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Human Anatomy

Facial Soft Tissue Pattern of the Hausa/Fulani Residents in Port Harcourt, Rivers State, Nigeria

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Abstract **Original Research Article**

Introduction: This research, facial soft tissue pattern of the Hausa-Fulani in Port Harcourt ascertains the soft tissue dimensions of the face in the Hausa-Fulani population resident in Port Harcourt. ***Methodology:*** A sample size of 300 subjects was investigated; 270 males and 30 females, using a digital camera to photograph the front and lateral aspects of the face in the normal position and transferring the image to a computer with specialized medical software for its analysis. ***Results:*** Sexual dimorphism was observed among the Hausa-Fulani's. The mean values for the face height, middle face height, lower face height, middle face ratio, lower face ratio and face width for both males and females are; 271.92cm, 131.96cm, 48.39cm 46.68cm, 733.77cm and 124.85cm for males and 439.80cm 114.80cm 46.68cm, 50.20cm, 72.28cm and 125.21cm for females respectively. ***Conclusion:*** This research is relevant in cosmetic surgery and trauma management involving the face and while forming a database for the facial index of this ethnic group.

Keywords: Soft tissues, Hausa, Fulani, linear measurement, sexual dimorphism.

INTRODUCTION

The face is the supero-frontal part of the human body. Anatomically, it is the vertical distance of the head from the forehead, just below the hair line, to the chin and horizontally from one lateral ear to the contra-lateral ear. The face plays roles, such as, portraying beauty and identification, communication, enhances attractiveness and acceptability in an environment and facial expression. Thus, its understanding is important in cosmetic and reconstructive surgeries, as well as, in treatment regimens, orthodontic procedures and management of facial trauma. Its soft tissues connect, surround and support other structures, except the underlying skeleton, and form important facial trait of an individual. The soft tissues of the face vary in their dimension in the different sexes, form important landmarks from which various parameters of the face that categorizes the norms of a given set of people can be analysed and valuable in the treatment plan in facial pathology and trauma. It is composed of bones (frontal, sphenoidal, ethmoidal, zygomatic, temporal, lacrimal, vomer, maxilla, mandible, parietal and nasal), muscles (occipito-frontalis, orbicularis oculi, depressor supercili, corrugators' supercili, procerus, zygomatis major, levator labii superioris alequae nasii, levator anguli oris, risorius, depressor anguli oris, depressor labii inferioris, mentalis, platysma, tempero-parietalis, nasalis, depressor septi nasi, zygomaticus minor, auricular, buccinator, orbicularis oris and levator labii superioris), blood vessels (transverse facial artery and facial vein), fascia and nerves (supra and infra- orbital, mental and zygomatico-facial).

The skeleton of the face provides support, protection and passage way for vessels and other structures, while the muscles, which are subcutaneous, develop from the second branchial (pharyngeal) apparatus and are innervated by cranial nerve VII. The face can be affected by developmental defects, such as cleft lip, oblique facial cleft and cleft palate. This study determined the normal and average values of the soft tissues of the face among the Hausa-Fulani ethnic group resident in Port Harcourt, Rivers State. The parameters considered are mean percentage ratio of the middle face and lower face and mean values for the naso-frontal, naso-mental, naso-cervical, naso-facial angles and upper and lower lip lengths, while the soft tissue parameters are facial height, head height, face height, forehead height II, nose length, lower face height,

forehead height I, Special upper face height, ear length, inter-canthal distance, nasal width, nasal tip projection line, eye fissure width, mouth width, height of calva, upper and lower nasal height. This will provide relevant information to orthodontics, maxillofacial and cosmetic surgeons in putting together their treatment plan and serve as guideline, providing the required soft tissue parameters of the face for this ethnic group, which will thus, form a basis for understanding the face of this ethnic group, in situations of defect.

The Hausa-Fulani originated from the ancient Mali Empire and constitutes the major occupants of northern, north-western and north-central part of Nigeria. Their language is of Chad, infused with numerous Arabic words, due to Islamic influence. They operate a feudal system, aided by extensive bureaucracy, with an Emir (surrounded by titled office-holders, fiefs, that represent each village) ruling each state.

Photogrammetric analysis is a non-penetrable medical technique employed to obtain data and other relevant information that are vital for diagnosis and treatment of medical conditions and to provide a baseline data for a group of people. Photographs are usually taken with the aid of a digital camera and length-measuring equipment employed for taking the facial dimensions.

