

Correlation Matrix and Linear Regression of Anthropometric Characters Among The Sugalis - A Tribal Population of Cuddapah District, Andhra Pradesh

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INTRODUCTION

Growth and nutritional studies are valuable as they provide good information on the health and nutritional status of a community. Nutritional anthropometry is considered with measurements of variations of physical dimensions and gross composition of human body at different age levels and degree of nutrition. Since the physical dimensions of the body are much influenced by nutrition, particularly in the rapidly growing period of early childhood and in different phases of life, selected body measurements give valuable information concerning certain types of malnutrition in which body size and gross body measurements are affected (Jelliffe, 1966). In order to know the average relationship of 14 anthropometric measurements, which were taken on the Sugali individuals of both sexes simple correlation co-efficient between pairs of variables and against age a straight line is fitted for the data.

SUBJECTS AND METHODS

A study has been conducted on the Sugali, a tribal population of pastoral nomads inhabiting the Palakonda Hill ranges of Cuddapah district, Andhra Pradesh in order to know the growth pattern and nutritional status based on cross-sectional data. The sample has been drawn from 10 Sugali Thandas (settlements) located in four mandals (revenue divisions) of Cuddapah district. The size of the sample consists of 1565 children (854 boys and 711 girls) aged 1 to 20 years. Field work was conducted from December 1991 to November 1992.

The Sugali is the largest tribal population of Andhra Pradesh. They are also known as Lambadi, Lambani, Banjari, Brinjari in various parts of India. The Sugalis are supposed to be the descendents of the original Aryan Gypsies

or Roma Banjaras of North-West India, whose descendents are also found in various parts of the Central and Southern Europe and in central Asia. They live in exclusive settlements of their own called 'Thandas' named after the headman (*Nayak*) of the group. The traditional dress pattern of the Sugali is colourful and attractive and is a distinctive identity marker of the community. The Sugali language closely resembles the Marvari language of Rajasthan both in accent and in script. Owing to their cultural contact with the surrounding Telugu people the Sugalis became bi-linguistic and can speak Telugu fluently. They present a complete picture of transition of a group of people from pastoral nomads to settled peasantry. The economic life of the people varies from agriculture, lime-selling, fire wood selling and agriculture labour.

The anthropometric measurements like Height (Ht), Weight (Wt) Sitting Height (SH), Total Arm length (Al), Biacromial Diameter (BAD), Biiliocrystal Diameter (BID), Chest Circumference (CC), Upper Arm Circumference (AC), Medical Calf Circumference (CAC), Head Circumference (HC), Skinfold at Triceps (SFT), Skinfold at Subscapular (SFSS), Skinfold at Supra-iliac (SFS) and Skinfold at Medial Calf (SFC) were taken for the study. The measurements are age dependent and are sensitive to environmental factors like socio-economic conditions, nutrition and other ecological factors. The definitions of land marks, instruments and methods were used as suggested by Sing and Bhasin (1989) and Weiner and Lourie (1969). Anthropometric data were statistically analysed on IBM compatible PC-AT 386 computer at the university computer centre, S.V. University, Tirupati, Andhra Pradesh, using the SPSS package.

Simple correlations (r) between measurements were calculated and tested for significant difference from zero, where

$$r = \frac{\sum_{i=1}^n x_i y_i - n \bar{x} \bar{y}}{\sqrt{\left\{ \sum_{i=1}^n x_i^2 - n \bar{x}^2 \right\} \left\{ \sum_{i=1}^n y_i^2 - n \bar{y}^2 \right\}}}$$

$$-1 \leq r \leq +1$$

The significant difference of these correlation co-efficients from zero is examined by t-test,

$$\text{where } t = \frac{r \sqrt{n-2}}{\sqrt{1-r^2}}$$

't' follows students 't' distribution with n-2 degrees of freedom. However, since the sample is large in each case 't' distribution can be approximated by standard normal distribution (central limit theorem of probability). If null hypothesis of no significant difference is rejected, a positive 'r' value implies a co-movement of the variables in the same direction. On the otherhand, a negative 'r' implies a co-movement of the variables in the opposite direction.

