Growth Pattern among Konda Reddi Children and Adolescents aged 0 to 18 years

Dr.Bharathi Karri[1], Prof.V.L.N.Rao[2]

Assistant Professor, Department of Anthropology and Tribal Development[1],Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh. Email:bharathi259@gmail.com
Former Professor, Department of Anthropology, Andhra University, Visakhapatnam, Andhra Pradesh.,
Email: nrao.vithala@gmail.com

Abstract- An attempt has been made to study the effect of age from 0+ to 18+ on ten body measurements throughout the growth period and also to study the juvenile growth spurt. A cross-sectional study was undertaken among Konda Reddi tribal population by using systematic household survey method. The sample consists of 1187 subjects belonging to both sexes (boys-603; girls-584) who are considered to evaluate the growth patterns from 0+ to 18+ years age group. Data on body weight, stature, sitting height vertex, bi-acromial breadth, hip breadth, chest, waist, upper arm, calf circumferences were considered using standard techniques. Patterns of change have been observed in the physical traits which indicates progressive accelerating trend with advancement in age. The mean values of body weight; in stature; in sitting height vertex; in bi-acromial breadth and waist circumference are not statistically significant. The *p*-value for hip breadth ($p<0.001$) and hip circumference ($p<0.001$) is statistically significant among both sexes.

Index Terms- Body Measurements; Anthropometry; Growth; Konda Reddi; Tribe

1. INTRODUCTION

The process by which human beings develop biologically from conception to death is termed as growth and the details of the growth process are the keys to understanding the unique attributes of a species' adaptation. Growth is a product of the continuous and complex interaction of heredity and environment (Tanner, 1978). Growth pattern is controlled by a maturation clock (Tanner, 1963). One particular time of this clock is puberty where an acceleration of growth is observed. Anthropometry is used as an efficient tool for diagnosis of growth which was validated by experimental study on animals and of controlled supplementary food intake (Jelliffe, 1966). The influence of socio-economic factors on growth is very much evident (Johnston et al., 1978. Malina et al., 1995), low income prevalence among lower social groups than in higher groups (Sussane, 1984; Malina et al., 1995).

The study of physical growth comprises of a comprehensive understanding of both health and nutritional status. Anthropometric measurements such as height, weight, breadths, and circumferences are valuable indicators to assess nutritional status of a community. Earlier studies on rural population have indicated that with the advancement of age, there is an increase in the physical traits (Singh, 1980; ICMR, 1989; Bharati et al., 1991; Sharma, 1991; Nath et al., 1991; Busi et al., 2003; Busi et al., 2004; Rao et al., 2005; Rao et al., 2006; Rao et al., 2009) is observed. Keeping this in view, followed by dearth of anthropometric studies of Konda Reddi tribe, a cross-sectional survey of growth pattern was undertaken to evaluate standard reference values for the study population.

2. MATERIAL AND METHODS

Konda Reddi is a vulnerable primitive tribal group predominantly inhabiting on the banks situated on either side of river Godavari in the hilly and forest tracts of East Godavari, West Godavari and Khammam districts of Andhra Pradesh, India. A cross-sectional study was undertaken among Konda Reddi tribal population by using systematic household survey method. The sample consists of 1187 subjects belonging to both sexes (boys-603; girls-584) were considered for 10 anthropometric measurements. The size of the sample is maintained to a minimum limit of 30 in order to make the sample statistically significant. The variation in the sample size between each group is due to the availability of the tribal children in the course of data collection. The present study is intended to focus upon the differential growth trends, health and nutritional status among children aged 0 to 18 years.

The data was collected from 183 households inhabiting 22 villages and also from 10 schools in the study area. Villages selected from the mandals (blocks) in the scheduled area by taking in to

International Journal of Research in Advent Technology, Vol.3, No.11, November 2015
E-ISSN: 2321-9637
Available online at www.ijrat.org

consideration the numerical preponderance of the tribal population in the tribal sub-plan area. The data was collected both from villages and schools periodically throughout the year and informed consent was obtained from all individual participants. The data was collected by using the expertise of well-trained 2 personnel in recording the anthropometric measurements. Standard instruments such as anthropometer, rod compass, tape etc. manufactured by Galaxy Informatics, New Delhi were used to assess the following measurements, such as body weight, stature, sitting height vertex, bi-acromial breadth, hip breadth, chest, waist, upper arm, and calf circumference using standard techniques (Weiner and Lowrie, 1969). The ages of the subjects were recorded by taking the assistance of school teachers, and as per school admission registers at schools and from anganwadi workers in the study villages.

