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BODY PROPORTIONS IN HUMAN PHYSIQUE: A STUDY RELATED TO SOMATOMETRIC MEASUREMENTS — SOME OBSERVATIONS

ABSTRACT — The present study is an attempt to find out the body dimensions, both longitudinally and transversally of the different body segments and their relation with the highest linear dimension i.e. Stature/Height vertex.

KEY WORDS: Body dimensions — Stature/Height vertex — Body proportions.

Body proportion in human physique is a bio-genetically controlled anatomical feature. It is usually maintained at the population level in such a way that it regulates the conformity in respect of body dimension. This particular phenomenon is apparently found also among all animals. It is presumed that the biological features as well as the other characteristics, such as morphological, physiological and psychological traits helped the Homo sapiens in general to occupy the highest order and position in the animal kingdom. Apart from certain species specific morphological features, the human body can be proportionately divided into a number of segments; like, head and neck region, the thoracic region and the distal body parts. The meshwork between each of the segments is so closely and keenly interwoven, that it usually gives us the possibility to ascertain a normal proportionate body size of the population in general, and for the people of India in particular. Any deviation in segmental arrangement may create a problem both apparently and relatively in respect of normal body growth.

The slightest apparent metric deviation in body dimension can be secluded by means of statistical analysis. Hypothetically, it may be presumed, that all normal individuals of a particular population group of the universe are alike, and that they show the same trend of segmental variation. The interlinkages between the segmental alignment are usually maintained by means of the character specific biogenetic factors. Sometimes, these deviations in body dimensions are to some extent stimulated by certain externally influenced stimulating factors, like: environment, food and ecology. However, in this present paper, an attempt has been made by the present author(s) to find out the body dimensions, both longitudinally and transversally, of the different body segments and their relation with the highest linear dimension i.e. Stature/Height vertex.

MATERIAL AND METHODS

The data utilized for the present study are mostly secondary in nature, and all measurements of a group are primarily measured by the same author, therefore, the investigator's error in respect of measurements could be found out uniform in nature. Keeping in view of the possible error, we have computed only the average (x) of each trait for the aforsaid study; and the groups were computed as per geograhical boundaries.

We do not claim that our study is an exhaustive one. It is simply an experiment to find out how far our hypothesis could be established for further research in the light of medico-legal profession.

In this study only male anthropometric measurements have been incorporated from Assam, Arunachal Pradesh and Meghalaya of north-eastern part of India.

This particular region is predominantly inhabited by the tribal groups with some percentages of caste people. Most of tribal populations of the region belong to Mongoloid racial stock, whereas the caste people belong to the Caucasoid racial stock (Das et al., 1980). In this present study a total number of 34 population groups have been incorporated of which 23 groups are from Assam (10 castes; 13 tribes); seven are from Arunachal Pradesh (all tribes); and four tribes are from Meghalaya (*Table 1*).

TABLE 1. *State-wise distribution of the population*

State	Caste	Tribe	Total
Assam	10	13	23
Arunachal Pradesh	—	7	7
Meghalaya	—	4	4
Total	10	24	34

In this study 11 anthropometric traits were taken to study the aforesaid medico-legal problems. The traits are: Stature (St), Sitting height (SH), Lower limb length (St−SH=LL), Head length (HL), Head breadth (HB), Head height (HH), Head circumference (HC), Bizygomatic breadth (BzB), Total facial height (TFH), Upper facial height (UFH), Nasal height (NH) and Nasal breadth (NB).

The relations between stature and all other traits were analysed by simple percentage analysis, like:

$$\frac{\textit{Sitting height}}{\text{Stature}} \times 100$$

The same method has been applied also in case of all other traits, keeping the stature as "K". The name of the populations with state and researchers are given in *Table 2*. Original data in respect of measurements have been tabulated in *Table 3 and 4* along with the analysis for the convenience of study for further research.

ANALYSIS OF CHARACTERS

The characters and character-specific analysis are discussed below:

Stature: Stature is one of the most important and fundamental measurements of all the anthropometric measurements. Though it is measured to find out the highest linear dimension, in reality it is a combination of segmental measurements. However, in this present study the stature of the individual population as well as of the other population groups in general was taken to find out its correlation in respect of other longitudinal and transverse body measurements for medico-legal analysis.