In order to study the average relationship of 14 anthropometric measurements of both sexes against age a straight line is fitted for the data. The regression equation between two variables describes how one variable, say 'Y', varies in relation to change in 't'.

Straight line model : $Y_t = a + bt + u_t$

Where, Y_t = measurement

t = age

u_t = Statistical disturbance term

'a' and 'b' are constants to be estimated by the method of least squares

The fitted model is,

$$Y_t = a + bt$$

$$1 \leq t \leq 20$$

RESULTS AND DISCUSSION

Means, Standard Deviations of all anthropometric measurements along with sample size of each age group for boys and girls were presented in tables 1 and 2.

It is observed from the tables that the growth patterns of different anthropometric measurements exhibit uniform increase with age for both sexes except skinfold measurements. The boys are taller and heavier than the girls at all ages except at the ages of 11+, 12+ and 13+ years. The girls gained 90 per cent of their total height (138.10 cms) and weight (39.65 kgs) at the age

of 12+ years, that is two years before boys did for height (147.48 cms) and one year before for weight (42.80 kgs). The mean values of sitting height for boys are higher than the girls at all ages except at the ages of 10+, 11+ and 12+ years. Boys are having longer upper extremities than the girls at almost all age groups. However, the girls are presenting higher mean values for this measurement at the ages of 1+, 2+, 10+, 11+, 12+, 13+ and 14+ years. The mean values for arm circumference are higher in boys than those of girls at all ages except 3+, 4+, 7+, 10+, 11+ and 13+ years. The girls show higher mean values for biacromial diameter at the ages of 2+, 5+, 10+, 11+, 12+, and 13+ years than those of boys. The girls also exhibiting higher mean values for biiliocrystal diameter at the ages of 5+, 8+, 11+, 12+, 13+, 14+, 15+ and 16+ years than those of boys. 90 per cent of total gain for biiliocrystal diameter is observed at the age of 14+ years in the case of girls, where as in boys it is observed at the age of 17+ years, that is three years later than the girls did. Boys have wider chests than the girls at all ages, except at the ages of 2+, 10+, 11+, 12+, 13+, 19+ and 20+ years. Boys are presenting higher mean values for medial calf circumference than the girls at all age groups except at the ages of 2+, 8+ and 16+ years. The mean values for head circumference in boys are higher than those of girls at all ages.

A gradual increase in skinfold measurements is observed with the age for girls, where as slight decrease is observed for boys. The mean values of four skinfold measurements of girls are higher than those of boys except at certain ages. The skinfold thickness is higher at triceps and medial calf regions when compared to subscapular and suprailiac regions. The less skinfold thickness of boys may be due to their physical activity, which is comparatively high in boys than that of girls.

Correlation Matrix of Anthropometric Measurements

Table 3 presents the correlation matrix for the above measurements of boys aged between 1+ and 20+ years. It is evident from the table that the relationship between all measurements is strong except for skinfold measurements.

Table 1: Means and standard deviations (SD) for anthropometric measurements of Sugali boys by age and number

