Man In India, 94 (1-2) : 337-350

SCIENTIFIC AND PHYSICAL ANTHROPOLOGICAL STUDY OF KALINGAS-A COMMUNITY POPULATION OF EASTERN ANDHRA PRADESH STATE IN INDIA

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This paper attempts to present the Anthropological traits in Kalinga, an endogamous caste population from the North Coastal Andhra Pradesh. So far, several anthropogenetic studies have been carried out on several tribal and non-tribal communities however, the present study population "Kalinga" has not been touched so far hence, the observations made in this paper will add to the existing information on caste population of Andhra Pradesh. The main objectives include anthropometric profile in the Kalinga caste on the basis of different linear, breadth and circumference measurements, body weight and some somatometric indices. The observations (Anthropological traits) were compared with data available on other caste population of the state.

Keywords: Anthropometric traits, Body Measurements, Anthropometric indices, Kalingas.

Objective

To give an anthropometric profile of the Kalinga caste on the basis of different linear, breadth and circumference measurements, body weight and some somatometric indices.

Introduction

The present Chapter presents an anthropometric profile of the Kalinga Caste Population of Andhra Pradesh. It includes the distribution of 15 body measurements and 12 anthropometric indices among the Kalingas and the results are compared with those observed in other caste populations from Andhra Pradesh.

Material and Methods

A sample of 214 male and 225 female adult individuals belonging to Kalinga caste from Srikakulam district of Andhra Pradesh forms the basis for this anthropometric study. Procedures of taking measurements, instrument to be used, classification of somatometric observations – were followed after Singh and Bhasin (1987). Altogether, fifteen somatometric characters and twelve body indices were covered in the present study.

The following linear, breadth and circumference measurements are taken after locating the appropriate landmarks. The measurements were taken using appropriate instruments recommended.

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Statistical Methods

The statistical formulae for computing mean, standard deviation, standard errors, t – value etc. were presented and elaborated in the preceding Chapter.

Results and Discussion

Anthropometric Measurements

The details of anthropometric measurements along with the minimum, maximum and mean values for each measurement are presented in Table –1. The Kalinga men and women are classified into various categories based on each measurement as shown by Singh and Bhasin (1968) and the discussion is presented accordingly.

TABLE 1: DETAILS OF ANTHROPOMETRIC MEASUREMENTS AMONG KALINGAS

Measurements (Cm)	*Males*			*Females*		
	Minimum	*Maximum*	*Mean+S.E.*	*Minimum*	*Maximum*	*Mean+S.E.*
1. Height Vertex	115.6	171.2	159.7±0.54	115.6	168.0	151.1±0.42
2. Sitting Height Vertex	70.9	92.9	82.1±0.28	57.9	88.9	77.6±0.26
3. Biacromial Breadth	24.2	42.1	36.2±0.16	28.0	38.9	33.0±0.14
4. Breadth of Bizygomatic Arch	11.6	16.9	13.7±0.06	10.9	15.9	13.3±0.06
5. Bigonial Breadth	8.4	13.1	10.4±0.07	7.2	14.8	9.8±0.06
6. Physiognomic Facial Height	15	21.2	17.7±0.08	9.7	20.5	16.7±0.08
7. Physiognomic Upper Facial Height	7.5	17	10.9±0.07	8.2	16.8	10.3±0.07
8. Maximum Head length	13	19.2	17.9±0.06	12.4	19.1	17.3±0.07
9. Maximum Head breadth	10.3	18.4	14.1±0.07	10.4	18.9	13.6±0.06
10. Nasal height	3.1	6.8	4.8±0.05	2.7	6.5	4.7±0.05
11. Nasal breadth	2.4	5	3.4±0.03	2.2	4.5	3.5±0.03
12. Chest circumference	56.3	96.6	81.6±0.33	68.6	85.5	76.4±0.26
13. Mid upper arm circumference	18.3	26.1	22.5±0.06	18.2	23.8	21.5±0.07
14. Calf circumference	21.4	35.1	28.8±0.16	19.7	32.8	28.3±0.14
15. Body weight (kg)	33	80	51.8±0.60	30.0	79	47.2±0.07

