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Original article

Forensic Anthropology

Study of facial types of Brazilian individuals

Estudo de tipos faciais de indivíduos brasileiros

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RESUMO

O presente estudo teve como objetivo avaliar os diferentes tipos faciais de adultos brasileiros de ambos os sexos, por meio de métodos antropométricos e antroposcópicos. Dados de idade, formato do rosto e índice facial de 382 participantes foram coletados e as medidas antropométricas foram obtidas com paquímetro digital. A amostra estudada apresentou predominantemente o tipo facial hiperleptoprosópico, sendo os formatos faciais mais comuns o oval e o redondo. Observou-se dimorfismo sexual significativo na população, com diferenças estatísticas entre as variáveis sexo e índice facial. Embora a população estudada apresente um tipo facial predominante, as características faciais observadas podem compor um banco de dados de informações antropométricas e antroposcópicas úteis para casos de identificação humana.

Descritores: Antropologia Forense; Antropometria; Face; Identificação humana.

ABSTRACT

The present study aimed to evaluate the different facial types of Brazilian adults of both sexes, using anthropometry and anthroposcopy methods. Data on age, the face shape, and the facial index of 382 participants were collected, and anthropometric measurements were obtained using a digital caliper. The studied sample predominantly presented the hyperleptoprosopic facial type, and the most common facial shapes were oval and round. Significant sexual dimorphism was observed among the population, with statistical differences between sex and facial index variables. Although the studied population presents one predominant facial type, the facial features observed can form a database on anthropometric and anthroposcopic information applicable to human identification cases.

Keywords: Forensic Anthropology; Anthropometry; Face; Human Identification.

Introduction

From the Forensic Anthropology perspective, the face provides characteristics that distinguish one individual from others, even within the same population[1-10]. Additionally, some anthropometric measurements of the face present sexual[8-14] and age[8] differences, contributing to one more biological profile step.

Although studies use anthropometry and facial anthroposcopy to assist forensic anthropology specifically, these are still scarce[10], primarily when related to the Brazilian population, which characteristic miscegenation results from its' historical process of colonization[15].

In this context, this study intended to evaluate different formats and facial types in a sample of Brazilians to contribute to the still incipient but flourishing field of study of Brazilian Forensic Anthropology.

Materials and Methods

This study followed the research regulations involving human beings and had prior approval of the Research Ethics Committee of the University of Pernambuco (CAAE n. 56824516.8.0000.5207).

A total of 382 individuals (196 males and 186 females) from Camaragibe, State of Pernambuco, northeastern Brazil, aged between 20 and 80 years, were included in the study. The sample calculation was performed using the OpenEpi software.

The variables used to carry out the study were based on the methodology proposed by Mane et al. (2010)[16], including facial shapes (oblong, oval, round, rectangular, square, triangular, diamond, inverted triangle, and heart), facial typology (Table 1), and vertical and horizontal anthropometric measurements (Table 2). The facial index was calculated for each participant to determine the facial type and compare it with the other variables.

Table1 - Facial typology, according to Mane et al. (2010).

FACIAL TYPE	FacialIndex	Facialstructure
Mesoprosopic	85.0-89.9 mm	Balanced
Euriprosopic	80.0- 84.9 mm	Short
Hipereuriprosopic	<or = 79.9mm	Very short
Leptoprosopic	90.0-94.9mm	Elongated
Hiperleptoprosopic	>or = 95mm	Very long

Table 2 - Facial measurements, according to Mane et al. (2010).

Vertical measurements	1- Tr-N (Trigion-Nasal) 2- N-Pro (Nasal-Pronasal) 3- Pro-Pog (Pronasal-Pogônio) 4- 4- Tr-Gn (Trigion-Gnátio)
Horizontal measurements	1- I-I (inter-pupil) 2- A-A (Nose wing) 3- C-C (Labial commissure) 4- Z-Z (Mostsalient points of the zygomatic arch)

With the participant sitting in an anatomical position, an eye makeup pencil was used to aid the marking of the facial points and measure distances between them using a digital caliper (Stainless-Hardened ® - 150mm). The facial index was determined by the ratio between facial height (Násio-Gnátio) and facial width (bizygomatic distance), multiplied by 100.