Age (Yrs)	N	Height (cm)		Weight (kg)		Sitting height (cm)		Total arm length (cm)		Upper arm Circumference (cm)		Biacromial Diameter (cm)		Biliocrystal Diameter (cm)	
		Mean	SD	Mean	SD	Mean	SD	Mean	S.D.	Mean	SD	Mean	SD	Mean	SD
1+	56	72.98	2.31	7.43	0.97	42.46	3.19	27.95	2.37	12.49	1.11	17.45	0.91	12.42	0.79
2+	30	77.74	3.38	8.82	0.74	46.04	2.87	31.99	1.90	12.86	0.80	18.13	0.86	13.72	0.80
3+	64	85.22	3.94	10.20	1.47	47.13	2.57	35.25	2.57	12.90	0.85	19.51	1.16	14.56	1.26
4+	46	91.68	4.54	12.87	1.68	55.57	3.48	38.86	2.88	13.35	0.84	20.66	1.04	15.66	1.20
5+	54	98.96	4.76	13.44	1.42	52.90	2.80	40.71	2.72	13.51	0.66	21.46	1.28	16.34	1.00
6+	72	105.36	7.38	15.82	1.58	55.79	3.36	45.90	2.64	14.06	0.74	23.10	1.38	17.46	1.30
7+	56	115.15	4.12	17.23	1.92	58.91	1.92	48.25	1.49	14.16	1.23	24.12	0.97	18.26	1.12
8+	55	119.81	3.61	19.62	1.92	60.93	2.34	50.92	3.07	15.69	1.02	25.60	1.20	18.59	0.91
9+	43	125.97	4.67	23.08	2.40	67.34	2.34	55.29	2.94	15.85	0.55	26.89	1.31	20.51	1.04
10+	33	130.79	1.82	25.59	1.38	64.65	0.64	55.76	2.04	16.51	1.03	27.88	1.22	21.24	1.57
11+	38	132.61	4.75	26.45	2.23	66.11	2.59	58.01	2.43	17.26	1.03	28.24	1.10	21.57	0.72
12+	33	136.58	4.37	28.26	2.99	68.73	1.65	61.12	2.91	17.52	0.81	28.43	0.68	22.26	1.12
13+	35	141.39	7.93	31.63	5.84	72.01	2.95	63.54	4.27	17.87	1.05	29.97	2.22	22.68	1.63
14+	38	149.57	4.25	36.53	2.44	76.31	1.02	66.68	1.93	20.20	1.57	32.10	2.01	24.13	1.18
15+	30	154.19	8.16	41.27	4.91	77.15	2.29	70.29	1.64	20.40	1.38	33.07	2.14	24.71	1.64
16+	39	158.05	4.37	43.58	1.24	80.13	2.52	71.44	2.19	21.45	0.79	34.30	1.26	25.29	1.32
17+	18	159.37	3.77	44.46	2.48	80.92	0.77	72.35	1.09	21.77	1.04	35.09	1.18	26.78	1.14
18+	43	161.44	4.57	45.16	2.01	81.00	2.31	73.21	2.57	21.84	0.63	35.56	1.34	28.34	0.92
19+	17	163.58	3.55	45.65	2.17	81.16	1.63	74.15	1.37	22.20	0.97	36.31	1.44	28.59	1.56
20+	33	163.87	5.19	47.56	4.34	81.64	5.54	75.14	2.71	22.40	1.05	37.26	1.32	29.01	0.85
		Chest circumference (cm)		Medial calf circumference (cm)		Head Circumference (cm)		Skinfolds(mm)							
								Triceps		Subscapular		Suprailiac		Medial Calf	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
		42.81	2.05	14.90	1.23	44.01	0.94	9.62	2.84	7.49	2.26	6.56	2.11	12.40	3.00
		44.75	1.37	16.17	1.09	45.01	1.26	10.40	2.28	6.59	0.72	5.86	1.55	12.87	2.18
		46.78	2.24	16.79	1.28	46.21	1.16	9.09	2.48	5.80	0.94	5.00	1.43	12.49	2.50
		49.11	1.92	18.07	0.87	47.71	1.70	9.84	2.56	6.26	1.61	5.12	1.90	11.92	2.02
		50.28	2.02	18.32	0.99	48.21	1.36	8.77	1.54	5.15	1.00	4.27	0.78	11.53	2.24
		52.29	2.11	19.49	1.07	48.94	1.75	8.28	2.64	5.50	1.01	4.69	1.84	10.66	2.75
		53.23	2.45	20.01	1.10	49.36	0.69	7.77	3.07	5.00	1.49	4.21	1.15	10.22	2.60
		54.77	2.00	20.66	1.01	49.79	1.19	6.89	1.23	4.93	0.79	3.55	0.74	9.31	2.53
		58.87	2.85	22.66	1.09	50.16	0.73	7.69	1.74	4.77	0.60	3.51	0.94	11.07	2.94
		59.19	1.36	23.66	1.59	50.69	0.73	6.73	0.38	5.76	0.39	4.48	0.99	10.00	2.20
		60.50	1.89	24.74	2.02	51.40	1.81	6.00	1.59	4.31	0.39	3.43	0.54	9.00	2.29
		62.89	1.36	25.49	1.69	51.67	1.28	6.75	1.07	5.60	0.34	4.47	0.88	11.10	3.11
		64.86	4.09	26.51	1.44	52.55	1.64	6.06	1.19	5.65	1.23	4.02	0.77	10.59	1.74
		69.20	1.56	27.03	1.42	53.43	1.33	8.00	1.69	6.57	0.72	5.20	0.87	9.60	1.74
		69.43	2.95	27.25	1.14	53.63	1.06	8.57	3.81	5.88	1.31	5.63	0.86	11.33	1.71
		73.05	1.29	27.35	1.76	53.81	1.40	7.44	1.89	7.06	0.87	5.36	0.99	9.41	2.29
		73.94	2.46	27.93	1.05	53.83	1.38	6.25	0.79	6.42	0.75	5.17	0.69	9.89	0.74
		75.62	1.32	28.18	1.34	54.20	1.31	6.63	1.86	6.45	0.80	5.34	1.00	10.28	2.90
		75.85	1.48	28.93	1.10	54.79	0.96	6.86	2.00	7.05	1.97	5.13	0.72	8.09	1.20
		76.76	2.42	29.96	1.51	55.02	1.69	8.27	1.76	8.42	1.19	6.64	1.75	10.61	3.65