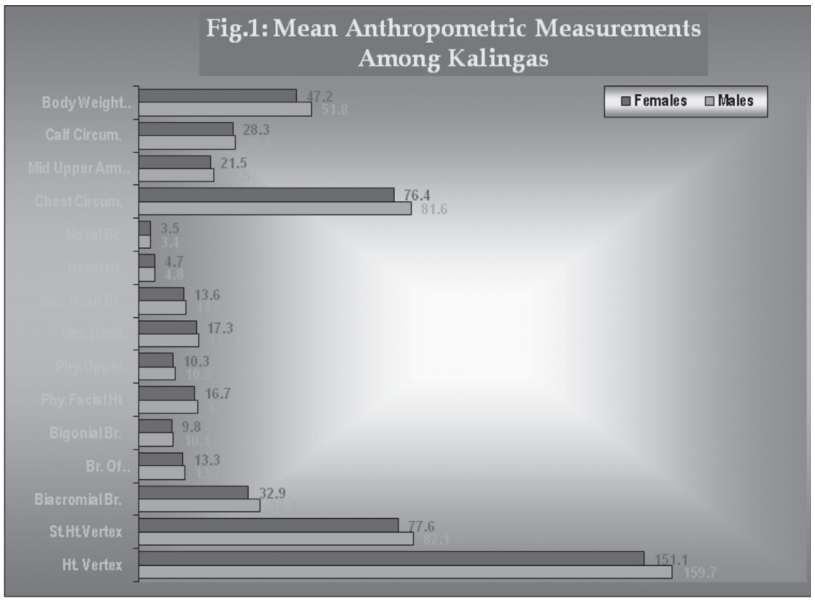
In view of the differences in mean values of different measurements between the two sexes, the ‘t’ – test is applied to find out whether the males and females differ significantly or not with regard to the measurements considered in the study. The ‘t’ values for all the fifteen measurements are presented in Table – 2 (Fig. 1).

TABLE 2: 'T' VALUES FOR BISEXUAL DIFFERENCES IN ANTHROPOMETRIC CHARACTERS AMONG KALINGAS

Measurements (Cm)	*Males Mean + S.E*	*Females Mean + S.E.*	*Difference in Mean + S.E.*	*'t' value*
1. Height Vertex	159.7 ± 0.54	151.1 ± 0.42	8.6 ± 0.68	12.652*
2. Sitting Height Vertex	82.1 ± 0.28	77.6 ± 0.26	4.5 ± 0.38	12.110*
3. Biacromial Breadth	36.2 ± 0.16	32.9 ± 0.14	3.3 ± 0.21	15.236*
4. Breadth of Bizygomatic Arch	13.7 ± 0.06	13.3 ± 0.06	0.4 ± 0.09	4.608*
5. Bigonial Breadth	10.4 ± 0.07	9.8 ± 0.06	0.6 ± 0.09	6.322*
6. Physiognomic Facial Height	17.7 ± 0.08	16.7 ± 0.07	1.0 ± 0.11	8.538*
7. Physiognomic Upper Facial Height	10.9 ± 0.07	10.3 ± 0.07	0.6 ± 0.10	5.568*
8. Maximum Head Length	17.9 ± 0.06	17.3 ± 0.07	0.6 ± 0.09	7.540*
9. Maximum Head Breadth	14.2 ± 0.08	13.6 ± 0.06	0.6 ± 0.10	6.020*
10. Nasal Height	4.8 ± 0.05	4.7 ± 0.05	0.1 ± 0.07	2.827*
11. Nasal Breadth	3.4 ± 0.03	3.5 ± 0.03	0.1 ± 0.04	1.414
12. Chest Circumference	81.6 ± 0.33	76.4 ± 0.26	5.2 ± 0.42	12.565*
13. Mid Upper Arm Circumference	22.5 ± 0.06	21.5 ± 0.07	1.0 ± 0.10	11.014*
14. Calf circumference	28.8 ± 0.16	28.3 ± 0.14	0.5 ± 0.21	2.490*
15. Body Weight (kg)	51.8 ± 0.60	47.2 ± 0.54	4.6 ± 0.81	5.672*

* Value significant at 5% level.

It can be noticed from the table that the mean values are, in general, lower in the case of females compared to males. With the exception of nasal breadth, the sex differences are found to be highly significant for all the measurements.



Anthropometric Indices

The mean values with their standard errors for different anthropometric indices computed for males as well as females of Kalinga caste group are presented in Table 3. The distribution of individual values for the 12 indices are discussed here.

