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Discrimination of Two Communities of Punjab on the Basis of Craniofacial Measurements

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Abstract:

Somatometry is a type of anthropometry which includes measurements of living beings as well as cadavers of the body including head and face. In cases where the body is mutilated/ decomposed and it is difficult to recognize the person from the face, it can be possible to identify the person from the bones of the skull and face. The present study is conducted on two different communities of Punjab state that are JATT SIKHS and BRAHMINS. The sample size comprises 400 healthy males including 200 of each community between the age of 25-35 years. The present study aims to find different indices which include different cranial measurements such as maximum head length, maximum head breadth, maximum head height, the circumference of the head, minimum breadth of the frontotemporal, maximum breadth of zygomatic breadth, maximum breadth of bigonial, physiogonic facial height, morphological facial height, nasal height, nasal breadth, lip length, lip breadth, ear length and ear breadth of the right ear. The study revealed that both the communities follow the almost same trend in all calculations. Very few differences can be seen in the comparative values of both communities. According to different indices, the shapes of both communities fall under the same category. The detailed study is presented below. The data obtained in the present study may be useful to distinguish the two major communities of Punjab (India) and can be used in anthropological research, forensic cases.

Key Words: *Somatometry, Zygomatic Breadth, Anthropometry, Cranial measurement*

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Introduction

Somatometry is the technique used for individualization since every person is different in various aspects. It gives an idea about the general physique, the appearance of an individual & one can be distinguished between two races, natives of two countries, state or two communities. As many studies conducted on the Punjabi population, but there is no study carried on the differences between two major communities of Punjab, i.e., Jatt Sikh and Brahmins. So, the present study is an approach to study the differences in craniofacial measurements and their indices of the above-named communities. For the study, 14 measurements (Maximum. Head Length, Maximum. Head Breadth, Head Height, Minimum Breadth Of Frontotemoral, Maximum Breadth Of Zygomatic Arch, Maximum Breadth Of Bigonial, Physiognomic Facial Length, Morphological Facial Length, Nasal Length, Nasal Breadth, Height Of Integumental Lips, Lip Length, Ear Length, and Ear Breadth) and 10 indices (Cephalic Index, Length Height Index, Breadth Height Index Jugo Frontal Index, Jugo Mandibular Index, Physiognomic Facial Index, Morphological Facial Index, Nasal Index, Lip Index, And Ear Index) of the measurements are the basis of the differentiation of two communities.

Craniometry and facial measurements are useful in making of different equipment such as goggles, headphones, helmets, etc. and also in medical lines for accidental surgeries, plastic surgeries, etc.

Material & Methodology

Total 400, healthy subjects were selected. Out of the 200 were males belonged to JATT SIKH community and 200 males belonged to the BRAHMIN community from the Punjab population. Total of 14 different measurements were taken from 400 subjects with the help of standard instruments (Measuring Tape, Spreading Caliper, Sliding Caliper and Steel Tape). The subjects were requested to stand erect for height measurement and then sit straight looking in the eye ear plane for taking the rest measurements. Different measurements of anthropometric landmarks were recorded for each participant. The measurements were taken 3 times and the final value was recorded as the average of the 3 values. The above mentioned 14 measurements and 10 indices of the craniometry were used for the study.

Observations & Results

The present study was undertaken to know whether the significant variations present in the two major communities (Jatt Sikh and Brahmins) of Punjab.

In the current analysis statistics on anthropometric measurements of craniofacial landmarks of 400 people of two different communities of Punjab in which 200 subjects belonged to Jatt Sikh community and 200 subjects belonged to the Brahmin community with the age group, 25-35 years were collected. Observations are as follows:

Table No. 1 – Shows the comparison between Sikh and Brahmin community based on 14 different Craniofacial Parameters