Statistical analysis was performed using the IBM© Software Statistical Package for Social Science (IBM© SPSS 22.0). Chi-square and Fisher's exact tests and linear logistic regression were used for data analysis.

RESULTS

The analysis of the facial shape of the sample revealed that there was a higher prevalence of round and oval faces, followed by the square type. Regarding the facial type, hyperleptoprosopic was the most prevalent and predominant, present in 310 participants (Table 3).

Table 3 - Sample distribution according to facial shape and type of face

FACIAL SHAPE	N	%
Oblong	33	8.6
Oval	102	26.7
Round	120	31.4
Rectangular	38	9.9
Square	47	12.3
Triangular	2	0.5
Diamond	17	4.5
Invertedtriangle	19	5.0
Heart	4	1.0
TOTAL	**382**	**100.0**
FACIAL TYPE	**N**	**%**
Leptoprosopic	54	14.1
Euriprosopic	6	1.6
Hyperleptoprosopic	310	81.2
Mesoprosopic	12	3.1
TOTAL	**382**	**100.0**

There was a statistically significant difference between sex and the formats of the face (Chi-square = 32.07, $p = 0.000$), and facial type (Chi-square = 9.50, $p = 0.002$), with regard to female participants.

When the population's facial index was analyzed, a mean of 103.39 (SD = 9.5) was observed, with a minimum value of 80 and a maximum of 128. Males had a facial index higher than females, which was statistically significant (105,75 ± 8,91 e 101,16 ± 9,46).

Regarding the metric variables, the A-A measurement had the lowest standard deviation (4.8), while the highest standard deviation was observed for the T-POG variable (sd = 15.3), as shown in Table 4.

Table 4 - Distribution of the sample according to the frequency of facial measurements

VARIABLE	N	MEAN (mm)	STANDARD DEVIATION	MINIMUM	MAXIMUM
T_G	382	57.0	8.1	30.0	81.0
T_N	382	67.5	8.5	40.0	95.0
T_PRO	382	113.4	14.0	74.8	152.0
T_POG	382	180.4	15.3	119.0	244.0
G_N	382	12.2	6.4	6.0	16.4
G_PRO	382	57.7	8.0	33.0	120.0
G_POG	382	124.6	12.5	79.0	198.0
N_PRO	382	47.1	6.7	24.0	77.0
N_POG	382	111.4	9.9	70.0	163.0
PRO_POG	382	71.5	9.4	38.0	98.0
I_I	382	63.0	5.0	47.0	86.0
A_A	382	38.3	4.8	21.0	56.0
A_T	382	101.2	6.2	82.0	125.0
C_C	382	52.3	6.2	30.0	84.0
Z_Z	382	107.8	9.3	79.0	149.0

When the linear logistic regression analysis was performed between facial measures and facial type, it was observed that only the variables T-N; T-PRO; G-POG; N-POG; T-G; and Z-Z presented statistical significance (Table 5).

Table 5 - Result of the linear logistic regression, considering the dependent variable "Facial Type".

Model	Variable	Non-standardizedcoefficients		Standardized coefficients	T	Sig.	CIof 95% toExp (B)	
		B	S.E.	Beta			Loweest	Highest
13	(Constante)	3.056	0.489		6.253	0.000	2.095	4.017
	T-N	0.041	0.015	0.472	2.688	0.008	0.011	0.071
	T_PRO	0.008	0.003	0.150	2.317	0.021	0.001	0.015
	G_POG	-0.012	0.004	-0.202	-2.922	0.004	-0.020	-0.004
	N_POG	0.035	0.005	0.471	6.393	0.000	0.024	0.046
	T_G	-0.044	0.016	-0.485	-2.789	0.006	-0.075	-0.013
	Z_Z	-0.038	0.004	-0.476	-9.538	0.000	-0.045	-0.030

Discussion

The study of anthropometric facial features in different populations, through anthropometry and anthroposcopy, aims to assist the clinical practices of orthodontics, speech therapy, and facial reconstruction surgeries[17-29] and forensic identifications[-30-38]. Also, some researchers choose to carry out these studies with indirect measurements so that identifications that need to be established in images, such as those of security video systems, can have the applicability of an effective methodology.