All the subjects between the ages of 0.0 to 0.9 years were considered under 0+ age group, 1.0 to 1.9 years in 1+ age group and so on up to 18+ years following (Tanner, 1962) and (Eveleth and Tanner, 1976). The entire data was entered in MS-Excel and statistical analysis was done using the software SPSS (version 16.0). Student t-test was performed to find the significant differences in the measurements between both the sexes.

3. RESULTS AND DISCUSSION

The anthropometric measurements showing mean and standard deviation values for age group are presented in Table 1 and 2. It is observed that the mean values of all the physical traits increase as the age advances with a few fluctuating discrepancies mostly due to cross-sectional nature of the study. The mean body weight of Konda Reddi infant at 0+ age group is 5.93 kgs. among boys and 5.18 kgs. in girls. Between 0+ to 18+ years, both boys and girls showed a marked difference of 5.94 kgs. and 9.35 kgs. from lowest to highest annual increments in body weight. A peak velocity has occurred between 13+ years and 14+ years among Konda Reddi boys (+6.44 kgs. per year), which is earlier by one year (i.e) 12+ and 13+ years in Konda Reddi girls (+9.39 kgs. per year). It indicates the growth of the total body mass manifested.

The mean stature of infants at 0+ age group among Konda Reddi boys is observed as 64.05 cms. while it

is 61.04 cms. among girls. The difference between the lowest and highest annual increments in stature of boys is higher than the condition in girls. The highest mean annual gain have occurred between 11+ and 12+ years among Konda Reddi boys (+7.30 cms. per year) and (+6.03 cms. per year) between 12+ and 13+ years among girls. When both sexes were compared, it is observed as occurring later by one year among Konda Reddi girls.

The mean sitting height vertex of infants at 0+ years age group among boys is 38.96 cms. and it is observed as 37.33 cms. among girls. The difference in minimum and maximum annual increment of sitting height vertex of girls is greater than that among boys. The highest mean annual gain has occurred later by one year (i.e) 13+ and 14+ years (+4.61 cms per year) among boys and between 12+ and 13+ years (+3.27 cms per year) among girls.

The mean Bi-acromial breadth of infants at 0+ age group among boys is observed as 15.82 cms. and it is noted as 15.03 cms among girls. The difference in minimum and maximum annual increment of bi-acromial breadth of girls is greater than that among boys. The highest mean annual gain among boys has occurred between 12+ and 13+ years (+2.38 cms per year) between 12+ and 13+ years (+2.70 cms. per year) among girls.

The mean hip breadth of infants at 0+ age group is observed as 11.80 cms among boys and 11.49 cms among girls. The difference in minimum and maximum annual increment of hip breadth of girls is greater than that in boys. The highest mean annual gain has occurred similarly among boys (+1.74 cms per year) and girls (+3.11 cms per year) between 12+ and 13+ years.

The mean chest circumference of infants at 0+ age group is observed as 41.54 cms among boys while it is 39.85 cms among girls. The difference in minimum and maximum annual increment of chest circumference of girls is greater than among boys. The highest mean annual gain among boys has occurred between 13+ and 14+ years (+4.60 cms per year) however among girls, it is observed in between 12+ and 13+ years (+9.44 cms per year).

The mean waist circumference of infants at 0+ age group among boys is observed as 39.73 cms and it is

International Journal of Research in Advent Technology, Vol.3, No.11, November 2015
E-ISSN: 2321-9637
Available online at www.ijrat.org

38.70 cms among Konda Reddi girls. The difference in minimum and maximum annual increment of waist circumference of girls is greater than in boys. However, the highest mean annual gain among boys has occurred between 13+ and 14+ years (+4.02 cms per year) and it is observed in between 12+ and 13+ years (+4.99 cms per year) among Konda Reddi girls.

The mean hip circumference is observed as 39.73 cms among boys at 0+ years age group while among girls it is observed as 39.59 cms. The difference in minimum and maximum annual increment of hip circumference of girls is greater than among boys. The highest mean annual gain has occurred between 12+ and 13+ years (+5.24 cms per year) among boys and (+9.73 cms per year) among girls.

The mean mid-upper arm circumference at 0+ age group boys is observed as 13.12 cms and as 13.19 cms among girls. The difference in minimum and maximum annual increments of mid-upper arm circumference of boys is more than in girls. The highest mean annual gain has occurred between 12+ and 13+ years among boys (+1.31 cms per year) and (+2.98 cms per year) among girls.

The mean calf circumference at 0+ age group is observed as 15.50 cms among boys and 15.59 cms among girls. The difference in minimum and maximum annual increments of calf circumference is greater among girls than in boys. The highest mean annual gain has occurred between 12+ and 13 + years among boys (+1.68 cms per year) and it is (+2.74 cms per year) among girls.