Among the skinfold measurements SFT, SFS and SFC are negatively correlated with the other variables. However, it was found that there is positive correlation between SFS and Wt, BAD, BID, CC, AC and CAC. The relationship between SFC and CAC is also low but positive. It is also noticed that among skinfold measurements, SFSS is positively correlated with all

other variables. The correlation between skinfold measurements is also found positive.

The 't' values calculated for the above correlations are significant at 5 per cent level for all relationships except for the relationship between skinfold measurements and other measurements. The 't' values are insignificant at 5 per cent level for the relationship between FFS and Ht, SH,

Table 2: Means and standard deviations (SD) for anthropometric measurements of Sugali girls by age and number

Age (Yrs)	N	Height (cm)		Weight (kg)		Sitting height (cm)		Total arm length (cm)		Upper arm Circumference (cm)		Biacromial Diameter (cm)		Biliocrystal Diameter (cm)	
		Mean	SD	Mean	SD	Mean	SD	Mean	S.D.	Mean	SD	Mean	SD	Mean	SD
1+	61	71.51	4.49	7.25	1.49	41.51	2.65	28.14	2.49	12.06	0.85	17.44	1.02	12.59	1.11
2+	22	77.74	5.60	9.91	1.60	44.91	3.68	32.59	3.33	12.80	0.66	18.38	1.78	13.55	1.20
3+	43	79.67	5.02	10.47	1.50	45.84	3.31	33.71	3.03	12.97	0.76	18.85	1.10	13.84	1.17
4+	29	86.92	3.97	11.78	0.89	48.79	2.09	36.10	2.15	13.67	0.77	20.12	1.05	14.71	0.68
5+	28	97.35	5.19	12.07	0.59	52.35	1.45	40.75	3.12	13.71	0.65	21.51	1.27	16.61	1.16
6+	40	102.30	6.89	14.60	1.90	54.08	2.85	42.61	3.14	13.79	0.83	22.19	1.22	16.75	0.96
7+	50	110.84	6.74	17.16	1.77	57.65	4.02	47.91	4.13	14.78	0.94	23.64	1.58	18.08	1.12
8+	58	115.28	5.95	18.12	1.59	60.01	3.34	49.68	3.72	15.00	1.12	25.08	1.37	18.99	0.94
9+	83	120.71	8.49	20.25	2.81	60.79	4.43	52.78	2.63	15.21	0.89	25.64	1.37	19.24	1.50
10+	27	129.11	3.05	25.07	1.67	66.00	0.94	56.78	1.93	16.61	0.81	27.94	0.80	20.77	1.03
11+	42	134.92	6.71	28.48	5.32	68.70	4.00	60.53	2.96	17.29	1.33	29.37	1.95	22.32	1.51
12+	28	138.04	4.76	29.39	3.08	69.47	1.67	61.36	3.01	17.31	0.97	29.46	1.21	22.55	1.15
13+	22	142.67	4.43	34.61	3.27	71.69	3.42	65.45	2.63	18.28	0.63	31.42	1.25	23.75	0.84
14+	29	146.55	5.77	35.80	4.41	74.06	2.59	66.94	3.22	18.84	1.65	31.75	1.43	24.81	1.40