TABLE 3: DETAILS OF ANTHROPOMETRIC INDICES AMONG KALINGAS

Index	*Males*			*Females*		
	Minimum	*Maximum*	*Mean+S.E.*	*Minimum*	*Maximum*	*Mean+S.E.*
1. Relative Sitting Height Index	42.8	69.2	51.5±0.21	38.5	63.3	51.4±0.17
2. Relative Biacromial Breadth Index	14.5	31.9	22.7±0.11	18.2	29.8	21.8±0.10
3. Relative Chest Girth Index	36.4	77.2	51.2±0.27	43.4	68	50.6±0.22
4. Cephalic Index	54.9	131.2	79.3±0.60	61.3	115.6	78.9±0.47
5. Physiognomic Facial Index	107.6	158.8	129.1±0.59	77.6	148.6	125.9±0.57
6. Upper Facial Index	42.1	101.2	61.6±0.30	53.1	105.2	61.9±0.34
7. Jugo – Mandibular Index	58.3	96.1	76.0±0.40	59.5	118.4	74.0±0.42
8. Chervin's Cephalo – Facial Index	79.1	150.9	97.1±0.58	66.7	129.2	98.4±0.53
9. Nasal Index	37.5	106.5	71.6±0.83	39.7	121.9	76.2±0.96
10. Pignet – Vervaek Index	65.4	133.2	83.7±0.56	67.5	111.2	81.9±0.45
11. Robusticity Index	8.9	16.7	13.0±0.80	8.7	15.6	12.2±0.74
12. Ponderal Index	20	34.6	23.3±0.12	20.5	31.8	23.9±0.11

t – test is applied in order to understand the significance of the differences in mean index values observed in the two sexes. The results are shown in Table 4. Significant differences between the two sexes are observed in the case of relative biacromial breadth index, physicognomic facial index, Jugo – mandibular index,

TABLE 4: SEX DIFFERENCES IN ANTHROPOMETRIC INDICES AMONG KALINGAS

Index	*Mean Values*		*Difference in means*	*'t' value*
	Males	*Females*		
1. Relative Sitting Height Index	51.52	51.37	0.15	0.535
2. Relative Biacromial Breadth Index	22.71	21.85	0.86	5.745*
3. Relative Chest Girth Index	51.23	50.64	0.59	1.73
4. Cephalic Index	79.28	78.93	0.35	0.458
5. Physiognomic Facial Index	129.1	125.88	3.22	3.911*
6. Upper Facial Index	61.56	61.85	-0.29	0.644
7. Jugo – Mandibular Index	75.98	73.95	2.03	3.498*
8. Cherviu's Cephalo Facial Index	97.13	98.4	-1.27	1.622
9. Nasal Index	71.58	76.25	-4.67	3.667*
10. Pignet – Vervaek Index	83.68	81.87	1.81	2.531*
11. Robusticity Index	12.98	12.19	0.79	7.306*
12. Ponderal Index	23.31	23.88	-0.57	3.549*

* Value significant at 5% level.

nasal index, pignet – vervaek index, robusticity index and ponderal index. The mean index values are in general, high among males than among females with the exception of ponderal index, nasal index, chervin's cephalic facial index and the upper facial index and some of the differences even attained statistical significance as shown in the table (Fig. 2).

t – test is applied in order to understand the significance of the differences in mean index values observed in the two sexes. The results are shown in Table 5. Significant differences between the two sexes are observed in the case of relative biacromial breadth index, physicognomic facial index, Jugo – mandibular index, nasal index, pignet – vervaek index, robusticity index and ponderal index. The mean index values are in general, high among males than among females with the exception of ponderal index, nasal index, chervin's cephalic facial index and the upper facial index and some of the differences even attained statistical significance as shown in the table 5 (Fig. 2).

