and females of Ikwerre ethnic group**

| VARIABLES | N | REGRESSION EQUATION(mm) |
|---|---|---|
| Male F.H and N.H | 585 | facial height = 57.8 + 1.29 N.H |
| Female F.H and N.H | 453 | facial height = 82.0 + 0.50 N.H |
| Male F.H and MAN. H | 585 | facial height = 64.7 + 0.89 MAN. H |
| Female F.H and MAN. H | 453 | facial height = 89.1 + 0.29 MAN.H |

Data are mean ± SD. N, number of subjects, F.H, facial height, N.H, nasal height, MAN.H, mandibular height.
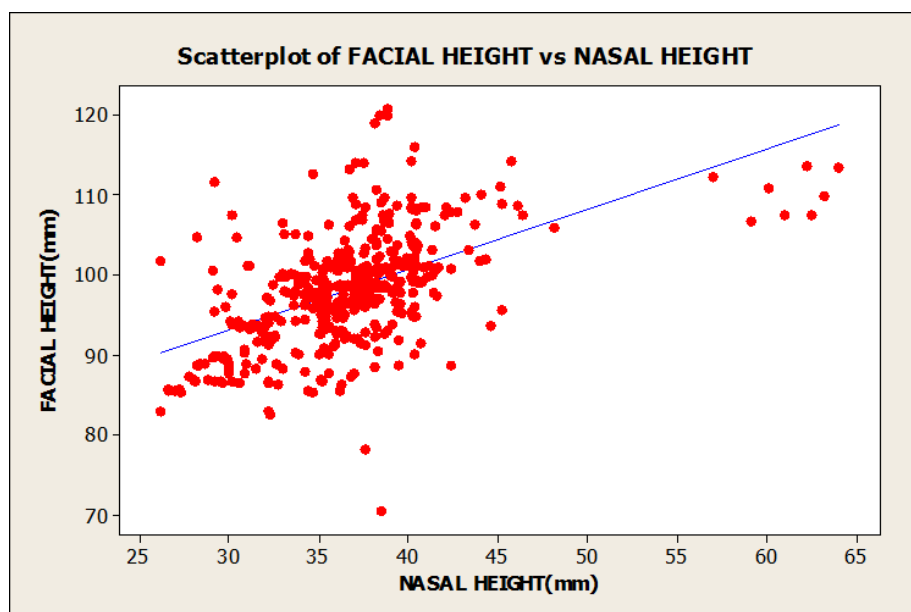


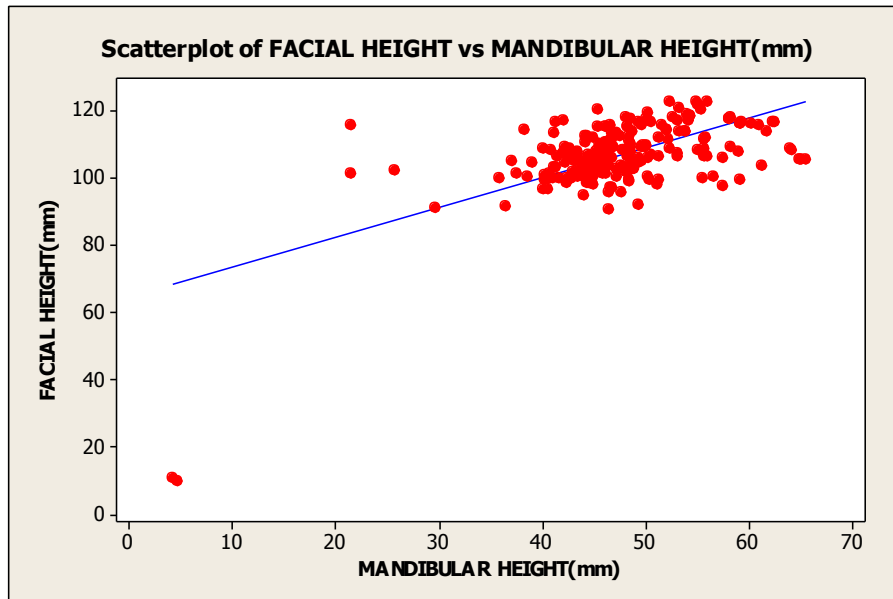**Fig-1: Pearson correlation of facial height (mm) and nasal height (mm) for Ikwerre females r = 0.545**