15+	12	148.92	5.70	40.42	2.78	75.75	0.81	67.77	1.04	20.20	1.03	31.92	0.95	25.97	0.62
16+	32	150.52	4.23	40.61	2.90	76.27	1.79	68.14	2.01	20.50	1.51	32.22	0.96	26.16	1.02
17+	21	151.01	3.95	41.67	1.98	76.54	2.66	68.23	1.52	20.72	1.41	32.42	0.39	26.29	1.03
18+	20	151.23	8.08	42.45	5.77	76.81	2.73	69.26	3.86	21.19	0.95	34.37	1.58	26.59	0.99
19+	17	152.90	3.67	43.38	1.51	77.30	2.43	69.65	2.81	21.25	1.24	34.72	1.75	26.70	1.15
20+	47	153.44	4.38	44.06	3.00	77.86	2.57	69.86	3.08	21.71	1.18	35.14	2.03	26.81	1.40

Chest circumference (cm)		Medial calf circumference (cm)		Head Circumference (cm)		Skinfolds(mm)							
						Triceps		Subscapular		Suprailiac		Medial Calf	
Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
41.62	2.16	14.89	1.15	42.78	1.58	8.87	2.40	6.94	1.79	6.30	1.87	12.93	2.78
45.52	3.51	16.27	1.26	43.35	1.37	9.77	2.58	7.25	1.53	6.30	2.35	12.76	2.42
45.77	2.03	16.71	1.21	45.84	1.44	10.55	2.37	7.26	1.25	5.27	0.86	12.80	1.60
47.74	1.54	17.63	0.91	46.17	1.05	11.54	2.89	8.42	2.64	5.82	1.04	13.56	1.82
49.31	1.35	17.76	0.89	46.66	1.12	8.79	2.32	6.54	2.74	3.74	0.89	10.28	2.07
49.85	1.60	18.79	1.19	47.58	1.32	9.10	2.37	5.33	0.87	4.48	1.39	10.76	1.90
52.82	2.95	19.78	1.19	48.26	2.39	9.34	2.57	5.74	1.12	4.61	1.58	11.13	2.34
54.15	2.60	20.76	1.05	48.88	1.14	8.08	1.90	5.14	1.28	4.26	1.39	10.53	2.79
55.98	3.48	20.95	1.69	49.11	1.88	7.02	1.85	5.01	0.63	3.89	0.98	10.00	3.12
59.44	1.47	23.11	1.09	49.82	0.91	9.07	1.91	5.63	1.19	4.37	0.70	12.67	2.45
63.23	5.00	24.30	1.90	50.28	1.15	9.05	2.92	6.38	1.70	4.90	1.38	12.76	3.29
63.88	2.32	24.65	1.35	50.51	1.48	8.69	2.55	5.99	0.82	4.77	0.77	11.34	2.74
66.23	1.28	25.28	1.06	50.81	1.39	11.34	2.27	6.43	0.68	5.49	0.59	12.89	1.60
68.08	4.08	25.67	1.15	50.91	0.48	9.56	1.27	6.60	1.10	6.17	1.33	12.58	2.81
70.57	1.68	26.97	1.15	51.42	0.73	10.36	4.71	9.34	1.08	6.66	0.52	10.33	4.55
72.54	4.22	27.44	1.38	51.56	1.01	12.36	3.49	8.92	1.58	7.00	1.64	14.69	2.88
72.92	3.35	27.50	1.21	51.97	0.91	13.90	3.75	8.07	1.10	7.86	2.08	14.89	2.74
75.23	2.68	27.80	1.46	52.48	0.48	13.82	4.24	9.85	3.02	7.64	2.33	16.01	3.84
76.32	1.15	28.20	1.10	52.80	1.20	13.19	3.47	9.19	1.76	7.76	1.46	13.07	4.36
76.97	2.78	28.77	1.39	53.05	1.03	12.60	2.68	8.75	1.81	7.56	2.04	13.38	2.69