Research on soft tissue analysis in Africans and Nigerians are limited, albeit some local researchers now strive to make some input in that direction, which if properly attended to, will aid the prevention and treatment of possible deformities of the face.

Didia and Dappa [1] observed varying facial dimensions in the middle face of Nigerians while the lower face lengths were similar in both males and females. They further observed significant differences in maxillary, mandibular, oro-facial, facial and nasal heights. Their study reported average facial height (12.28cm; males and 11.77cm; females), maxillary height (4.50cm; males and 4.48cm; females), mandibular height (4.49cm; males and 4.023cm; females) and oro-facial height (6.90cm; males and 6.32cm; females).

Oladipo et al. [2], in a study of the cranio-facial dimensions among adult Ijaws, in the Niger Delta region of southern Nigeria, obtained similar results to that obtained by Didia and Dappa [1], with only slight differences. Their results for the mean facial, nasal, maxillary, mandibular and oro-facial heights showed 11.87cm, 4.71cm, 2.49cm, 4.60cm and 7.12cm for males, and 10.71cm, 4.43cm, 2.39cm, 4.28cm and 6.50cm for females respectively. They observed significantly higher male values compared to that of females.

In a similar study by Akpa et al. [3], on the nasal heights of the Igbos, south-eastern Nigeria, dimorphism was observed: males (6.31cm) had significantly higher values than females (6.04 cm). This corroborates the results obtained by Didia and Dappa [1] and further buttresses the fact that nasal heights are higher in Nigerian males than females and is also very near in the range of values from that obtained by Olotu et al. [4], but varies from the values obtained by Oladipo et al. [2].

Olotu et al. [4] did a similar work on the facial and nasal lengths of adult Igbos. The results obtained were similar to that obtained by Akpa et al. [3]. Olotu et al. [4] reported the average facial length for males as 12.22cm ± 2.11cm, while that for females was 11.19cm ± 0,84cm, and the nasal height for males and females were 4.87cm ± 0.84cm and 4.40cm ± 0.76cm respectively. As with that of Didia and Dappa [1], the work of Olotu et al. [4] also showed higher male values than females.

Hershon and Giddon [5], Gluksman [6], Sahin and Gazileri [5] explain that facial traits are a major feature of physical appearance and are associated with social acceptance, psychological wellbeing and self-esteem of an individual. Sexual dimorphism is also a prominent human characteristic that can be determined from the face, apart from the sex organs. This feature includes the usual presence of facial hairs in adult males.

Profit [7] and Moyers [8] opines that a single facial aesthetic is not appropriate for application to diverse race and ethnic groups. This is due to variation in genetic make-up, environment and culture. It was corroborated by Mandall et al. [9], further elaborating facial traits as largely influenced by factors such as race, age, sex and culture. For instance, the Hausa-Fulani have a distinct culture from other ethnic groups in Nigeria, although transient similarities may exist. Krishnan and Kumar [15] posits that morphological features of different races and ethnic groups are not randomly distributed but appear in geographical cluster, thus, their relevance in anthropometric studies of distinct populations.

Stedman [10] defined facial dimension as the measurement of the height, width and length in relation to the face. Aspects of facial heights were considered by Jorge [11], who posited that nasal, maxillary and mandibular heights are related, but differ in their proportions, thus, accounting for sexual dimorphism, with prominence in male values as against females.

A photogrammetry of the vertical and angular facial soft tissue profile of the Urhobo ethnic group was determined by Oghenemavwe et al. [12] and showed higher male values in all parameters measured. The study of facial soft tissues among Nigerians was further

considered by Omotoso, Adeniyi and Medubi [12] and reported 7.2% (4.4% females and 2.8% males), 22.2% and 18.3% had both cheek and chin dimple, only cheek dimple and only chin dimple respectively.

The facial length of neonates in Maiduguri was reported by Garba et al. [13] to show sexual dimorphism. Osunwoke [14] also reported sexual dimorphism among the Bini tribe, especially, among young and middle-aged adults (17-45 years), a period of transition into maturity. This is agreeable, because at child birth, the sex organ is the most prominent distinction between the both sexes, but as maturity ensues, facial features, such as the appearance of hairs on the jaws and broadening shoulder of the male becomes tenable.