VARIABLES	COMMUNITIES	TOTAL	MEAN	MAX.	MIN.	S.D.	VARIANCE	z-stat	p-VALUE	SIGNIFICANCE
Max. Head Length	Brahmin	3863.7	19.3185	20.9	17.6	0.575031352	0.330661055	-2.022181911	0.021578781	Significant
	Jatt Sikh	3888.4	19.442	20.7	18	0.644447486	0.415312563			
Max. Head Breadth	Brahmin	3034.2	15.171	16.5	13.8	0.584093164	0.341164824	-2.365494546	0.009003004	Significant
	Jatt Sikh	3061.8	15.309	16.5	14	0.582680515	0.339516583			
Head Height	Brahmin	4827.7	24.1385	26.2	21.8	0.898445195	0.807203769	0.138192262	0.445044235	Not Significant
	Jatt Sikh	4825.2	24.126	26.2	22.2	0.91058764	0.829169849			
Minimum Breadth of Frontotemoral	Brahmin	2507.2	12.536	13.9	10.9	0.515687569	0.265933668	-2.588604817	0.004818272	Significance
	Jatt Sikh	2537.4	12.687	14.4	11.3	0.643897523	0.41460402			
Maximum breadth of Zygomatic Arch	Brahmin	2831.05	14.15525	15.5	12	0.623138383	0.388301445	-1.969361248	0.024455811	Significance
	Jatt Sikh	2855.42	14.2771	16	12.9	0.614287666	0.377349337			
Maximum Breadth Of Bigonial	Brahmin	1890.2	9.451	11.2	7.5	0.763092755	0.582310553	-2.97108435	0.001483751	Significance
	Jatt Sikh	1938.5	9.6925	12.5	8	0.85970297	0.739089196			
Physiognomic Facial Length	Brahmin	3619.3	18.0965	20	16.3	0.76140425	0.579736432	-1.007045655	0.156956418	Not Significance
	Jatt Sikh	3636.5	18.1825	20.4	15.7	0.937463567	0.87883794			

Morphological Facial Length	Brahmin	2264.9	11.3245	13.2	9.9	0.592032314	0.350502261	-3.707862205	0.000104508	Significant
	Jatt Sikh	2315.9	11.5795	13.5	9.9	0.771626065	0.595406784			
Nasal Length	Brahmin	937.5	4.6875	5.3	4	0.257341941	0.066224874	-3.246926726	0.000583292	Significant
	Jatt Sikh	956.9	4.7845	5.7	3.7	0.335068807	0.112271106			
Nasal Breadth	Brahmin	696.9	3.4845	4.3	3	0.234488109	0.054984673	-1.773016698	0.03811297	Significant
	Jatt Sikh	705.9	3.5295	4.2	2.9	0.271751716	0.073848995			
Height Of Integumental Lips	Brahmin	365.8	1.829	2.4	1.1	0.241559007	0.058350754	1.671258191	0.047335345	Significant
	Jatt Sikh	357	1.785	2.6	1.2	0.28333087	0.080276382			
Lip Length	Brahmin	985.6	4.928	5.6	4.1	0.370543537	0.137302513	-3.185370571	0.000722844	Significant
	Jatt Sikh	1009.3	5.0465	6.2	4.3	0.373477142	0.139485176			
Ear Length	Brahmin	1072.1	5.3605	6.5	4.6	0.400740207	0.160592714	1.27213967	0.101661749	Not Significant
	Jatt Sikh	1061	5.305	6.5	4.3	0.469121921	0.220075377			
Ear Breadth	Brahmin	719.8	3.617085 427	4.5	2.9	0.29182385	0.085161159	-2.684351242	0.003633536	Significant
	Jatt Sikh	740	3.7	4.4	3	0.324385774	0.105226131			

Table No. 2 – Shows the comparison between Jatt Sikh and Brahmin community on the basis of 10 different Craniofacial Indices