TABLE 5: SEX DIFFERENCES IN ANTHROPOMETRIC INDICES AMONG KALINGAS

Index	*Mean Values*		*Difference*	*'t' value*
	Males	*Females*	*in means*	
1. Relative Sitting Height Index	51.52	51.37	0.15	0.535
2. Relative Biacromial Breadth Index	22.71	21.85	0.86	5.745*
3. Relative Chest Girth Index	51.23	50.64	0.59	1.73
4. Cephalic Index	79.28	78.93	0.35	0.458
5. Physiognomic Facial Index	129.1	125.88	3.22	3.911*
6. Upper Facial Index	61.56	61.85	-0.29	0.644
7. Jugo – Mandibular Index	75.98	73.95	2.03	3.498*
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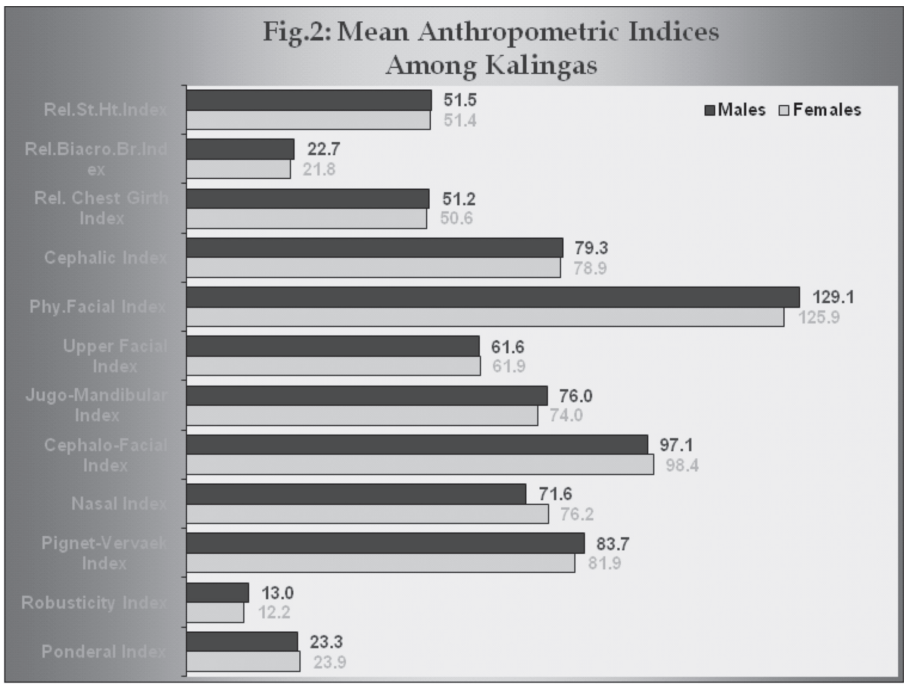
11. Robusticity Index	12.98	12.19	0.79	7.306*
12. Ponderal Index	23.31	23.88	-0.57	3.549*

* Value significant at 5% level.

COMPARISON OF ANTHROPOMETRIC TRAITS WITH OTHER CASTE POPULATIONS OF ANDHRA PRADESH

An attempt is made here to compare the mean values of some anthropometric measurements observed among males and females of Kalinga caste with available data on other caste populations of Andhra Pradesh. This data is mainly available in the form of unpublished reports in the departments of Anthropology and Human Genetics in Andhra University and the same has been used for the present comparison (Table 6).



The mean body weight among males ranged from 45.9 kgs among Padmasalis to 53.3 kgs among Vadabalijas-I while the mean body weight among females is found to be low (40.6 kgs) in Padmasalis and high (49.1 kgs) among Kammas.

With regard to stature or height, the mean value among men is found to be low (143.5 cm) among Vadabalijas-I and is high (170.3 cm) among Kammas. The mean height of the females ranged from 147.9 cm in Padmasalis to 159.9 cm in Kammas. Mean value for sitting height ranged from 80.3 cm (Padmasalis) to 83.4 cm (Kammas) among males and from 67.8 cm (Padmasalis) to 84.0 cm (Kammas).

Not much variation is noticed with regard to Head length among males of different castes. The mean value among males ranged from 18.0 cm (Kalingas) to 19.4 cm (Padmasalis) while it ranged from 16.9 cm (Rajakas) to 18.1 cm (Kapus). In the same way, the average value for head breadth among males ranged from 13.6 cm (Rajakas and Vadabalija-II) to 14.5 cm (Velmas) and among females, it ranged from 12.9 cm (Brahmins) to 14.0 cm (Kapus).

Regarding the average values for nasal height and nasal breadth also, the variation is not much. The mean value for nasal height among males ranged from 4.4 cm (Vadabalija-I) to 5.1 cm (Vadabalija-II) while in the case of females, the mean nasal height value ranged from 4.1 cm (Rajakas) to 5.3 cm (Vadabalijas). The mean value for nasal breadth among males ranged from 3.2 cm (Velamas) to