With the passing of time, advancement and in line with modern trends, new, modern and more sophisticated techniques have evolved in the photogrammetry of the soft tissues of the face. Over time, photogrammetric techniques have shifted from invasive to non-invasive. The currently employed non-invasive techniques, 3D-based, are faster, more accurate and more precise, in addition to capability of preserving obtained results [15].

Currently, the employed 3D techniques for facial analysis include, laser scanning, helicoidal computer tomography, cone-beam computer tomography and stereo-photogrammetry. The effectiveness of these techniques is proven to produce accurate results within 1.5 milliseconds.

METHODOLOGY

This descriptive study involved 300 healthy subjects (270 males and 30 females) of Hausa-Fulani extraction (both parents of the same extraction), residing in Port Harcourt and its environs, such as, Oyigbo, Eleme, Obio/Akpor and Okrika. They were between 18-55years old. Ethical approval was obtained from the University of Port Harcourt Research Ethics Committee. Tribal and religious leaders of the participants were also informed and approved of the study, while the participants understood the concept of the study and consented.

A passport photograph of the front and lateral sides of their face was taken with a digital camera mounted on a tripod stand. The obtained photographs were transmitted to a computer and analysed with the aid of software designed for this purpose and then the parameters evaluated. Participants without facial deformity (including prominent tribal marks), has not undergone a visible facial surgery and both parents of Hausa-Fulani extraction were recruited. Random sampling technique was employed.

The camera was set on the tripod stand via its base and fastened properly. The tripod was positioned on a flat ground. A scaled graph paper was hung somewhere directly opposite the front of the camera, at a distance of about 150 meters. The subject stands in front of the graph paper at a distance of about 120 meters from the tripod. The height of the tripod is adjusted to the ear level of the subject. Front and lateral passport photographs of the subject were taken.

The photographs obtained were transmitted to a computer through a memory card. The pictures were analysed, using the installed medical software to evaluate the various linear soft tissue profiles of the face, and obtained values are presented in a table.

RESULTS

Table-1: Descriptive statistics and comparison of mean values of facial parameters in Hausa-Fulani subjects

Parameter	Sex	Mean	SEM	SD	Variance	z/t score	z-score	Inference
Face height (N-Me)	M	271.92	9.35	153.56	23580.94	-0.99	1.96	Not significant (p>)
	F	439.87	4.97	227.16	51816.59			
Middle face height	M	131.96	4.67	76.78	5895.23	1.22	1.96	Not significant (p>)
	F	114.80	2.48	13.58	184.46			
Lower face height	M	48.40	0.03	0.57	0.32	1.06	1.96	Not significant (p>)
	F	46.68	1.61	8.80	77.45			
Middle face ratio	M	46.85	1.29	21.24	451.05	-0.90	1.96	Not significant (p>)
	F	50.20	3.50	19.20	368.47			
Lower face ratio	M	73.77	4.75	74.38	5534.64	0.49	1.96	Not significant (p>)
	F	72.28	2.00	10.94	119.78			
Face width	M	124.85	3.22	52.86	2794.34	-0.04	1.96	Not significant (p>)
	F	125.21	8.04	44.03	1938.31			

Table-2: Descriptive statistics and comparison of mean values of facial parameters in Hausa-Fulani male and female subjects with age range

Parameter	Sex	Age (years)	Number	mean	SEM	SD	Variance	calculated z score	critical z score	Inference
Face height (N-Me)	M	18-34	145	264.76	3.93	47.34	2240.71	-0.99	1.96	Not significant (p>)
	F		25	522.21	4.11	249.55	62178.66			
Middle face height	M	18-34	145	128.38	1.97	23.67	560.18	3.77	1.96	Significant (p<0.05)
	F		25	115.44	2.81	14.05	197.44			
Lower face height	M	18-34	145	128.16	8.68	10.21	102.53	1.44	1.96	Not significant (p>)
	F		25	71.01	2.24	11.22	125.83			
Middle face ratio	M	18-34	145	121.63	4.77	57.41	329.81	-0.26	1.96	Not significant (p>)
	F		25	124.38	9.58	47.88	229.39			
Lower face ratio	M	18-34	145	48.41	0.04	0.52	0.27	1.06	1.96	Not significant (p>)
	F		25	46.37	1.93	9.64	92.96			
Face width	M	18-34	145	45.11	1.76	21.21	449.87	-0.87	1.96	Not significant (p>)
	F		25	49.05	4.17	20.84	434.41			

