

Parameters of Facial, Nasal, Maxillary, Mandibular and Oro-facial Heights of Adult Urhobos of Nigeria

Gabriel Sunday Oladipo^{1*}, Oghenemavwe Loveday¹, S. Hart Josiah¹
and U. Dike Eberechi¹

¹Department of Human Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, University of Port Harcourt, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author GSO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors OL and SHJ managed the analyses of the study. Author UDE managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/ARRB/2015/9628

Editor(s):

(1) George Perry, Dean and Professor of Biology, University of Texas at San Antonio, USA.

Reviewers:

(1) Anonymous, University of São Paulo, Brazil.

(2) Anonymous, Hamedan University of Medical Sciences, Iran.

(3) Anonymous, Health Science University Vientiane, Austria.

Complete Peer review History: <http://www.sciencedomain.org/review-history.php?iid=653&id=32&aid=6012>

Original Research Article

Received 20th February 2014
Accepted 16th July 2014
Published 9th September 2014

ABSTRACT

The study was carried out to determine the mean values of facial, nasal, maxillary, mandibular and oro-facial heights of adult Urhobos: one of the ethnic groups in Nigeria and comparison with some other ethnic groups in Nigeria (Igbo and Ijaws) and Latvians; an ethnic group in Russia. One thousand (1000) subjects purely of Urhobo ethnic group were used for the study. The subjects comprised 500 males and 500 females with age range of 18 to 45 years. The facial height, nasal height, maxillary height, mandibular height and oro-facial height were measured using sliding caliper at established landmarks for the parameters. The results obtained showed that males had mean facial height of 12.18 ± 1.63 cm, nasal height of 4.85 ± 0.65 cm, maxillary height of $2.46(0.33)$ cm, mandibular height of 4.89 ± 0.65 cm, oro-facial height of 7.33 ± 0.98 cm while females had mean facial height of 11.03 ± 1.48 cm, nasal height of 4.40 ± 0.59 cm, maxillary height of 2.33 ± 0.31 cm, mandibular height of 4.39 ± 0.58 cm, oro-facial height 6.67 ± 0.89 cm. Statistical analysis using the z-test showed that the males had significantly higher values than the females in all the oro-facial parameters measured ($p < 0.05$). All variables were sexually dimorphic. The data obtained from this study could be useful in forensic investigation, craniofacial surgery and population study.

*Corresponding author: Email: oladipogabriel@yahoo.com;

Keywords: Orofacial parameters; forensic science and Nigeria.

1. INTRODUCTION

The face is described as a component of the head region located at the front of the head between the ears and from the chin to the hairline. It forms the anterior section of the head. It comprises the forehead, eyes, nose, mouth and chin. The underlying bones of the face, the thickness and distribution of the underlying fat as well as the facial muscles determines the configuration of the face [1,2]. The human face is essential for expression, appearance and identity amongst others. It has been described as the principal tool that distinguishes a person, often at first glance. Thus one of the primary functions of the face is physical appearance. It gives an idea on how attractive one is [3].

Studies have shown that facial features differ amongst various tribes and ethnic groups [4]. Authors have thus argued that for proper evaluation of differences in craniofacial morphology, standards of anthropometrical measurements are important and should be established for a particular population [4].

Facial parameters such as facial, maxillary, mandibular, nasal and oro-facial heights which constitute the essential anthropometric parts of the face are of very important in determination of standards for each population. These parameters are affected by age, ethnicity [5], variations in the dimensions of the skeleton, development of muscles, sex, fat content and distribution in the body [6].

The nose has been reported by Oladipo et al. [7] as one of the best clues to racial origin [7]. The nasal parameters of the Ogonis in Nigeria were reported by Oladipo et al. [8] 2007. They reported mean nasal height of Ogoni males and females as 3.99cm and 3.91cm respectively [8]. In a similar study, nasal parameters of Nigerian Igbos were reported by Akpa et al. [9] 2003. From their report, mean nasal height was reported as 6.31cm and 6.04cm for males and females respectively. They concluded that nasal parameters amongst the Igbo population were sexually dimorphic [9].