TABLE 6: MEAN VALUES OF SOME ANTHROPOMETRIC MEASUREMENTS IN ANDHRA CASTE POPULATIONS

Population	*Body Weight (kg)*	*Heigh(cm)*	*Sitting Height (cm)*	*Head Length (cm)*	*Head Breadth (cm)*	*Nasal Height (cm)*	*Nasal Breadth (cm)*	*Breadth of Bizygomatric Arch (cm)*	*Source*
					Males				
Kalingas	51.8	159.7	82.1	18	14.1	4.8	3.4	13.7	Present study
Jalaris	51.2	161.4	-	18.9	14.2	4.7	3.9	13.3	A.U. Reports, 1969
Kammas	53.0	170.3	83.4	18.9	13.8	4.8	3.6	11.8	A.U. Reports, 1973
Kapus	51.9	165.6	81.5	18.8	14.0	5.0	3.8	12.1	A.U. Reports, 1970
Padmasalis	45.9	159.3	80.3	19.4	14.3	4.6	3.3	11.9	A.U. Reports, 1980
Rajakas	50.5	162	82	18.1	13.6	4.7	3.8	11.5	Parvatheesam, 1995
Vadabalija-I	53.3	143.5	-	18.8	14.0	4.4	3.4	13.0	A.U. Reports, 1969
Vadabalija-II	51.4	160.5	81.1	18.6	13.6	5.1	3.5	12.8	A.U. Reports, 1977
Velamas	49.5	161.6	79.4	18.5	14.5	4.7	3.2	12.3	A.U. Reports, 1980
					Females				
Kalingas	47.2	151.1	77.6	17.3	13.6	4.7	3.5	13.3	Present study
Brahmins	46.4	157.2	83.4	17.7	12.9	4.8	3.3	10.5	A.U. Reports, 1973
Kammas	49.1	159.9	84	18	13.1	5.1	3.3	11.1	A.U. Reports, 1973
Kapus	41.4	153.8	76.5	18.1	14	5	3.3	11.9	A.U. Reports, 1970
Padmasalis	40.6	147.9	67.8	17.4	13.9	4.6	3.4	11	A.U. Reports, 1980
Rajakas	44.5	149.1	73.4	16.9	13	4.1	3.6	9.8	Parvatheesam, 1995
Vadabalijas	41.9	150	76.1	18	13.1	5.3	3.4	12.5	A.U. Reports, 1977

3.9 cm (Jalaris) and among females it ranged from 3.3 cm (Brahmins, Kammas and Kapus) to 3.6 cm (Rajakas).

The average measurement value for the breadth of Bizygomatic Arch among males ranged from 11.5 cm (Rajakas) to 13.7 cm (Kalingas) and among females the values ranged from 9.8 cm (Rajakas) to 13.3 cm (Kalingas).

It can be noticed that the measurement values observed among the Kalingas of the present study are closer to those recorded among other caste populations of Andhra Pradesh or falling well within the range observed among the other caste groups.

An attempt is also made here to compare the mean values of three body indices of Kalingas with those reported among other Andhra Caste populations (Table 7).

TABLE 7: MEAN VALUES OF SOME BODY INDICES IN ANDHRA CASTE POPULATIONS

Population	*Cephalic Index*	*Nasal Index*	*Cephalo Facial Index*	*Source*
			Males	
Kalingas	79.28	71.58	97.13	Present study
Jalaris	74.92	81.65	93.31	A.U. Reports, 1969
Kammas	75.77	75.62	86.10	A.U. Reports, 1973
Kapus	75.45	80.54	90.50	A.U. Reports, 1970
Rajakas	75.04	84.20	82.50	Parvatheesam, 1995
Vadabalijas-I	74.40	85.76	93.16	A.U. Reports, 1969
Vadabalijas-II	74.40	70.34	87.07	A.U. Reports, 1977
			Females	
Kalingas	78.93	76.25	98.40	Present study
Brahmins	73.08	69.62	81.45	A.U. Reports, 1973
Kammas	73.60	64.00	85.00	A.U. Reports, 1973
Kapus	72.69	51.20	72.12	A.U. Reports, 1970
Rajakas	76.95	70.27	78.43	Parvatheesam, 1995
Vadabalijas	72.73	66.13	95.14	A.U. Reports, 1977

It can be noticed that the mean value for cephalic index among males shows not much variations and the values ranged from 74.40 (Vadabalijas) to 79.28 (Kalingas) while in females it ranged from 72.69 (Kapus) to 78.93 (Kalingas). The nasal index values ranged from 70.34 (Vadabalijas-II) to 85.76 (Vadabalijas-I) among men and from 51.20 (Kapus) to 76.25 (Kalingas) among women. Mean values for cephalo facial index ranged from 82.50 (Rajakas) to 97.13 (Kalingas) among men and from 72.12 (Kapus) to 98.40 (Kalingas) among women. These values are also found to be well within the range found among caste populations of Andhra Pradesh.