Table-3: Descriptive statistics and comparison of mean values of facial parameters in Hausa-Fulani male and female subjects with age range

Parameter	Sex	Age (years)	Number	mean	SEM	SD	Variance	calculated z score	critical z score	Inference
Face height (N-Me)	M	35-55	39	263.50	8.01	50.01	2501.18	2.45	2.01	Significant (p<0.05)
	F		5	231.16	10.47	23.42	548.57			
Middle face height	M	35-55	39	127.75	4.00	25.01	625.29	2.45	2.01	Significant (p<0.05)
	F		5	111.58	5.24	11.71	137.14			
Lower face height	M	35-55	39	90.53	1.87	11.70	136.96	3.17	2.01	Significant (p<0.05)
	F		5	78.62	3.26	7.29	53.16			
Middle face ratio	M	35-55	39	133.95	6.85	42.75	182.84	0.46	2.01	Not significant (p>)
	F		5	129.33	7.39	16.52	272.92			
Lower face ratio	M	35-55	39	48.39	0.09	0.58	0.33	1.12	2.01	Not significant (p>)
	F		5	48.26	0.08	0.17	0.03			
Face width	M	35-55	39	52.94	3.74	23.37	546.07	-0.72	2.01	Not significant (p>)
	F		5	55.92	1.78	3.98	15.84			

Table-4: Comparative data of the linear measurements of the soft tissue facial analysis in different populations

Author/date	Population	Facial height	Nasal length	Oro-facial height	Maxillary height	Mandibular height	MIDDLE FACE	LOWER FACE
Didia and Dapper [1]	Nigerians	12.25cm(M) 11.77cm(F)	6.90cm(M) 6.32cm(F)		4.50cm(M) 4.48cm(F)	4.49cm(M) 4.02cm(F)		
Oladipo et al. [2]	Ijaws	11.87cm(M) 10.71cm(F)	4.71cm(M) 4.43cm(F)	7.20cm(M) 6.50cm(F)	2.49cm(M) 2.39cm(F)	4.60cm(M) 4.28cm(F)		
Akpa et al. [3]	Igbos		6.31cm(M) 6.04cm(F)					
Olotu et al. [4]	Igbos	12.22cm(M) 11.19cm(F)	4.87cm(M) 4.40cm(F)					

The above results show a variation in the facial soft tissues parameters in both males and females. In all the soft tissue parameters considered, it was clear that sexual dimorphism exists. In some parameters, these values are higher in the females than in males, while it is the reverse in other parameters.

Females tend to have a broader face (face width), higher face height and higher middle face ratio, as is seen in the obtained parameters. This suggests an increased concentration of soft tissues in this region of the face in the females than in males, and may account for why females profit more in cosmetic surgery. On the other hand, the values are also higher in the males than

in females in the lower face, lower face height and in middle face.

This sexual dimorphism is important when carrying out procedures that involve the face; in trauma, orthodontic and cosmetic surgery.

DISCUSSION/CONCLUSION

By way of conclusion, it is very important to note the various components that make this research work what it is and also to stand the test of time in the field of Human anatomy, in particular, and in the practice of medicine, in general. It is evident from the results obtained from this study that the human face is a very dynamic aspect of the human body and, thus, require great attention and care. This is because it forms the basis for recognition and attractiveness of an individual. Its dynamism lies in the fact that human faces are quite distinct, different humans, different faces, even in identical twin. This difference in human faces lies mainly in the soft tissues of the face, which vary in individuals and sexes. Values of soft tissue parameters were noted to be higher in males than in females. Even in the same sex, differences were noticed in the soft tissue parameters in the different age group and siblings.

Only few groups of particular identity in the society have been considered or their facial soft tissue parameters analysed. More still needs to be done for the other world regions and ethnic groups. The possible resolution of these, will improve human standards, facial aesthetics and trauma management.

Comparing this study with that of others reveals dimorphism, hence, same parameters cannot be used as standard value in treatment and aesthetic modules.

Finally, the relationship between this study and developmental defects of the face cannot be under-estimated, as a good and in-depth knowledge of the soft tissue values of the face will aid the advancement of medical practice, as it concerns the correction of these birth defects of the face, thus giving affected subjects the opportunity to have a normal or almost normal face that will afford them a degree of confidence and self-esteem. This study will contribute to the fields of cosmetic, plastic, orthodontic and reconstructive surgery.