VARIABLES	COMMUNITIES	TOTAL	MEAN	MAX.	MIN.	S.D.	VARIANCE	Z-STAT	P-VALUE (1 TAIL)	SIGNIFICANCE
Cephalic Index	Brahmins	15641.13 732	78.5986 8002	87.7005 3476	70.5	3.532616 809	12.47938152	-0.608120179	0.271553885	Not Significant
	Jatt Sikh	15765.07 389	78.8253 6943	88.9502 7624	67.63285 024	3.905062 664	15.24951441			
Length Height Index	Brahmins	25001.31 966	125.006 5983	138.888 8889	112.2549 02	4.701022 375	22.09961137	1.634821042	0.051043284	Significant
	Jatt Sikh	24837.11 813	124.185 5906	138.461 5385	109.9009 901	5.323666 434	28.3414243			
Breadth Height Index	Brahmins	31872.77 459	159.363 8729	182.608 6957	137.8881 988	8.388315 402	70.36383529	1.889502877	0.029412239	Significant
	Jatt Sikh	31560.55 797	157.802 7899	180.851 0638	137.8881 988	8.133462 811	66.15321729			
Jugo Frontal Index	Brahmins	17740.20 882	88.7010 4412	106.976 7442	74.65753 425	4.810867 842	23.14444939	-0.595199927	0.27585492	Not Significant
	Jatt Sikh	17803.77 307	89.0188 6537	107.692 3077	75.33333 333	5.820754 75	33.88118586			
Jugo Mandibular Index	Brahmins	13359.87 616	66.7993 8082	78.6259 542	54.30463 576	5.019010 882	25.19047023	-2.070338785	0.019210315	Significant
	Jatt Sikh	13589.61	62.3376 6	89.2857 1	52.98013	6.030998	36.37294			
Physiognomic Facial Index	Brahmins	25608.43 678	128.042 1839	148.461 5385	112.5827 815	6.945607 966	48.24147002	0.664617497	0.253147588	Not Significant
	Jatt Sikh	25509.72	127.548 6	146.153 8	103.9735	7.877668	62.05766			
Morphological Facial Index	Brahmins	16030.56 16	80.1528 0799	99.1666 6667	67.80821 918	5.441619 923	29.61122738	-1.871053735	0.030668817	Significant
	Jatt Sikh	16242.73 658	81.2136 8292	100.746 2687	66.875	5.889401 701	34.68505239			
Nasal Index	Brahmins	14918.76 747	74.5938 3733	100	60.78431 373	6.902572 088	47.64550143	0.694093875	0.24381167	Not Significant
	Jatt Sikh	14893.86	74.0988 3	95.4545 5	53.57143	7.353805	54.07845			
Lip Index	Brahmins	7467.166 897	37.3358 3448	53.6585 3659	21.15384 615	5.781264 488	33.42301909	3.043598516	0.001168834	Significant
	Jatt Sikh	7107.414 132	35.5370 7066	56.5217 3913	20.96774 194	6.035971 824	36.43295586			
Ear Index	Brahmins	13560.12 812	67.8006 4059	91.4893 617	46.77419 355	7.197424 84	51.80292433	-3.082615209	0.001025951	Significant
	Jatt Sikh	14070.78	70.3539 2	100	46.15385	9.241658	85.40823			

***p-value ≤ 0.05 has been considered to be statistically highly significant.**

Discussion & Results

The technique somatometry of anthropology used in forensic science is very useful for the personal identification of an individual. This technique is used in cases such as mass disaster, the decomposed dead bodies, on skulls for individualization. As the landmarks are fixed anatomical points on the human body, the measurements of craniofacial landmarks are taken for different parameters such as head length, head breadth, their index, i.e., cephalic index, etc. In forensics, this technique is a tool to identify a person's age, stature, race with precision even in the cases where the body is mutilated/ decomposed and it is difficult to recognize the person from the face, it can be possible to identify the person from the bones of skull and face.

The present study was conducted to determine the differences between two major communities of Punjab Jatt Sikh and Brahmins based on craniofacial measurements. For this, the craniofacial landmarks based measurements of the subjects were taken and recorded along with the names, age, profession, city of the subjects. For all the recorded parameters, the indices were calculated, and then the descriptive statistical analysis, charts of all data to show differences in both communities, and z-test was applied. The values less than or equal to 0.05 can be calculated as highly significant.

As head length is the first parameter it was observed that based on this parameter, it is possible to distinguish both the communities as the p-value is 0.02 less than the 0.05. Similarly, head breadth, maximum breadth of the zygomatic arch, maximum breadth of bigonial, morphological facial length, nasal length, nasal breadth, the height of integument lips, lip length, and ear breadth considered as useful parameters to differentiate the Jatt Sikh and Brahmins communities as their p values are less than or equal to the value 0.05.