Rabanus, 2003 related nasal height to maxillary height by ratio 1.000 to 0.618. He also reported that sum of the nasal height and maxillary heights are related to the mandibular height by the ratio of 1.618 to 1.000. He also related the

mandibular height to the maxillary height by the ratio of 1 to 0.618 and the oro-facial height is related to the nasal height by the ratio of 1.618 to 1.000. Each ratio differs by 1.618 in line with rule of golden proportions [10].

A study on facial, nasal, maxillary, mandibular and oro-facial heights of adult Nigerians was carried out by Didia and Dapper [3]. They observed that for males, facial height was 12.28±3.39cm; nasal height 4.50±1.23cm; maxillary height 2.44±0.66cm; mandibular height 4.49±1.23cm and oro-facial height 6.90±1.89cm. The figures obtained for the female subjects were facial height 11.77±3.53cm; nasal height 4.48±1.37cm; maxillary height 2.30±0.69cm; mandibular height 4.20±1.26cm and oro-facial height 6.32±1.91cm. The values of these parameters sexually dimorphic with males showing significantly higher values [3].

In a similar study to establish standards for craniofacial anthropometric parameters of Latvian population by Erika et al. [11]. The authors reported nasal height and facial height of 5.87±0.45cm and 12.41±0.41cm respectively for male and female populations. The measurements of the face showed that males in comparison with females had wider and higher faces, bigger minimal frontal breadth and upper face depth. Measurements taken from the jaw region showed that this region in males is more expressive than in females. There was no statistically significant difference in the mandibular body length between the males and females, as well as between the Latvian and non-Latvian subjects in the study group [11].

Knowledge of facial proportion values is applied in facial aesthetics [12,13]. Advanced concepts in diagnosis and treatment planning of craniofacial abnormalities focus on the balance and harmony of various facial features [14-17].

Increased skeletal treatment and surgical intervention in the present time make it imperative to study examples of esthetically balanced faces and the scope of acceptable compromises between different facial elements. No established report exists on the facial parameters of the Urhobos hence the need for this study. Furthermore, this study is aimed at providing the ethnic specific data on some of the craniofacial parameters of Urhobos of Nigeria and the comparison to other ethnic groups such as Latvians from Russia, Ijaws and Igbos from

Nigeria. Data obtained from this study could be used as anthropometric reference values, in clinical practices (plastic surgery and orthodontics) and in forensic investigation. It will also set the pace for further investigation.

2. MATERIALS AND METHODS

One thousand (1000) subjects of Urhobo ethnic group with ages ranging from 18-45 years were included in the study. These were made up of 500 males and 500 females who were Urhobos by both parents and grandparents. The subjects were selected at random from Urhobos residing in Delta State and Rivers State, Nigeria. All the subjects had normal craniofacial configuration. Sliding veneer caliper was used to determine the various craniofacial parameters using the method described by Didia and Dapper, 2005 (Fig. 1).

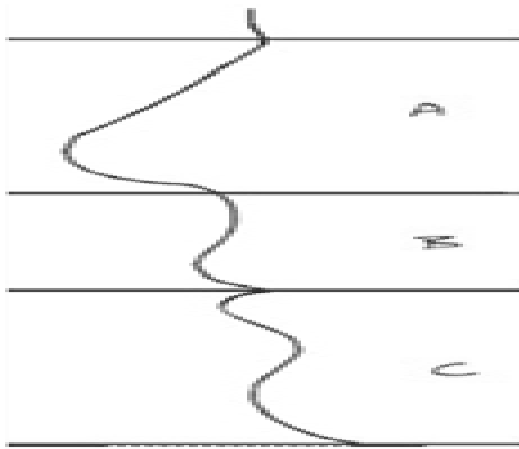


Fig. 1. Scheme to show measurement of facial parameters (Didia and Dapper, 2005)

Note: Nasal height-----A (distance between the nasion and the anterior nasal spine)

Maxillary height ----B (distance between anterior nasal spine and the junction between the upper and lower lips)

Mandibular height-----C (distance between junction of the upper and lower lip and the menton)

Oro-facial height-----B + C (the sum of the maxillary and mandibular heights (B+C))

Facial height-----A + B + C (distance between distance between the nasion of the nose and the menton of the mandible)