Summary and Conclusions

Anthropometry

Since persons living under different conditions and members of different ethnic groups and their offspring of unions between them frequently presenting differences in bodily form and proportions, it is desirable to have some means of giving quantitative expression to the variations which are exhibited by such traits through anthropometry.

In the present study, the material for the anthropometric study comprises of 214 male and 225 female adult individuals belonging to Kalinga caste group. In all, 6 selected linear measurements, 5 breadth measurements, 3 circumferential measurements and body weight have been considered and 12 somatometric indices were calculated using the 15 measurements taken.

It is observed that Kalinga men and women are mainly 'short' statured as 33 percent of males and 32 percent of females fell in this category. The mean stature of males is 159.7 cm while that of females is 151.1 cm. Body height among men ranged from 115.6 cm to 171.2 cm while it ranged from 115.6 cm to 168.0 cm among females. The average sitting height values are 82.1 cm among males and 77.6 cm among females. Sitting height values ranged from 70.9 cm to 92.9 cm among males and from 57.9 cm to 88.9 cm among females.

The mean value for Biacromial Breadth among males is 36.2 cm with values ranging from 24.2 cm to 42.1 cm. While the mean value among females is 33.0 cm with the values ranging from 28.0 cm to 38.9 cm. It can be noticed that about 44 percent of the males are in the 'narrow' category and 27 percent are in 'medium' category with regard to the breadth of bizygomatic arch. The mean value for this measurement among males is 13.7 cm with values ranging between 11.6 cm and 16.9 cm. While it is 13.3 cm among the females with values ranging from 10.9 cm to 15.9 cm. While most of the females (56 percent) are in 'below medium' category with respect to Bigonial Breadth. The mean measurement values for males and females are 10.4 cm and 9.8 cm respectively. The individual values for this measurement ranged from 8.4 cm to 13.1 cm among males and 7.2 cm to 14.8 cm among females.

The average values for Physiognomic Facial Height are found to be 17.7 cm for males and 16.7 cm for females, the individual values ranging from 15.0 cm to 21.2 cm among males and 9.7 cm to 29.5 cm among females. The mean Physiognomic Upper Facial Height is 10.9 cm in males, values ranging from 7.5 cm to 17.0 cm while the mean value in females is 10.3 cm with values ranging from 8.2 cm to 16.8 cm.

With regard to head length, most of the males (43 percent) and females (40 percent) are found to be in 'medium' category. The mean values for this measurement are found to be 17.9 cm among the males and 17.3 cm among the

females. The range of the individual values is 13.0 cm to 19.2 cm among males and 12.4 cm to 19.1 cm among females. Regarding Head Breadth among the men, about 49 percent are found to be in 'very narrow' category and among females, about 48 percent are seen in 'very narrow' category. The mean value for head breadth among the males is found to be 14.1 with individual values ranging from 10.3 cm to 18.4 cm while among the females, the mean value is 13.6 cm with values ranging from 10.4 cm to 18.9 cm.

It is observed that a majority of males (48 percent) and females (34 percent) are in 'below medium' category with regard to nasal height. The mean nasal height is observed to be 4.8 cm among males and 4.7 cm among females. The individual values ranged from 3.1 cm to 6.8 cm in males and in females, the range is between 2.7 cm and 6.5 cm. Most of the males (49 percent) and half of the females (50 percent) are in 'above medium' category with regard to nasal breadth. The average nasal breadth among males and females is 3.4 cm and 3.5 cm respectively with the individual values ranging from 2.4 to 5.0 cm among males and 2.2 to 4.5 cm among females.

The average value for chest circumference among males is 81.6 cm with a range of 56.3 cm to 96.6 cm and the average value among females is 76.4 cm with values ranging from 68.6 cm to 85.5 cm. Regarding the Mid Upper Arm Circumference, the average value among males is 22.5 cm with values ranging from 18.3 cm to 26.1 cm while among females, the average value is 21.5 cm and the range of values is between 18.2 cm and 23.8 cm. The average value for calf circumference in males is 28.8 cm and it is 28.3 among the females. The individual values ranged from 21.4 cm to 35.1 cm among males as from 19.7 cm to 32.8 cm among females.

The average body weight among males and females is observed to be 51.8 kg for men and 47.2 kg for women. The individual values for this measurement ranged from 33.0 kg to 80.0 kg among the males and from 30.0 kg to 79.0 among the females.

It is noticed that the mean values are, in general, lower in the case of females compared to males. With the exception of nasal breadth, the sex differences are found to be highly significant for all the measurements.