TABLE 2. *Sources of data and state-wise distribution*

State	Population	Author
ASAM	AHOM	Das et al, 1980
	BRAHMAN (Kamrup)	—
	BRAHMAN (Darang)	—
	BRAHMAN (Sibsagar)	—
	CHUTIYA	—
	DEURI	Sharma, 1962
	FAKIAL	Waddel, 1901
	GARO	Das, 1960a
	HIRA	Das et al, 1980
	JOGI	—
	KAIBARTA	—
	KALITA	—
	KAYASTHA	—
	KUMAR	—
	KACHARI	Das, 1960b
	KHAMIYANG	Das and Bhagabati, 1963
	LALUNG	Das and Sharma, 1968
	MORAN	Das et al, 1980
	MISHING	Das, 1980
	RABHA	Das, 1960
	RAJBANSHI	Das, 1959
	SURI	Das, 1973
	THENGAL KACHARI	Phookan, 1974
ARUNACHAL PRADESH	ASHING	Roy, 1966
	MINYONG	—
	MILAN	—
	PADAM	—
	PASI	—
	SHIMONG	—
	SINGPHO	Gogoi, 1978
MEGHALAYA	BHOI	Das, 1978
	KHYNRIUM	—
	PNAR	—
	WAR	—

In Assam the average height of the caste population is 163.25 cm and in case of tribals it is 162.51 cm. The linear difference between the aforesaid two groups is only 0.74 cm. The maximum height among the caste group is observed within the Brahman of Kamrup (164.61 cm) and the least in case of Hira (161.46 cm). But among the tribals of Assam, the Lalung possess the highest stature (165.27 cm) and the least in case of Khamyang (159.90 cm).

Likewise, in Arunachal Pradesh the highest stature is found among the Pasi (160.48 cm) and the least in case of Singpho (155.03 cm); whereas in Meghalaya the highest stature is found among the Pnar (157.35 cm) and the least in case of War (155.68 cm). The average stature among the people of Arunachal Pradesh is 158.05 cm, while in Meghalaya it is 156.66 cm respectively.

On comparing the stature of the tribals of the aforesaid regions it was found that apparently the plane tribals of Assam occupy the highest ranks, while the people of Meghalaya possess the least dimensions. Though all the tribals of the aforesaid three regions fall under the same racial stock, the genetic factor of the people as well as the ecological

TABLE 3. *Average male somatometric measurements of three different states of north-east region (in cm)*