The parameters by which one can't find the difference in the given communities are head height, physiognomic facial length, and ear length.

Now, if we talk about the indices that are calculated from these measurements and can predict the difference between both the communities as their p values are less than or equal to 0.05 are length height index, breadth height index, jugo mandibular index, morphological facial index, lip index, and ear index.

The indices which by which one can't decide the community whether the person belongs to Jatt Sikh or Brahmin community are cephalic index, jugo frontal index, physiognomic facial index, nasal index because their p values are more than the significant value 0.05.

If we look upon the other values such as a total sum of a particular parameter of all subjects, mean, maximum value, minimum value, standard deviation and variance of particular parameters of both the communities, the values don't follow any trend as some values are larger in the case of Jatt Sikh community and some values are larger in Brahmin community such as the total sum value, mean value of head length is higher in Jatt Sikh community but the maximum value is higher in Brahmins. In the case of Head Breadth maximum value for both communities is similar.

The comparison of the present study's values with the literature, the findings for the cephalic index for different populations are:

Research Workers	Population	Cephalic Index
Shah & Jadhav	Gujarati Population	80.81
Oladipo & Oluto	Ijaw	80.98
Oladipo & Oluto	Igbo	79.04
Anupama et al.	Punjabi Students	81.34
Anitha et al.	North Indian	79.1
Present Study	Jatt Sikh of Punjab	78.83
	Brahmin of Punjab	78.6

Similarly, the face type or facial index or prosopic index's value compared with the previous studies, the observations are as under:

Research Workers	Population	Prosopic Index
Singla Mukesh et al.	Jatt Sikh of Punjab	Euryprosopic
Pandey AK	Onges of Andaman & Nicobar Islands	Hypereuryprosopic
Ghosh & Malik	Santhals of West Bengal	Hypereuryprosopic
Meka & Rexhepi	Albanian Kosova Population	90.38
Present Study	Jatt Sikh	Euryprosopic
	Brahmin	Euryprosopic

Now, if we talk about the nose type or say nasal index, according to the literature, the Indo-African population is having Platyrrhine nose type (Sparks & Jantz), Jingo people of China have Mesorrhine nose type (Xu et al.), Kosovo Albanian population's nose type is Leptorrhine (G. Staka et al.) and according to the present study, the nose type of Jatt Sikh and Brahmin community is Mesorrhine.

With the help of the above statistics and discussion, the community or say individualization of the deceased can be an estimate and this knowledge can be play important role in forensic cases.

Conclusion

The study revealed that some parameters such as maximum head breadth, minimum breadth of the frontotemporal, maximum breadth of bigonial, nasal length, lip breadth, lip index, ear breadth, and ear index are useful to differentiate Jatt Sikh and Brahmin communities for the personal identification in` the forensic investigation.

From all the observations, results (Tables and charts), analysis, and discussions, the conclusion can be drawn that both the communities follow the almost same trend in all calculations. Very few differences can be seen in the comparative values of both communities. According to different indices, the shapes of both communities fall under the same category. The head shape of Brahmins and Jatt Sikh communities as per the mean values of Cephalic Index 78.6 and 78.83 respectively is Mesocephalic. The mean value of Physiognomic Facial Index for Brahmin is 128.04 & Jatt Sikhs are 127.55. The face shape according to the morphological facial index is Euryproscopic and the mean value for Brahmins is 80.15 and for Jatt Sikh is 81.21. Jugo frontal index and jugo mandibular index's mean values for Brahmins are 88.7 & 66.8 and Jatt Sikh is 89.01 & 62.34 respectively and categorized as broad and very narrow. Mesorrhine is the type of nasal index for both communities and the mean value for Brahmins is 74.59 and Jatt Sikh is 74.09. The mean values of lip index and ear index for Brahmins are 37.34 & 67.8 and for Jatt Sikh are 35.54 & 70.35.

The data obtained in the present study may be useful to distinguish the two major communities of Punjab (India) and can be used in anthropological research, clinical surgeries, and forensic cases.

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