As mentioned earlier, 12 somatometric indices were computed to describe the body form of the Kalingas of the present study. The Relative Sitting Height Index values reveal that 40 percent of the males and 70 percent of the females are under 'Makroskel' category. The average index value among males is 51.5 and it is 51.4 among females indicating no difference between the two sexes. The individual values ranged from 42.8 to 69.2 among males and from 38.5 to 63.3 among females. Regarding the Relative Biacromial Breadth Index, the mean value is 22.7 among males and 21.8 among females indicating very small difference between the two sexes. The range of individual index value is 14.5 to 31.9 in men and 18.2 to 29.8 in women. The values of Relative Chest Girth Index indicates that about half of the

males (50 percent) and more than half of the females (56 percent) come under the category of 'narrow chest'. The mean index value is 51.2 in males with values ranging from 36.4 to 77.2 and the mean value in females is 50.6 with values ranging from 43.4 to 68.0. The average index value is slightly higher in males than in females.

With regard to the Cephalic Index, the distribution of values show that most of the men (41 percent) and women (39 percent) are in 'mesocephalic' category. The mean index value among males (79.3) does not differ much from the mean value among females (78.9). The range of individual values is 54.9 to 131.2 in males and it is 61.3 to 115.6 in females.

Regarding the Physiognomic Facial Index, the mean index value among men (129.1) is higher than the mean index value of the women (125.9). Range of individual values is between 107.6 and 158.8 in case of males and between 77.6 and 148.6 in case of females. In the same way, the mean index value for Upper Facial Index is found to be slightly more among females (61.9) than among the males (61.6). The range of individual values is between 42.1 and 101.2 in the case of males and between 53.1 and 105.2 in the case of females.

The distribution of Jugo–Mandibular Index values indicate that most of the males (43 percent) and females (39 percent) are found in 'medium' category while 23 percent of males and 34 percent of females fall in 'narrow' category. The average index value is higher in case of males (76.0) compared to that of females (74.0). Range of individual values is between 58.3 and 96.1 in males and between 59.5 and 118.4 in females. The average value for Chervin's Cephalo – Facial Index is higher among the females (98.4) than among the males (97.1). The values ranged from 79.1 to 150.9 in men and from 66.7 to 129.2 in women.

With regard to the Nasal Index, most of the males (52 percent) and females (44 percent) belong to 'Mesorhinae' category while 27 percent of the males and 23 percent of the females are in 'Leptorhinae' category. The mean nasal index value is higher among women (76.2) than among the men (71.6). The range of individual values is between 37.5 and 106.5 in men and between 39.7 and 121.9 in women. Distribution of the Pignet – Vervaek index values shows that about 52 percent of the males and 56 percent of the females are in the 'broad' category while 37 percent of the males and 36 percent of the females come under 'Medium category. The mean index value is higher in males (83.7) than in females (81.9). Individual values ranged from 65.4 to 133.2 among men and from 67.5 to 111.2 among females**.**

Distribution of the robusticity index values show that 95 percent of the males and 96 percent of the females are under 'strong' category. The mean index value is higher in males (13.0) than in females (12.2). The range of values is from 8.9 to 16.7 among males and 8.7 to 15.6 among the females. In the same way, as expected, the mean Ponderal Index value is slightly higher among females (23.9) than among the males (23.3). Individual values ranged from 20.0 to 34.6 among males and

from 20.5 to 31.8 among females.

The mean index values are in general, high among males than among females with the exception of ponderal index, nasal index, chervin's cephalic facial index and the upper facial index and some of the differences even attained statistical significance. It is noticed that the measurement and index values observed among the Kalingas of the present study are closer to those recorded among other caste populations of Andhra Pradesh or falling well within the range observed among the other caste groups.

Cluster Analysis

An attempt is made here to see the pattern of relationships based on grouping of populations into clusters such that populations belonging to a cluster are very closer to one another than those belonging to different clusters. In the present study, such clusters were obtained using single linkage method, basing on the computed Euclidean distances for the traits used for the analysis.