	Stature	Sitting height	Head length	Head breadth	Head height	Head circumference	Bizygomatic breadth	Total facial height	Upper facial height	Nasal height	Nasal breadth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
ASSAM											
Caste (N−10)											
Brahman (Kamrup)	164.61	84.81	18.92	14.54	13.80	53.68	—	11.68	6.91	5.21	3.74
Brahman (Darang)	163.73	84.18	18.25	14.33	13.11	55.10	13.15	11.18	6.38	5.01	3.49
Brahman (Sibsagar)	161.95	85.40	18.35	14.50	13.35	54.94	12.71	11.23	7.02	5.40	3.54
Hira	161.46	82.95	18.26	14.46	13.32	54.59	13.20	11.20	6.46	4.72	3.48
Jogi	164.29	83.86	18.21	14.44	13.41	54.81	13.32	11.39	6.45	4.74	3.59
Kaibarta	163.10	82.96	18.29	14.52	13.15	54.52	13.16	11.10	6.30	4.65	3.52
Kalita	163.63	84.46	18.70	14.55	12.01	53.92	13.20	11.34	6.52	5.03	3.64
Kayastha	164.06	84.16	18.84	14.66	13.63	54.17		11.65	6.78	4.11	3.55
Kumar	163.06	81.95	18.24	14.39	13.53	54.38	13.03	11.28	6.58	4.92	3.48
Suri	162.62	83.50	18.58	14.36	11.89	53.19	13.10	11.30	6.65	4.94	3.62
Average	**163.25**	83.82	18.46	14.47	13.12	54.33	13.11	11.33	6.60	4.87	3.56
TRIBE (N-13)											
Ahom	162.83	84.72	18.24	14.88	12.65	55.45	13.65	11.46	6.98	5.27	3.78
Chutiya	164.11	84.13	18.38	14.68	13.63	55.16	13.44	11.59	6.76	5.04	3.78
Deuri	163.86	83.95	18.38	14.63	13.69	55.71	13.59	11.44	7.00	5.21	3.80
Fakial	162.50	81.60	18.00	14.00			13.20			4.90	4.00
Garo	160.70	83.50	18.75	14.14	12.03	54.90	13.82	11.39	6.64	4.73	3.97
Kachari	163.05	84.49	18.69	14.33	12.05	54.08	13.70	11.43	6.79	5.00	3.84
Khamyang	159.90		18.72	14.56			13.71			4.98	3.84
Lalung	165.27	86.29	18.54	14.09	13.34	55.73	13.35	11.53	6.52	4.61	3.68
Moran	162.97	84.59	18.80	14.46	13.55	55.81	13.39	11.98	7.28	5.37	3.80
Mishing	161.13	84.05	18.63	14.78	13.77	55.94	13.65	11.97	7.19	5.29	3.69
Rabha	161.25	84.36	18.85	14.20	12.11	53.56	13.50	11.20	6.61	4.76	3.83
Rajbanshi	163.63	83.95	18.46	14.01	12.55	53.21	13.24	11.31	6.68	4.97	3.58
Thengal Kachari	161.49	83.21	18.10	14.86	13.02	53.93	13.69	11.62	6.92	5.73	3.70
Average	162.51	84.07	18.50	14.43	12.94	54.86	13.53	11.54	6.85	5.07	3.79
Mean (N 23)	162.83	83.96	18.49	14.45	13.03	54.61	13.37	11.44	6.73	4.98	3.60
ARUNAGHAL Pradesh											
Ashing	157.32		19.14	14.48	12.66	56.32	13.87	12.18	7.78	5.40	3.92
Milan	158.90		19.13	14.61	12.72	55.00	13.86	12.02	7.71	5.34	3.92
Minyong	159.00		19.06	14.59	12.30	54.80	13.63	11.93	7.62	5.30	3.85
Padam	157.60		19.11	14.55	12.85	54.95	14.02	11.97	7.64	5.27	3.88
Pasi	160.48		19.33	14.71	12.53	55.73	14.14	12.38	7.89	5.54	4.02
Shimong	158.00		19.06	14.48	12.45	55.14	13.83	11.89	7.64	5.28	3.90
Singpho	155.03		18.30	14.20			12.60	10.90	6.10	4.60	3.70
Average	158.05		19.02	14.52	12.58	55.32	13.71	11.89	7.48	6.25	3.88
MEGHALAYA											
Bhoi	157.00	82.36	18.34	14.24	12.77	51.79	13.45	11.33	6.64	4.80	3.95
Khynrium	156.62	82.36	18.82	14.64	12.29	54.60	13.51	11.07	6.36	4.54	3.92
Pnar	157.35	81.12	19.10	14.53	11.92	54.59	13.51	11.40	6.56	4.79	3.72
War	155.68	81.57	18.67	14.43	11.90	54.16	13.47	11.05	6.34	4.58	3.80
Average	156.66	81.85	18.73	14.46	12.22	53.78	13.48	11.21	6.47	4.68	3.85

condition of the area played a good role, at least in this situation, to bring out the changes between the population groups.

Sitting height: The mean sitting height of the people of Assam is 83.96 cm and it is almost half of their average stature. The average sitting height of the caste people of Assam is 83.82 cm and in case of tribals it is 84.07 cm respectively. The apparent deviation between the caste and tribals of the aforesaid region is only 1.25 cm. The average sitting height of the people of Meghalaya is 81.85 cm and it is proportionately higher as compared to that of the stature.

No sitting height data were available as regards

the population of Arunachal Pradesh. From the analysis of data it was observed that the caste people of Assam stand between the tribals of Assam and Meghalaya.