The juvenile spurt of body weight (+1.95 kgs.) in boys is attained during 4+ and 5+ years and the same occurred earlier among girls (+2.64 kgs.) during 0+ and 1+ years. The juvenile spurt of stature (+8.89 cms) in boys is attained during 5+ years, similarly the juvenile spurt among girls (+10.98 cms) is accomplished during 3+ and 4+ years. The juvenile spurt of sitting height vertex is attained between 0+ and 1+ year in Konda Reddi boys (+4.70 cms) which occurred later when compared to the juvenile spurt of sitting height vertex among Konda Reddi girls (+5.72 cms). Further, the juvenile spurt of bi-acromial breadth in boys (+2.67 cms) is attained between 0+ and 1+ years and it is attained between 4+ and 5+ years among girls (+3.12 cms) and hence, it is evident that the juvenile spurt of bi-acromial breadth occurred

earlier among Konda Reddi girls. The juvenile spurt of hip breadth among boys (+1.74 cms) is observed to have occurred between 0+ and 1+ year, hence, the juvenile spurt in hip breadth among boys is attained earlier among Konda Reddi. Similarly among girls, the juvenile spurt in hip breadth is attained between 3+ and 4+ years among Konda Reddi girls (+2.46 cms). The juvenile spurt of chest circumference is attained between 0+ and 1+ year among boys (+4.60 cms) while it is (+9.96 cms) among girls. The juvenile spurt of waist circumference is attained between 0+ and 1+ year as (+4.13 cms) among boys and (+5.69 cms) among girls indicates that early occurrence of spurt. The juvenile spurt of mid-upper arm circumference among boys (+1.31 cms) is attained during 0+ and 1+ year while among girls (+0.99 cms) it is attained between 3+ and 4+ years. So, it is clear that the juvenile spurt of mid-upper arm circumference of boys is attained earlier than girls. The juvenile spurt of calf circumference among boys (+1.33 cms) is attained between 0+ and 1+ year while for girls (+1.71 cms.) during 4+ to 5+ years.

The result of t-test comparison between somatometric measurements of boys versus girls is presented in Table 3. It is observed that the mean values of Konda Reddi boys and girls for body weight during 13+, 17+ and 18+ years; for stature from 14+ to 18+ years; for sitting height vertex during 14+ years; for bi-acromial breadth during 17+ and 18+ years; for hip breadth from 11+ to 17+ years; for chest circumference and waist circumference during 13+ and 14+ years; for hip circumference from 11+ to 17+ years; for mid upper arm circumference during 11+ to 15+ years; and for calf circumference at 11+ years and during 13+ to 14+ years are observed to be statistically significant.

To know the significance of the difference under the multiple comparisons, the Bonferroni post hoc test was performed. Tests of 171 a priori hypotheses were conducted using Bonferroni adjusted alpha levels of 0.00029 per test (.05/ 171). This value is less than 0.05, so the difference between certain groups is considered significant. From the post hoc tests, the results indicated that the average number of errors occurred is not significantly lower among boys (M= 17.39, SD=7.02), than girls (M= 18.31, SD= 4.29), F (1, 1186)= 7.26, *p*= 0.007 in mid upper arm circumference. The pairwise comparisons for hip breadth is statistically significant and higher among girls (M= 21.38, SD= 5.96) than boys (M= 20.18, SD=

4.93), F (1, 1186)= 14.52, *p*= 0.000. The errors in calf circumference is not statistically significantly and found to be higher among girls (M= 24.45, SD= 5.75), than boys (MD= 23.83, SD= 5.31), F (1, 1186)= 3.62, *p*= 0.057 than those were in body weight among boys (M= 25.03, SD= 14.00) than were those among girls (M=25.28, SD=12.44), F (1, 1186)= 0.095, *p*= 0.758 than those in biacromial breadth which is not significantly lower among girls (M= 27.02, SD= 6.37) than boys (M= 27.29, SD= 6.61), F (1, 1186)= 0.514, *p*= 0.473 followed in waist circumference which is found to be lower among boys (M= 55.46, SD= 8.57), than girls (M= 56.24, SD= 9.56), F (1, 1186)= 2.18, *p*= 0.139 than in hip circumference is statistically significantly lower among boys (M= 61.67, SD= 3.33) than girls (M= 66.23, SD= 17.24), F (1, 1186)= 26.06, *p*=0.000. The pairwise comparisons for chest circumference is not statistically significant and are lower among boys (M= 61.98, SD= 12.27), than girls (M= 63.79, SD= 14.34), F (1, 1186)= 5.491, *p*= 0.019. Sitting vertex is not significantly lower among girls (M= 62.16, SD= 12.28) than boys (M= 62.99, 12.54), F (1, 1186)= 1.34, *p*= 0.24 than in stature among girls which is lower among girls (M= 119.56, SD= 28.29) than among boys (M= 121.35, SD= 29.75), F (1, 1186) = 1.12, *p*= 0.29. The pairwise comparison for all the anthropometric measurements is highly significant among girls than boys and does not show equal means in all treatments. However, the pairwise comparison among Kolam population shows that the average number of errors occurred is not statistically significant and found to be lower among girls than boys for hip breadth followed by hip circumference and is statistically significant and reported lower among girls than boys for mid-upper arm circumference followed by calf circumference, body weight, sitting vertex, chest circumference, waist circumference, biacromial breadth and stature measurements among 0-18 years Kolam children and adolescents (Bharathi and Rao, 2015).