The distance between the nasion of the nose and the menton of the mandible was measured as the facial height (A+B+C). The distance between the nasion and the anterior nasal spine was measured as the Nasal height (A). The distance between the anterior nasal spine and the junction between the upper and lower lips was measured as the Maxillary height (B). The distance between the junction of the upper and lower lip

and the menton was measured as the Mandibular height (C). Oro-facial height was gotten as the sum of the maxillary and mandibular heights (B+C). It is also measured as the distance between the nasospinale and the menton. All the measurements were made by one person avoid inter-observer error and were made with the subjects sitting upright, relaxed and breathing quietly. The data obtained from the study was analyzed statistically using discrete statistics and students' z test at significance level of 0.05.

3. RESULTS

Table 1 shows the mean sample distribution of subjects. Tables 2, 3 and 4 shows the mean dimensions of the facial parameters obtained in this study for both male and female subjects. Table 5 shows a comparison between the mean facial dimensions of Urhobos males and females with that of other Nigerian ethnic groups (Ijaws and Igbos) as well as with a Russian ethnic group (Latvians). The values obtained for the males were found to be significantly higher than the corresponding female values ($p < 0.05$). It was observed that the Urhobo males have higher values of facial height, nasal height, mandibular height and orofacial height than male Ijaws but lower values of maxillary height than male Ijaws. In addition, facial height and nasal height of male Urhobos was lower than those of male Latvians. The nasal height of the male Urhobos was higher but lower than those of male Igbos. In females, Urhobos had higher facial height than Ijaws but lower facial value than Latvian. The value of nasal height was lower than those of Ijaws, Igbos and Latvians. Orofacial height and mandibular height were significantly higher than those of Ijaws while maxillary height was lower than that of Ijaws.

4. DISCUSSION

In the present study, mean facial dimensions of male Urhobos were significantly higher than the corresponding female values; this could be as a result of genetic makeup and inheritance which manifest as sexual dimorphism as reported by previous authors on most anthropometric parameters [18,19,3,7,8,20,21].

Many investigators have shown significant differences in craniofacial complex among ethnic and racial groups [22,23,18,19,7,8,20,21]. Several other investigators [24,18,19,3,7,8,20,21] suggested that genetic factors have a major

influence on the individual differences in body shape and configuration.

From the study on the Latvian population by Erika et al. [11], they observed that the Latvian males have a facial height of 12.41 ± 0.45 cm and a nasal height of 5.87 ± 0.45 cm; the female values were, for facial height 11.76 ± 0.62 cm and 5.67 ± 0.57 cm for nasal height. These values are significantly higher than those obtained for Urhobos ($p < 0.05$), thus the Urhobos can be said to have a smaller facial profile than the Latvians.

In similar studies on Nigerian Igbos, by Akpa et al. [9] they reported significantly higher value ($p < 0.05$) of nasal length than Ijaws; this is significantly lower than the value obtained for Urhobos in the present study. Ogonis on the other hand [8], have significantly lower values of nasal length than both Ijaws [7] and Urhobos-present study. The values obtained by Ebeye et al. [25] in their study on Urhobos are slightly but not significantly different from those of the present study.

Table 1. Age and sex distribution of subjects

Age Group (Yrs)	Male subjects	Female subjects	Total
18 – 20	40	65	105
21 – 23	69	73	142
24 – 26	83	81	164
27 – 29	68	49	117
30 – 32	49	48	97
33 – 35	51	37	88
36 – 38	54	33	87
39 – 41	45	52	97
42 -45	41	62	103
Total	500	500	1000

Table 2. Mean facial dimensions of males

Age group years	Facial height (cm)	Nasal height (cm)	Maxillary height (cm)	Mandibular height (cm)	Oro-facial height (cm)
18 – 20	11.64	4.84	2.30	4.79	7.09
21 – 23	11.84	4.65	2.40	4.77	7.17
24 – 26	11.71	4.76	2.52	4.63	7.15
27 – 29	12.05	4.93	2.51	5.08	7.59
30 – 32	12.59	5.60	2.46	4.90	7.36
33 – 35	12.47	4.99	2.42	5.04	7.46
36 – 38	12.67	4.73	2.33	4.80	7.13
39 – 41	12.29	4.60	2.39	4.85	7.24
42 -45	12.80	5.29	2.78	5.32	8.10