Head length: The average head length of the people of Assam, Arunachal Pradesh and Meghalaya is 18.49 cm, 19.02 cm and 18.73 cm respectively. Among the caste people of Assam the maximum head length was found among the Brahman of Kamrup dist. (18.92 cm) and the least among the Jogi (18.21 cm) whereas, in case of tribal people it is the highest among the Rabha (18.85 cm) and the least among the Fakial (18.00 cm). In Arunachal Pradesh, the highest head length could be observed among the Pasi (19.33 cm) and the least among the Singpho (18.30 cm); whereas in Meghalaya the highest head length could be observed among the Pnar (19.10 cm) and the least among the Bhoi (18.34 cm). But if we

TABLE 4. *Proportion between stature and other body parts in per cent*

	Sitting height	Length of lower limb	Head length	Head breadth	Head height	Head circum-ference	Bizygo-matic breadth	Total facial height	Upper facial height	Nasal height	Nasal breadth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
ASSAM											
CASTE(N=10)											
Brahman (Kamrup)	51.52	48.48	11.49	8.83	8.38	32.61	—	7.09	4.20	3.16	2.27
Brahman (Darang)	51.41	48.59	11.15	8.75	8.02	33.65	8.03	6.83	3.90	3.06	2.13
Brahman (Sibsagar)	52.73	47.27	11.33	8.95	8.24	33.93	7.85	6.93	4.33	3.33	2.18
Hira	51.37	48.63	11.31	8.95	8.25	33.81	8.17	6.94	4.00	2.92	2.15
Jogi	51.04	48.96	11.08	8.79	8.16	33.36	8.10	6.93	3.92	2.88	2.18
Kaibarta	50.86	49.14	11.21	8.90	8.06	33.43	8.07	6.80	3.86	2.85	2.16
Kalita	51.62	48.38	11.43	8.89	7.34	32.95	8.07	6.93	3.98	3.07	2.22
Kayastha	51.30	48.70	11.48	8.93	8.31	33.02	—	7.10	4.13	2.50	2.16
Kumar	50.26	49.74	11.19	8.82	8.30	33.35	7.99	6.92	4.03	3.02	2.13
Suri	51.35	48.65	11.42	8.83	7.31	32.71	8.05	6.95	4.09	3.04	2.23
Average	51.34	48.66	11.31	8.86	8.04	33.28	8.03	6.94	4.04	2.98	2.18
TRIBE (N 13)											
Ahom	52.03	47.97	11.20	9.14	7.77	34.05	8.38	7.04	4.28	3.24	2.32
Chutiya	51.26	48.74	11.20	8.94	8.30	33.61	8.19	7.06	4.12	3.47	2.30
Deuri	51.23	48.77	11.22	8.93	8.35	34.00	8.26	6.98	4.27	3.18	2.32
Fakial	50.21	49.79	11.08	8.61	—	—	8.12	—	—	3.01	2.46
Garo	51.96	48.04	11.67	8.80	7.48	34.16	8.60	7.09	4.13	2.94	2.47
Kachari	51.82	48.18	11.46	8.79	7.39	33.17	8.40	7.01	4.16	3.07	2.35
Khamyang	—	—	11.71	9.10	—	—	8.57	—	—	3.11	2.40
Lalung	52.21	47.79	11.22	8.52	8.07	33.72	8.08	6.98	3.94	2.79	2.23
Moran	51.90	48.10	11.53	8.87	8.31	34.24	8.22	7.35	4.47	3.29	2.33
Mishing	52.16	47.84	11.56	9.17	8.54	34.72	8.47	7.43	4.46	3.28	2.29
Rabha	52.32	47.68	11.69	8.81	7.51	33.21	8.37	6.94	4.10	2.95	2.37
Rajbanshi	51.30	48.70	11.28	8.56	7.67	32.52	8.09	6.91	4.08	3.04	2.19
Thengal Kachari	51.82	48.18	11.46	8.79	7.39	33.17	8.40	7.01	4.16	3.07	2.35
Average	51.73	48.27	11.38	8.88	7.96	33.76	8.32	7.10	4.21	3.12	2.33
ARUNACHAL PRADESH											
Ashing	—	—	12.17	9.20	8.05	35.80	8.82	7.74	4.94	3.43	2.47
Milan	—	—	12.04	9.19	8.00	34.61	8.72	7.56	4.85	3.36	2.47
Minyong	—	—	11.99	9.18	7.73	34.46	8.57	7.50	4.79	3.33	2.42
Padam	—	—	12.12	9.23	8.15	34.87	8.89	7.59	4.85	3.34	2.46
Pasi	—	—	12.04	9.17	7.81	34.73	8.81	7.71	4.92	3.45	2.50
Shimong	—	—	12.06	9.16	7.88	34.90	8.75	7.52	4.83	3.34	2.47
Singpho	—	—	11.80	9.16	—	—	8.13	7.03	3.93	2.97	2.39
Average	—	—	12.03	9.18	7.94	34.89	8.67	7.52	4.73	3.32	2.46
MEGHALAYA											
Bhoi	52.39	47.61	11.78	9.15	8.20	33.27	6.39	7.27	4.26	3.08	2.54
Khynrium	52.58	47.42	12.02	9.35	7.85	34.86	6.49	7.07	4.06	2.90	2.50
Pnar	51.55	48.45	12.14	9.23	7.57	34.69	6.49	7.24	4.17	3.04	2.36
War	52.39	47.61	11.97	9.27	7.64	34.79	6.45	7.10	4.07	2.94	2.44
Average	52.23	47.77	11.98	9.25	7.81	34.40	6.45	7.14	4.14	2.99	2.46