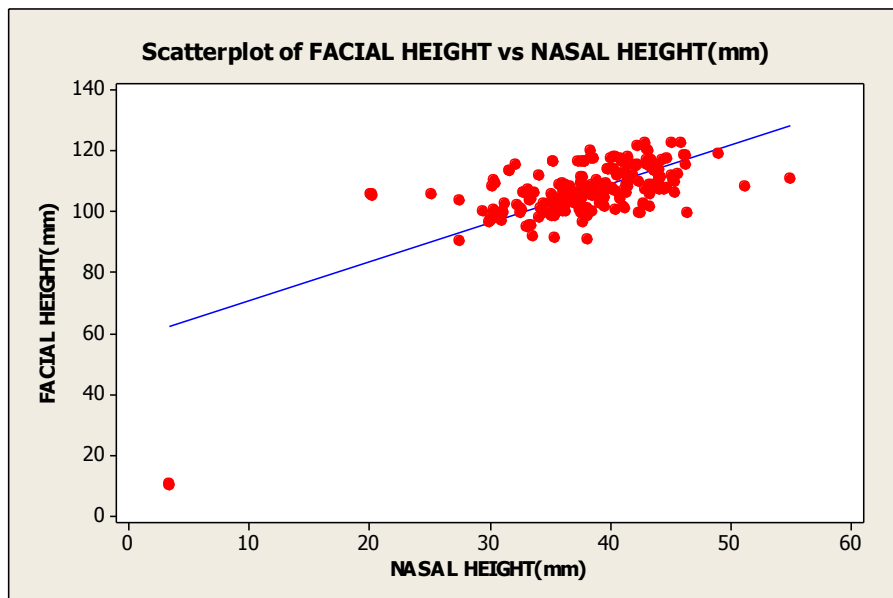**Fig-2: Pearson correlation of facial height (mm) and mandibular height(mm) for adult Ikwerre males r = 0.614**



**Fig-3: Pearson correlation of facial height (mm) and nasal height (mm) for adult Ikwerre males r = 0.682.**

## DISCUSSIONS

The result of the study showed that there is a progressive increase in the mean value of the facial height and nasal height with increase in age. This implies that there is an increase in the facial parameters with advancing age. This finding could be associated with natural growth and proportional body size increase i.e. facial growth. Facial growth is the sum of the individual growth of each bone which comprises the face.

The result of this study has shown that there is a relationship between the facial height and nasal height of the Ikwerre people which was seen as a positive correlation between the facial height and nasal height. It implies that for any increase in facial height, there is a resultant increase in nasal height amongst the Ikwerre people (Fig 1, 2 & 3).

The study established that there is a regression formula for predicting the facial height of the Ikwerre people using either nasal height or mandibular height (Table 5). This formula could be used scale the growth of the face of the Ikwerre people.

The study carried out on adult Bheel-meena tribe in India [5] the facial parameters were measured in centimeters, in order for these results to correspond with the present study which was done in millimeters, the mean facial parameters were changed from centimeters to millimeters. The resultant values of facial height and nasal height for adult male Bheel-

meena were higher than the result in the present study whereas the values of mandibular height, maxillary height and orofacial height of the present study was significantly higher than those of the Bheel-meena. This was also same when comparing the adult females of Bheel-meena with the present study. However, the differences probably are due to racial differences. Isong et al. [6] worked on adult Ibibios of Nigeria. They recorded their facial parameters in centimeters but were converted to millimeters so as to be comparable with the present study. For the males of Ibibio, the value of their facial height, nasal height, maxillary height and orofacial height was higher than those in the present study and the value for the mandibular height of the male Ibibios was lower than those in present study. For the females, the facial height, nasal height, maxillary height and orofacial height of adult female Ibibios was higher than those in present study; but the mean mandibular height of adult female Ibibios was lower than that of the adult Ikwerre females in the present study. The differences observed in the facial parameters of the two ethnic groups could be as a result of ethnic variation.

Similarly Muhammad and Hazem [7] recorded in centimeters higher values of nasal height and orofacial height for males Assiut Governorate in Egypt than their females. The present study was in accordance with theirs as the nasal and orofacial height of male Ikwerre was higher than females. Also their values were converted to millimeters in which the present study was done, to allow for better comparison.

## CONCLUSION
The result of the study showed that there is a progressive increase in the mean value of the facial height and nasal height with increase in age. This implies that there is an increase in the facial parameters with advancing age. This finding could be associated with natural growth and proportional body size increase i.e. facial growth. In addition, there is a relationship between the facial height and nasal height of the Ikwerre people which was seen as a positive correlation between the facial height and nasal height. It implies that for any increase in facial height, there is a resultant increase in nasal height amongst the Ikwerre people.

## RECOMMENDATIONS
We recommend that the findings from this study be used as reference in for other studies.

## CONFLICT OF INTEREST
We write to state that there is no conflict of interest.

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