Table 3. Mean facial dimensions of females

Age group years	Facial height (cm)	Nasal height (cm)	Maxillary height (cm)	Mandibular height (cm)	Oro-facial height (cm)
18 – 20	10.49	4.19	2.35	4.44	6.74
21 – 23	10.80	4.25	2.32	4.42	6.74
24 – 26	10.62	4.31	2.30	4.29	6.55
27 – 29	11.00	4.59	2.28	4.56	6.80
30 – 32	11.18	4.38	2.43	4.68	6.92
33 – 35	11.40	4.50	2.38	4.20	6.49
36 – 38	11.28	4.49	2.30	4.32	6.61
39 – 41	11.80	4.58	2.25	4.29	6.68
42 -45	11.29	4.54	2.36	4.31	6.42

Table 4. Comparison of facial dimensions between Urhobos males and females

Measurements parameters	Males = 500; Females n = 500	
	Males	Females
Facial height (cm)	12.18±1.63	11.03±1.48
Nasal height (cm)	4.85±0.65	4.40±0.59
Maxillary height (cm)	2.46±0.33	2.33±0.31
Mandibular height (cm)	4.89±0.65	4.39±0.58
Oro-facial height (cm)	7.33±0.98	6.67±0.89

SD-standard deviation; SE- standard error. P<0.05

Table 5. Comparative facial dimensions in ethnic groups

Parameter	Group	Male	Female	Author/Year
Facial height (cm)	Nigerians	12.28	11.77	Didia & Dappa,2005
	Latvians	12.41	11.76	Erika et al.,2005 Oladipo et al.,2008
	Nigerian Ijaws	11.87	10.71	
	Urhobos	12.61	11.91	Ebeye et al.,2009
	Urhobos	12.18	11.03	Present study
Nasal height (cm)	Nigerians	4.50	4.48	Didia & Dappa, 2005
	Latvians	5.87	5.67	Erika et al., 2005
	Nigerian Igbo	6.31	6.04	Akpa et al., 2003
	Ogonis	3.99	3.91	Oladipo et al., 2007
	Nigerian Ijaws	4.71	4.43	Oladipo et al.,2008
	Urhobos	4.56	4.27	Ebeye et al.,2009
	Urhobos	4.85	4.40	Present study
Maxillary height (cm)	Nigerians	2.44	2.30	Didia & Dappa, 2005
	Nigerian Ijaws	2.49	2.39	Oladipo et al.,2008
	Urhobos	2.68	2.21	Ebeye el al,2009
	Urhobos	2.46	2.33	Present study
Mandibular height (cm)	Nigerians	4.49	4.20	Didia & Dappa, 2005
	Nigerian Ijaws	4.60	4.28	Oladipo et al.,2008
	Urhobos	4.52	4.14	Ebeye et al.,2009
	Urhobos	4.89	4.39	Present study
Orofacial height (cm)	Nigerians	6.90	6.32	Didia & Dappa, 2005
	Nigerian Ijaws	7.12	6.50	Oladipo et al.,2008
	Urhobos	6.75	6.36	Ebeye et al.,2009
	Urhobos	7.33	6.67	Present study

5. CONCLUSION

This study has been able to establish the mean oro-facial dimensions of adult Urhobos. It has also established that, as in other populations, oro-facial parameters are sexually dimorphic among the Urhobos with males showing significantly higher values than females ($p < 0.05$). Mean facial dimensions are essential in evaluation of age, sex and racial differences, in clinical applications and in forensic application. The result of this study will be beneficial to plastic surgeons and orthodontists in facial reconstructive surgery and in orthodontic appliances when facial aesthetics is to be improved upon. Forensic expert should also use this knowledge in their investigations.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sinnatamby CS. Last's Anatomy' 10th Edition, Harcourt Publishers Ltd. 1999;180.
2. Moore KL, Dally AF. Clinically oriented ANATOMY. Fourth edition. Lippincott Williams and Wilkins. 1999;823–835,953-954.
3. Didia BC, Dapper DV. Facial, nasal, maxillary, mandibular and orofacial heights of adult Nigerians. Orient Journal of Medicine. 2005;17(1&2):1-8.
4. Basciftel FA, Uysal T, Buyukerkman A. Craniofacial structures of Anatolian Turkish adults with normal occlusion and well balanced faces. AmJ Orthod and Dentofacial Orthopedics. 2004;125(3):366-372.
5. Rajaksmi C, Shyamo M, Bidhumukhi T, Chanramani Singh. Cephalic index of fetuses of Manipuri population- A baseline study. J. Anat. Soc. India. 2001;50(1):8-10.