combine all the tribal groups we find that the maximum head length could be observed among the Pasi (19.33 cm) of Arunachal Pradesh and the least among the Fakial (18.00 cm) of Assam (*Table 3*).

Head breadth: With this measurement we generally try to assess the contour of the head of a population. From the computed analysis of head breadth of the people of Assam it was found that in general their head breadth is 14.45 cm (caste < 14.47 cm; tribe 14.43 cm); whereas in Arunachal Pradesh it is 14.52 cm and in Meghalaya it is 14.46 cm respectively. Likewise, if we compare only the tribal data of the aforesaid three regions, we find, that the people of Meghalaya stand intermediate between the people of Assam and Arunachal Pradesh. From the table 3, it was observed that among the caste people of Assam the highest dimension was found among the Kayastha (14.66 cm) and the least among the Brahman (14.33 cm) of Darang district; whereas among the tribal people of Assam, the highest measure could be found among the Ahom (14.88 cm) and the least among Fakial (14.00 cm); while in Arunachal Pradesh the maximum dimension was found among the Pasi (14.71 cm) and the least among the Singpho (14.20 cm) and in Meghalaya the maximum dimension was found among the Khynrium (14.64 cm) and the least among the Bhoi (14.24 cm).

On the basis of comparison among the tribal groups of the aforesaid three regions the Ahom and Fakial groups encompass all the tribals included in the present study (*Table 3*).

Head height: This is one of the most important measurements for assessing cranial capacity in respect of *Homo sapiens* in general. The average head height of the people of Assam, Arunachal Pradesh and Meghalaya is 13.03 cm, 12.58 cm and 12.22 cm respectively. From the analysis of data it was found that the people of Arunachal Pradesh stand between the population of Assam and Meghalaya. In Assam the highest head heights have been found among the Mishing (13.77 cm) and the least among the Garo (12.03 cm); whereas in Arunachal Pradesh the maximum dimension is observed among the Padam (12.85 cm) and the least among the Minyong (12.30 cm); while in Meghalaya the maximum and minimum dimensions were found among the Bhoi (12.77 cm) and in War (11.90 cm) respectively. The computed data reveal that the Padam of Arunachal Pradesh and the War of Meghalaya encompass all the tribals presented for the aforesaid study.

Head circumference: This signifies the contour of the head. From somatological point of view there are six types of head forms: Pentagonoids, Ellipsoids, Rhomboids, Ovoids, Sphenoids and Sphaeroids. From the analysis of the data it was found that the average head circumference of the people of Assam, Arunachal Pradesh and Meghalaya are 54.61 cm (caste — 54.33 cm; tribe — 54.86 cm), 55.32 cm and 53.78 cm respectively. Further, it reveals that the people of Assam stand intermediate between the people of Meghalaya and Arunachal Pradesh (*Table 3*).