AL, BAD, BID, CC and CAC and between SFSS and HC.

Table 4 presents the correlation matrix for 14 anthropometric measurements of girls aged between 1+ and 20+ years. It is important to note that no negative correlation is noticed between anthropometric measurements of girls as observed in the case of boys. The correlation be-

tween different anthropometric measurements is shown to be strong, whereas in the case of skinfold measurements they show less degree of positive correlation with all other measurements and in between them.

It is evident from the 't' values that the correlation between all measurements are significant at 5 per cent level.

CORRELATION MATRIX AND LINEAR REGRESSION OF ANTHROPOMETRIC CHARACTERS

Table 3: Correlation matrix of anthropometric characters among Sugali boys

	Ht	Wt	SH	AL	BAD	BID	CC	AC	CAC	HC	SFT	SFSS	SFS	SFC
Ht	1.0000													
Wt	0.9658 (108.72)	1.0000												
SH	0.9779 (136.53)	0.9603 (100.48)	1.0000											
AL	0.9880 (189.1)	0.9653 (107.90)	0.9730 (123.05)	1.0000										
BAD	0.9790 (140.17)	0.9775 (135.27)	0.9638 (105.51)	0.9761 (131.10)	1.0000									
BID	0.9656 (108.39)	0.9667 (110.26)	0.9561 (95.23)	0.9632 (104.60)	0.9758 (130.26)	1.0000								
CC	0.9695 (115.46)	0.9832 (157.23)	0.9613 (101.85)	0.9697 (115.86)	0.9753 (128.88)	0.9696 (115.66)	1.0000							
AC	0.9328 (75.55)	0.9689 (114.29)	0.9282 (72.81)	0.9314 (74.69)	0.9547 (93.65)	0.9461 (85.27)	0.9628 (104.00)	1.0000						
CAC	0.9644 (106.45)	0.9550 (93.98)	0.9482 (87.12)	0.9630 (104.30)	0.9590 (98.77)	0.9558 (94.89)	0.9599 (99.94)	0.9441 (83.59)	1.0000					
HC	0.9232 (70.12)	0.8943 (58.34)	0.9038 (61.64)	0.9188 (67.94)	0.9142 (65.85)	0.9032 (61.42)	0.9001 (60.30)	0.8758 (52.96)	0.9095 (63.86)	1.0000				
SFT	-0.3730 (11.73)	-0.2862 (8.72)	-0.3435 (10.68)	-0.3665 (11.50)	-0.3338 (10.34)	-0.2941 (8.98)	-0.2875 (8.76)	-0.2208 (6.61)	-0.3050 (9.35)	-0.3319 (10.27)	1.0000			
SFSS	0.0738 (2.16)	0.2261 (6.78)	0.1111 (3.26)	0.0878 (2.57)	0.1451 (4.28)	0.1632 (4.83)	0.2043 (6.09)	0.2687 (8.14)	0.1509 (4.45)	0.0412 (1.20)	0.5206 (17.80)	1.0000		
SFS	-0.0521 (1.52)	0.0897 (2.63)	-0.0106 (0.31)	-0.0513 (1.50)	0.0071 (0.21)	0.0285 (0.83)	0.0574 (1.68)	0.1278 (3.76)	0.0318 (0.93)	-0.0746 (2.18)	0.4650 (15.33)	0.6445 (24.60)	1.0000	
SFC	-0.3095 (9.50)	0.2285 (6.85)	-0.2919 (8.90)	-0.3150 (9.69)	-0.2759 (8.38)	-0.2603 (7.87)	-0.2458 (7.41)	-0.1897 (5.64)	-0.2240 (6.71)	-0.2783 (8.46)	0.5534 (19.39)	0.3170 (9.76)	0.4437 (14.45)	1.0000