The few limitations that were experienced during the study include obtaining the required sample size, giving participants time to exercise their religious rites, culture-attenuated reserved nature of the females and unfavourable weather conditions.

REFERENCES

1. Didia B and Dapper V. Facial, nasal, maxillary, mandibular and oro-facial heights of adult Nigerians. Oriental Journal of Medicine. 2005; 17(10): 1-8.
2. Oladipo G, Didia B, Okoh P and Hart J. Sexual dimorphism in facial, nasal, mandibular, maxillary and oro-facial heights of adult Ijaws. Journal of Experimental & Clinical Anatomy. 2008; 13(22)43-45.
3. Akpa A, Ukwu O, Maliki A and Maliki O. Mophometric study of the nasal parameters in the Nigerian Igbos. Journal of Experimental & Clinical Anatomy. 11(23): 16-21.
4. Olotu J, Oladipo G, Eroje A and Edibamode E. Anthropometric study of the nasal and facial length in adult Igbo ethnic group in Nigeria. International Journal of Biological Anthropology. 2009; 2:2.
5. Hershon LE, Giddon DB. Determinants of facial profile self-perception. American journal of orthodontics. 1980 Sep 1;78(3):279-95.
6. Glucksman ML. Physiological measures and feedback during psychotherapy. Psychotherapy and psychosomatics. 1981 Jan 1;36(3/4):185-99.
7. Profit L, Eagling VA, Back DJ. Modulation of P-glycoprotein function in human lymphocytes and Caco-2 cell monolayers by HIV-1 protease inhibitors. Aids. 1999 Sep 10;13(13):1623-7.
8. Moyers RE. Handbook of orthodontics; 1988.
9. Mandall NA, McCord JF, Blinkhorn AS, Worthington HV, O'Brien KD. Perceived aesthetic impact of malocclusion and oral self-perceptions in 14-15-year-old Asian and Caucasian children in greater Manchester. The European Journal of Orthodontics. 2000 Apr 1;22(2):175-83.
10. Stedman RC. Understanding place attachment among second home owners. American behavioral scientist. 2006 Oct;50(2):187-205.
11. Jorge JH, Giampaolo ET, Machado AL, Vergani CE. Cytotoxicity of denture base acrylic resins: a literature review. The Journal of prosthetic dentistry. 2003 Aug 1;90(2):190-3.
12. Oghenemavwe EL, Osunwoke AE, Ordu SK, Omovigho O. Photometric analysis of soft tissue facial profile of adult Urhobos. Asian J Med Sci. 2010 Dec 24;2(6):248-52.
13. Garba SM, Gumel AB, Bakar MA. Backward bifurcations in dengue transmission dynamics. Mathematical biosciences. 2008 Sep 1;215(1):11-25.
14. Osunwoke E, Amah-Tariah F, Obia O and Ekere I. Sexual dimorphism in facial dimensions of the Bini ethnic group of South-southern Nigeria. Maxwell Scientific Publishers; 2011.
15. Noyani A, Sheidaey H, Mohammadi Z, Hajian M, Sadeghi F. A 62-year-old Man with Acute Dizziness, Nausea and Vomiting. Advanced journal of emergency medicine. 2019;3(4).

GLOSSARY

Facial height (N-Me); this is the measured distance from the nasion to the menton.

Special head height (V-En); distance from vertex to endocanthion.

Special face height (En-Gn); distance between endocanthion and menton.

Forehead height II (Tr-N); distance between trichion and nasion.

Nose length (N-Sn); distance between nasion and subnasale.

Lower face height (Sn-Me); distance between subnasale and gnathion.

Forehead height I (Tr-G); distance between trichion and glabella.

Special upper face height (G-Sn); distance between glabella and subnasale.

Ear length (Sa-Sba); distance between superaurale and subaurale.

Intercanthal distance (En-En); distance between left to right endocanthion.

Nasal width (Ala-Ala); distance between the left and right ala.

Nasal tip projection line (Sn-Prn); measured horizontal distance between the mid-facial vertical line and the pro-nasale.

Eye fissure width (Ex-En); measured distance between endocanthion and endocanthion.

Mouth width (Chr-Chl); distance between right and left cheillion.

Height of calva (V-Tr); distance between vertex and trichion.

Upper nasal height (N-Mn); distance between nasion and mid-nasale.

Lower nasal height (Mn-Sn); distance between menton to subnasale.