6. Quinn Francis B. Preoperative evaluation of the aesthetic patient. Grand Rounds Presentation, UTMB, Dept. of Otolaryngology; 2004.
7. Oladipo GS, Gwunireama IU, Asawo OD. Anthropometric comparison of nasal indices between the Igbos and Yorubas in Nigeria. *Global Journal of Medical Sciences*. 2006;5(1):37-40.
8. Oladipo GS, Olotu JE, Didia BC. Anthropometric study of nasal parameters of the Ogonis in Nigeria. *Scientia Africana*. 2007;6(10):69-71.
9. Akpa AOC, Ugwu C, Maliki AO, Aaliki SBO. Morphometric study of the nasal parameter in Nigerian Igbo. *Journal of Experimental and Clinical Anatomy*. 2003;2(2):24–25.
10. Rabanus J. Smile proportions, golden proportions. 2003;2of6. Available: <http://www.aesthetic-density.com/golden-proportions.htm>
11. Erika Nagle, Uldis Teibe, Dzintra Kapoka. Craniofacial anthropometry in a group of healthy Latvian residents. *Acta Medica Lituanica*. 2005;12(1):47-53.
12. McLaren EA, Rifkin R. Macro aesthetic: Facial and dentofacial analysis. *J. Calif. Dent. Assoc.* 2002;30(11):839–846.
13. Mohindra NK, Bulman JS. The effect of increasing vertical dimension of occlusion on facial aesthetics. *Br. Dent. J.* 2002;19293:104-168.
14. Riedel RA. Esthetics and its relation of orthodontic therapy. *Angle Orthod.* 1950;20:168–178.
15. Holdaway RA. Soft tissue cephalometric analysis and its use in orthodontic treatment planning. *Amj Orthod.* 1983;84:1-28.
16. Gonzales-Ulloa M, Stevens E. The role of chin correction in profile plasty. *Plast. Reconstr. Surg.* 1961;36:364–373.
17. Merrifield LL. The profile line as an aid in critically evaluating facial esthetics. *Am J Orthod.* 1966;52:804–822.
18. Bishara SE, Ortho MS. Facial and dental changes in adolescents and their clinical implications. *Angle Orthodontics.* 2000;70(6):471-483.
19. Daniel B. Racial anthropology and genetics of the Lebanese. 2002;1-2. Available: www.nasalindexoflebanese.com
20. Oladipo GS, Okoh PD, Hart JS. Anthropometric study of some craniofacial parameters. *Asian Journal of Medical Science*. 2010;2(3):111-113.
21. Oladipo GS, Yorkum LK, Okoh PD. Measurements of head circumference, intercanthal distances, canthal index and circumference interorbital index of Ikwerre school children in Nigeria. *Journal of Natural Science Research*. 2013;3(4):16-20
22. Hwang HS, Kim WS, McNamara JA. Ethnic differences in the soft tissue profile of Korean and European-American adults with normal occlusion and well balanced faces. *Angle Orthod.* 2002;72:72-80.
23. Mlyajima K, McNamara JA, Kinura T. Craniofacial structure of Japanese and European American adults with normal occlusion and well balanced faces. *Angle Orthod.* 1996;1(10):431-460.
24. Livhitis G, Moset A, Yakovenko K. Genetics of human body shape and size: Body proportions and indices. *Ann. Hum Biol.* 1994;29(2):271-89.
25. Ebeye O, Emore E, Ebite E, Ijeh N. Facial dimensions in Urhobos of Nigeria. *The Internet Journal of Biological Anthropology*. 2009;4(1).

© 2015 Oladipo et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history.php?iid=653&id=32&aid=6012>