Figures in parentheses are 't' values.

Table 4: Correlation matrix of anthropometric characters among Sugali girls

	Ht	Wt	SH	AL	BAD	BID	CC	AC	CAC	HC	SFT	SFSS	SFS	SFC
Ht	1.0000													
Wt	0.9400 (73.36)	1.0000												
SH	0.9807 (133.56)	0.9522 (3.00)	1.0000											
AL	0.9879 (169.61)	0.9420 (74.74)	0.9752 (117.32)	1.0000										
BAD	0.9676 (102.04)	0.9594 (90.57)	0.9684 (103.39)	0.9700 (106.24)	1.0000									
BID	0.9710 (108.14)	0.9656 (98.88)	0.9723 (110.76)	0.9681 (102.88)	0.9700 (106.24)	1.0000								
CC	0.9420 (74.74)	0.9759 (119.08)	0.9517 (82.54)	0.9415 (74.39)	0.9586 (89.64)	0.9621 (93.94)	1.0000							
AC	0.8977 (54.25)	0.9613 (92.91)	0.9147 (60.27)	0.9017 (55.53)	0.9272 (65.91)	0.9377 (71.86)	0.9516 (82.44)	1.0000						
CAC	0.9503 (81.27)	0.9674 (101.71)	0.9619 (93.68)	0.9487 (79.90)	0.9603 (91.66)	0.9629 (95.01)	0.9622 (94.07)	0.9558 (86.56)	1.0000					
HC	0.8912 (52.31)	0.8428 (41.69)	0.8839 (50.32)	0.8819 (49.81)	0.8727 (47.59)	0.8670 (46.33)	0.8515 (43.24)	0.8196 (38.09)	0.8799 (49.31)	1.0000				
SFT	0.2303 (6.30)	0.3959 (11.48)	0.2804 (7.78)	0.2406 (6.60)	0.2910 (8.10)	0.3329 (9.40)	0.3670 (10.50)	0.4548 (13.60)	0.3800 (10.94)	0.2523 (6.94)	1.0000			
SFSS	0.1631 (4.40)	0.3745 (10.75)	0.2193 (5.99)	0.1741 (4.71)	0.2620 (7.23)	0.2850 (7.92)	0.3530 (10.05)	0.4350 (12.86)	0.3285 (9.26)	0.1548 (4.17)	0.6479 (22.65)	1.0000		
SFS	0.2161 (5.89)	0.4068 (11.86)	0.2721 (7.53)	0.2257 (6.17)	0.2990 (8.34)	0.3121 (8.75)	0.3870 (11.18)	0.4467 (13.29)	0.3621 (10.34)	0.1512 (4.07)	0.5885 (19.38)	0.6063 (20.30)	1.0000	
SFC	0.0947 (2.53)	0.2418 (6.64)	0.1405 (3.78)	0.1026 (2.75)	0.1512 (4.07)	0.1819 (4.93)	0.2221 (6.07)	0.2979 (8.31)	0.2399 (6.58)	0.1157 (3.10)	0.6019 (20.07)	0.5157 (16.03)	0.4555 (13.62)	1.0000

Figures in parentheses are 't' values.