Similarly, if the data were compared population wise, we would find that among the caste people of Assam the maximum and minimum dimension were found among the Brahman of Darang district (55.10 cm) and the Suri (53.19 cm); but in case of tribal population of the aforesaid region, the highest and the lowest dimensions were observed among the Mishing (55.94 cm) and Thengal Kachari (53.93 cm); among the people of Arunachal Pradesh it is the highest among the Ashing (56.32 cm) and the least among the Minyong (54.80 cm): whereas in Meghalaya Khynrium (54.60 cm) and the Bhoi (51.79 cm) it occupies the highest and the lowest dimensions. Thus, if we compute only the Mongoloids of the aforesaid three regions, it reveals that the Ashing of Arunachal Pradesh and the Bhoi of Meghalaya encompass all the populations which are incorporated here.

Bizygomatic breadth: Altogether, 32 population groups are taken to visualise the usual face form of the people of Assam, Arunachal Pradesh and Meghalaya.

The average bizygomatic breadth of the people of Assam is 13.37 cm (caste — 13.11 cm, tribe — 13.53 cm); whereas in Arunachal Pradesh and in Meghalaya these measurements are 13.71 cm and 13.48 cm respectively. In Assam, among the caste population, the highest dimension is found among the Jogi (13.32 cm) and the least among the Brahman of Sibsagar district (12.71 cm); but among the tribals the maximum and minimum dimensions are found among the Garo and the Fakial of the aforesaid region. In Arunachal Pradesh, the maximum dimension was found among the Pasi and the least in Singpho; whereas in Meghalaya both Khynrium and Pnar show the highest dimension; and the least in case of Bhoi.

From the analysis of the tribal data of the regional together, we find that the Pasi and the Singpho of Arunachal Pradesh encompass all the available data which are being incorporated for the present study; however, to prove the hypothesis further, research is warranted.

Total facial height: The linear dimensions of facial height are taken between the two anatomical points, viz. nasion (n) and gnathion (Gn). In anthropological parlance it is one of the most important and vital measures and it is usually taken to find out the face form as well as facial index to visualise the racial discrimination.

In Assam the average total facial height, as observed, is 11.44 cm (caste — 11.33 cm; tribe — 11.54 cm); whereas in Arunachal Pradesh and in Meghalaya it is 11.89 cm and 11.21 cm respectively. From the analysis of data it was found that the people of Arunachal Pradesh possess the highest dimension followed subsequently by the people of Assam and Meghalaya respectively.

On comparison of the data it was found that among the caste people of Assam, the Brahman of Kamrup district (11.68 cm) show the highest dimension, while the Kaibarta reveal the least dimension; but in case of tribal people the highest and the lowest dimensions were found among the Mishing (11.97 cm) and Rabha (11.20 cm) respectively; whereas in Arunachal Pradesh the maximum and minimum dimensions were found among the Pasi (12.38 cm) and Singpho (10.90 cm); in Meghalaya

the highest dimension in respect of total facial height was found among the Pnar, and the least among the War (11.05 cm). On analysing the tribal data of the region it was observed that the Pasi and the Singpho of Arunachal Pradesh encompass the other tribal groups of the region (*Table 3*).

Upper facial height:

In the population of Assam the average upper facial height as observed is 6.73 cm (caste — 6.60 cm; tribe 6.85 cm) but among the people of Arunachal Pradesh and Meghalaya they are 7.48 cm and 6.47 cm respectively. Further, it may be noted that among the tribal people of the region, the people of Meghalaya and Arunachal Pradesh hold the both least and the highest dimensions.

By shuffling and re-shuffling the population data, we find, that in Assam, the Brahman of Sibsagar district (7.02 cm) possess the highest dimension and the Kaibarta the least (6.30 cm); among the tribals of the region the maximum and minimum dimensions were found among the Moran (7.28 cm) and Lalung (6.52 cm) respectively; whereas in Arunachal Pradesh the highest dimension was found among the Pasi (7.89 cm) and the least among the Singpho (6.10 cm); in Meghalaya the maximum and minimum dimensions were found among the Bhoi (6.64 cm) and War (6.34 cm) respectively. On shuffling the tribal data only, we find that both the Pasi and the Singpho of Arunachal Pradesh encompass the other groups which are presented here to find out the population variation.