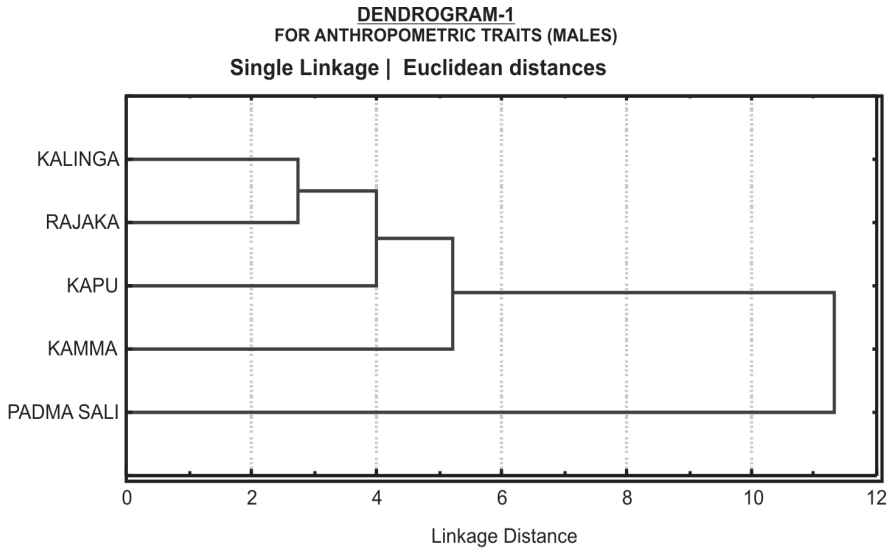
A dendrogram is obtained by different clustering methods. The Euclidean distance matrix obtained from cluster analysis is shown in the form of a dendrogram. It is more or less a tree-like figure lying on its side to facilitate listing of the populations tested against the final branches. Two branches will join at a level given by the Euclidean distance between the two clusters.

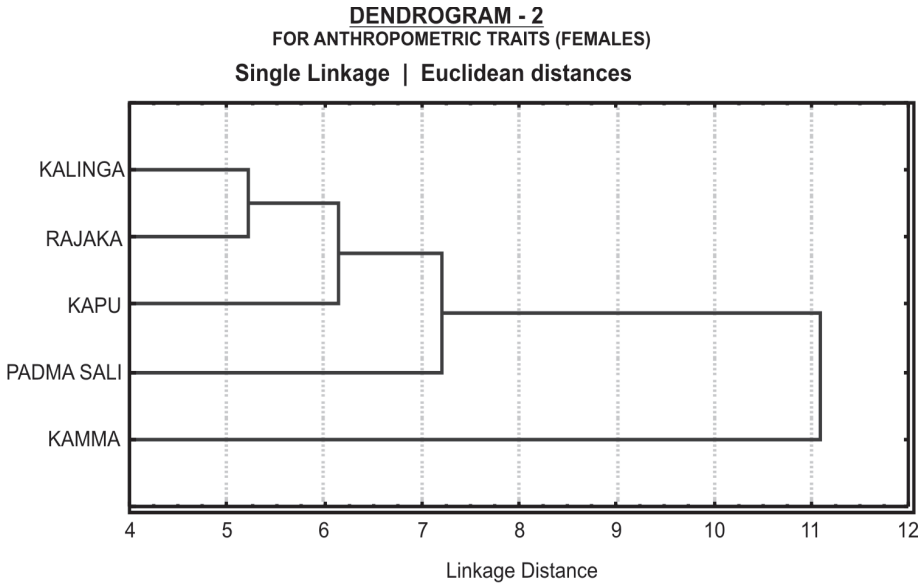
Here, five different population groups viz. Kalinga, Rajaka, Kamma, Padma Sali and Kapu are taken for computing the distance between them with regard to some seven anthropometric traits such as body weight, height, sitting height, head length, head breadth, nasal height and nasal breadth. Since these measurements vary between the two sexes, the analysis is done for males and females separately. The Euclidean distance matrices for male and females are shown in Table -8 (Dendrograms 1 & 2)

TABLE 8: EUCLIDEAN DISTANCE MATRIX FOR ANTHROPOMETRIC TRAITS

	Kalinga	*Rajaka*	*(Males) Kamma*	*Padma Sali*	*Kapu*
Kalinga					
Rajaka	2.724				
Kamma	10.790	8.822			
Padma Sali	11.334	12.782	21.463		
Kapu	31.177	30.756	32.265	33.172	
	Kalinga	*Rajaka*	*(Females) Kamma*	*Padma Sali*	*Kapu*
Kalinga					
Rajaka	5.221				
Kamma	11.088	15.357			
Padma Sali	12.246	7.206	21.908		
Kapu	6.563	6.146	12.393	10.574	

It can be observed from the distance matrices that the distance value is high between Kapu and Padma Sali and is lowest between Kalinga and Rajaka among males while among females the distance value is high between Kamma and Padma Sali and lowest between Kalinga and Rajaka. However, the present study Kalingas, both males and females are closer to Rajakas and Kapus.





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