The data from these analyzes can offer important information for the forensic area since their results, for each region studied, provide elements that establish the most common facial type, as well as the anthropometric variations inherent to the facial index. Therefore, this information can assist the forensic anthropologist in population individualization since these anthropometric measurements can vary according to sex, ancestry, eating habits, climate, and environment, in addition to the hereditary characteristics themselves.

Sadacharam et al.[4] collected data regarding facial measurements among young adult Indian-American students, finding no statistical differences between both sexes' facial indexes. The predominance was short-faced, while long-faced was the rarest. In contrast, in the present study, statistical differences were found between facial indexes, in addition to the very long facial typology as the predominant one. These results can be justified by the important geographical distance between both regions, reflecting the absence of hereditary influence between countries and the consequent difference in facial characteristics.

Another study[16] carried out in Indian population groups showed the hyperleptoprosopic facial type as predominant in both sexes. Regarding the facial shape, the oval face was the most common in the leptoprosopic and hyperleptoprosopic facial types. The facial type corroborates with the present study, as the facial format shows disagreement with the population of Camaragibe-PE, Brazil. Despite belonging to different continents, this result shows that due to the great miscegenation of the Brazilian population, it is possible to find similar characteristics with other population groups.

In 2008, Jahanshahi et al.[5] studied the facial types of population groups in Gorgan, northern Iran. The results showed that the euriprosopic and mesoprosopic facial types were more prevalent in the female and male gender, respectively. These results do not correspond to the predominant facial type found in the present study, probably due to the climatic discrepancies between northeastern Brazil and northern Iran, in which the tropical and arid climate predominate, respectively. In addition to the climatic factor, proven to be responsible for one of the influences on facial growth, the results can be correlated to differences in population colonization, where, in northeastern Brazil, Portuguese, Dutch and African colonization is predominant, whereas this is not the same characteristic in the Asian population.

Facial anthropometric measurements performed in 25 countries of different ethnic groups[2], and another study carried out in the Brazilian population[27] showed sexual dimorphism for all measurements performed, demonstrating that sexual anthropometric differences are not intrinsic characteristics to a population, which can be considered, even as other studies are carried out, as a universal characteristic.

In order to investigate the differences in facial measurements between white Americans, black Americans, Hispanics, and others, in 2010, Zhuang et al.[8], found significant statistical differences between sex, ancestry and, also, for the age group, showing how much the Anthropometric facial data can, when analyzed with caution, play an important role in screening an individual's population affinity and gender.

In 2011, Ritz-Timme et al.[10], in order to analyze the rarest and most common facial characteristics belonging to different European population groups, applied 43 pre-established measurements, those present in those necessary for the calculation of the facial index (face height and width). For the entire population group studied, composed of Italians, Germans, and Lithuanians, the average facial index was 86.4, 97.9, and 80.4, respectively, with no similarities in these data with those found in our study, who presented an average facial index equivalent to 103.39.

Thus, it is seen that the results presented by the present research, when compared to the data obtained in other studies in different regions, demonstrate that the concordances and disagreements come from the population affinities existing in each studied group, as well as from the environmental, climatic, and also sexual characteristics.

Conclusions

The studied population had a very long facial type as predominant, regardless of sex and facial shape. Despite this, the population's anthropometric measurements have significant sexual dimorphism characteristics.

As the provides valuable information to human identification, and due to the scarcity of studies of facial patterns in the Brazilian population, the construction of a database with facial types, characteristics individualizing morphological and morphometric characteristics can assist in the establishment of a biological profile of the individual, which, in turn, will help to identify a victim who may be missing, involved in a crime or even in an accident.

Conflict of interest

There are no known conflicts of interest associated with this publication, and there has been no significant financial support for this work that could have influenced its outcome.

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