Table 5: Regression out put of anthropometric measurements against age among sugali boys and girls

Sl. No.	Variable	Boys				Girls			
		Constant	X-coefficient	t-value	R ²	Constant	X-coefficient	t-value	R ²
1.	Height	73.54402	5.125402	120.03	0.944158	73.99760	4.683668	76.69	0.892411
2.	Weight	2.790663	2.320321	127.78	0.950402	3.188913	2.158111	94.59	0.926575
3.	Sitting height	41.90138	2.244844	104.90	0.928145	42.04278	2.060892	76.50	0.891945
4.	Total arm length	28.71013	2.595485	120.70	0.944746	29.39905	2.377520	78.60	0.897046
5.	Biacromial diameter	16.46271	1.077789	125.76	0.948874	16.75876	0.989158	85.78	0.912043
6.	Biiliocrystal diameter	12.01466	0.866886	114.62	0.939091	12.09152	0.825141	87.22	0.914739
7.	Chest circumference	40.87871	1.890943	128.94	0.951252	39.60700	1.953625	93.19	0.924513
8.	Arm circumference	10.93044	0.594848	86.31	0.895180	11.10523	0.539785	69.79	0.872929
9.	Calf circumference	14.64100	0.814112	89.72	0.904276	14.50525	-0.768520	77.22	0.893725
10.	Head circumference	44.97766	0.553660	59.69	0.807024	44.03392	0.500175	44.60	0.745725
11.	Fat-fold at triceps	9.363200	-0.15011	-10.35	0.111728	7.948295	0.196513	9.57	0.114326
12.	Fat-fold at sub-secular	5.547186	0.042344	4.60	0.024221	5.630527	0.116836	8.70	0.096423
13.	Fat-fold at supra-iliac	4.772450	0.006841	0.70	0.000578	4.324518	0.118097	9.56	0.114242
14.	Fat-fold at calf	12.07604	-0.14113	-8.33	0.075230	11.20866	0.101210	4.83	0.031917

Linear Regression of Anthropometric Measurements

The regression output is shown in the table 5. It is evident from the table that height, weight, sitting height, total arm length, biacromial diameter, biiliocrystal diameter chest circumference, arm circumference, calf circumference and head circumference measurements show an almost linear relationship with age. While the skinfold measurements are presenting downward trend in boys and upward trend in girls.

Growth of an individual is a continues process (Jelliffe, 1966), and normally it ceases at the end of adolescence. Accordingly all the anthropometric measurements except skinfold measurements presenting progressive increase with age upto 20+ years, hence, positive correlation between measurements is observed. Where as the skinfold measurements of SFT, SFS and SFC are negatively correlated in case of boys and positively correlated in case of girls. The Physical activity of boys of the present study is comparatively more than that of girl, as they actively participate in their occupational duties along with their parents to eke out their livelihood (Reddy and Papa Rao, 1995). Hence, fatfold thickness among boys is naturally less than that of girls. The same is evident from the regression output of the measurements, where

the skinfold measurements are presenting downward trend in case of boys and upward trend in case of girls.

KEY WORDS Correlation Coefficients. Linear Regression. Sugali. Tribal Population. Andhra Pradesh.

ABSTRACT With a view to know the average relationship of 14 anthropometric measurements, taken on the 1565 Sugali children (854 boys and 711 girls) of both sexes aged 1 to 20 years simple correlation co-efficients between pairs of variables and against age a straight line is fitted for the data. Among boys the relationship between all measurements is strong except for skinfold measurements. No negative correlation is noticed between anthropometric measurements of girls. All anthropometric measurements show an almost linear relationship with age. The skinfold measurements are presenting downward trend in boys and upward trend in girls.

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