Nasal height: This is measured from nasion (n) to subnasion (Sn.) The nasal height and breadth were considered by the physical anthropologists as dominant racial criteria to make the distinction between ethnic groups.

From the analysis of the data it could be found that the average nasal height among the people of Assam is 4.98 cm (caste — 4.87 cm; tribe — 5.07 cm); whereas in Arunachal Pradesh and in Meghalaya the average dimensions as observed are 5.25 cm and 4.68 cm respectively. Considering the data populationwise, it was found that among the caste people of Assam the maximum and minimum dimensions were found among the Brahman of Sibsagar district (5.40 cm) as well as among the Kayastha (4.11 cm); whereas, among the tribals of the aforesaid region, the maximum and the least dimensions were found among the Thengal Kachari (5.73 cm) as well as among the Lalung (4.61 cm); in Arunachal Pradesh the highest and the least dimensions were found among the Pasi (5.54 cm) and Singphos (4.60 cm), while in Meghalaya the Bhoi (4.80 cm) people occupy the highest dimension and the Khynrium (4.54 cm) possess the least dimension. From the analysis of the tribal data it was found that the Thengal Kachari of Assam and the Khynrium of Meghalaya occupy the highest and lowest dimensions which encompass the remaining population groups.

Nasal breadth: The average nasal breadth among the people of Assam is 3.69 cm (caste — 3.56 cm; tribe — 3.79 cm) while in Arunachal Pradesh and in Meghalaya, as observed, they are 3.88 cm and 3.85 cm respectively. Further it may be noted that on comparing the data as per caste and tribe, we find that among the caste people of Assam, the Brahman of Kamrup district occupy the highest dimension (3.74 cm) while the Kumar and the Hira possess the least dimension. But in case of tribal people of the aforesaid region the highest and the least dimensions are observed among the Fakial (4.00 cm) and Rajbanshi (3.58 cm); while in Arunachal Pradesh the maximum and minimum dimensions are found among the Pasi (4.02 cm) and Singpho (3.70 cm); whereas in Meghalaya the highest and the least dimensions are found among the Bhoi (3.95 cm) and Pnar (3.72 cm) people of the area. Now, if the tribal data are taken together, we find that the highest dimension of the Pasi of Arunachal Pradesh and the least measure of the Rajbanshi of Assam encompass the total tribals of the aforesaid three regions.

ANALYSIS OF VARIATION – PER STATURE

Sitting height: From the analysis of variation it was marked that the sitting height of an individual is almost half of hislher stature, sometimes its variability changes to an extent of three centimetres at least in this situation. In case of the people of Assam it is 51.73 per cent (caste — 51.34%; tribe — 52.16%) but in case of Meghalaya its proportion was found to be 52.23 per cent only. No data in this respect could be obtained from Arunachal Pradesh. The variation between Caucasoids and Mongoloids of the aforesaid two regions varies negligibly (*Table 4*).

Lower limb: Likewise, if we subtract the sitting height from the stature, then we get the linear dimension of the lower limbs portions. The proportion in respect of sitting height and lower limb ranges either 51: 49; 50: 50 or 52: 48 respectively. This shows that the average proportion between upper and lower body parts is almost 50: 50. The average lower limb proportion in case of Caucasoid population of Assam is little over 48 per cent but in case of the Mongoloid people of Meghalaya it is little over 47 per cent. The maximum difference between sitting height and lower parts of the body is little over two per cents (*Table 4*).

Head length: After analysing the data on head length of an individual, we find that there is a parallel concordance in respect of the stature and head length. From the available data it could be observed that the average linear difference of the Mongoloid population of Assam and Meghalaya is little over 11 per cent; whereas in Arunachal Pradesh, it is slightly more than twelve per cent. In case of the Caucasoid people of Assam it is almost akin to that of the other population groups of the region. (*Table 4*).

Head breadth: In case of the Mongoloid people of Assam, Arunachal Pradesh and Meghalaya the average percentages of head breadth in respect of the stature are little over nine per cent in almost all the cases, but in case of the Caucasoid people of Assam it is little over eight per cent. The average difference between length and breadth of head dimensions is little over two to three per cent (*Table 4*).

Head height: The average head height in respect of the stature of the Mongoloid people of the aforesaid region ranges from 7.81 to 8.54 per cent; while in case of the Caucasoid people of Assam, it is little over eight per cent. So we may hypothetically conclude that the head height of an individual is roughly about eight per cent of the total body height.

Head circumference: Head circumference means the contour of the head. It mainly depends upon both longitudinal and transverse diametre of the head. From the analysis of the data it was found that among the Mongoloid population of Assam, Arunachal Pradesh and Meghalaya, the average difference between the stature and head circumference is little over 34 per cent in all the aforesaid three regions. Apparently, it could be noticed that the head circumference of an individual is about one third of his|her total body height ± 3.00 cm. But, if we compare the data state-wise and population-wise we find that the variability is the least marked among the Caucasoid population of Assam and it gradually increases among the Mongoloids of Assam, Meghalaya and Arunachal Pradesh respectively.

Bizygomatic breadth: Of the available data in respect of the body height, the bizygomatic breadth occupies approximately six to eight per cent of its value; and it is usually twice of its upper facial height. From the percentile deviation it could be observed that there is an apparent insignificant correlation between head height and bizygomatic breadth among the populations of Assam. On the other hand there exists a very negligible difference between head breadth and bizygomatic breadth.

Total facial height: From the analysis of the available data it could be observed that the average total facial height is little over seven per cent of the total body height, particularly in respect of the Mongoloid population of Assam, Meghalaya and Arunachal Pradesh while, in case of the Caucasoid people of Assam, it is on the whole one per cent less then in the Mongoloids of the region. On the other hand the apparent difference between upper facial height and total facial height is about three per cent.

Upper facial height: The upper facial height of the pooled Mongoloid populations of Assam, Arunachal Pradesh and Meghalaya lies within the range of four per cent to that of the stature; and it holds true as regards the Caucasoid populations of Assam (*Table 4*).

Nasal height: The nasal height of an individual, particularly in case of the Mongoloid people of Assam, Arunachal Pradesh and Meghalaya, comes within the range of two to three per cent as compared to that of the stature; this also apparently holds trueas regards the Caucasoid people of Assam. Any deviation in this regard is usually due to the increase of total facial height.

Nasal breadth: The percentile value, in respect of nasal breadth as compared to that of the stature lies within the range of two to three per cent among the people of Assam, Arunachal Pradesh and Meghalaya (*Table 4*). Apparently, the nasal breadth of an individual is almost half of his|her upper facial height. Sometimes this may fail, when the other stimulating factors play a major role in bringing changes as regards the shape and size of the nose for adapting themselves in harsh situations.

CONCLUSION

The morpho-metric features of an ethnic group usually differ from the other population groups in a number of ways. These metric differences help us to distinguish one group from another. From the anthropometric point of view, we can conclude that the physical features of several individuals, when considered together, form a group of specific physical features, and we call it a distinguishing feature of the community. The present study reveals that, though the intergroup differentiation is very much pronounced, the trends in the nature of variation between and within the population are almost panoramic and the concordance in respect of intersegmental differentiation and allignment as regards the stature and other body parts are hypothetically a universal phenomenon.

In this study we have tried to visualise on the basis of limited data the concordance and discordance between the population groups of Assam, Arunachal Pradesh and Meghalaya. The data have also been analysed to find out the relationship between the stature of an individual with his|her other body dimensions. From the analysis of data it has also been observed that in almost all the cases there is a direct correlation between the stature and other body segments. In this study it has also been noticed that the stature of an individual could be measured indirectly, if the percentages and the range of actual body measurement of the population or the racial group was known. To tarify the aforesaid hypothesis we have analysed a number of traits both directly and indirectly to test the hypothesis.

From the analysis of the data it was marked that there is a direct correlation between the stature and other body parts for the maintenance of normal body proportions. Likewise, we find that there is a correlation between the segments too. So, further research of this nature is very much warranted either population-wise, caste-wise or race-wise at least in the Indian context; and it is apprehended that this type of study will help us to solve certain crucial points as regards medico-legal problems.

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