4. CONCLUSION

It is apparent from the above discussion that the growth pattern of Konda Reddi population among both the sexes is slightly lighter in weight and shorter in height when compared with the results of earlier studies among other populations (Bharathi and Rao, 2015; Singh, 1980; Bharati et al., 1991; Sharma, 1991; Rao et al., 1997) of India and also lighter and shorter than the height of boys and girls of West Bengal

(Hauspie, 1980). Further, it is found that Konda Reddi boys and Konda Reddi girls are heavier in weight and lengthier in height when compared with the results of Savara tribal population (Rao et al., 2009) of Andhra Pradesh. Konda Reddi boys are found to be heavier in weight and slightly lengthier in height; and Konda Reddi girls are found to be lighter in weight and possess similar height when compared with the results of Gadaba tribal population of Andhra Pradesh (Rao et al., 2006). However, the Bonferroni correction shows that Konda Reddi girls are statistically significant in hip breadth and hip circumference when compared with Konda Reddi boys. Growth and maturation are influenced by several factors depending on the geographical location and availability of the food required to meet the nutrient supplement to maintain average growth rates. Linear growth though remains constant in childhood but varies after onset of growth spurt resulting in constitutional growth delay.

ACKNOWLEDGEMENT

REFERENCES

[1] Bharathi, K and Rao, V.L.N. (2015): Growth Pattern among Kolam Children and Adolescents aged 0 to 18 years: 10 Anthropometric Measurements. International Journal of Research, 2 (7), pp.102-108.

[2] Bharati, S; Mukherjee, D; Bharati, P. (1991): Patterns of growth among the Bengali Brahmin and Mahishya castes of Howrah district, West Bengal, India. Indian Journal of Phyical Anthropology and Human Genetics 17, pp.163-174.

[3] Busi, B.R; Rao, D.B; Rao, V.L.N. (2004): Growth Progression in Physical and Physiological Variables among Yata's of Visakhapatnam district, Andhra Pradesh., Anthropologist, 6(1), pp.239-245.

International Journal of Research in Advent Technology, Vol.3, No.11, November 2015
E-ISSN: 2321-9637
Available online at www.ijrat.org

[4] Busi, B.R; Rao, D.B; Rao, V.L.N. (2003): Growth progression in physical and physiological variables among Jalaris of Visakhapatnam district, Andhra radish. Anthropologist, 5(4), pp.269-282.

[5] Eveleth, P.B; Tanner, J.M. (1976): World-wide variation in Human Growth. Cambridge University Press, Cambridge.

[6] Hauspie, R.C; Das, S.R; Preece, M.A; Tanner, J.M. (1980): A Longitudinal study of the growth in the height of boys and girls of West Bengal (India) aged six months to 20 years. Annals of Human Biology, 7, pp.429-440.

[7] Indian Council of Medical Research. (1989): Growth and Physical Development of Indian Infants and Children. ICMR Technical Report Series No.18, New Delhi.

[8] Jelliffe, D.B. (1966): The Assessment of the Nutritional Status of the Community. Monograph Series No.55, WHO, Geneva.

[9] Johnston, F.E; Roche, A; Susanne, C. (1980): Human Physical Growth and Maturation: Methodologies and Factors. Plenum Press, New York, pp.329-338.

[10] Malina, M.R; Little, B.B; Buschang, H.P; Denaoss, J; Sillay, A.H.B. (1995):. Socio-economic studies in the growth studies of children in a subsistence agricultural community. American Journal of Physical Anthropology, 68, pp.385-391.

[11] Nath, S; Sachadeva, V; Chauhan, N. (1991)" Progression of maturational sequence in stature and linear measures of the extremities and sex differences among Lodhas of West Bengal. Indian Journal of Physical Anthropology & Human Genetics, 17, pp.205-218.

[12] Rao V.L.N; Busi,B.R; Rao, Ch.S; Bharathi, K. (2009). Patterns of Growth among Savaras of Srikakulam district, Andhra Pradesh. South Asian Anthropologist, 9 (1), pp.21-30.

[13] Rao, D.B; Busi, B.R. (1997): A study of physical growth and nutritional status among Jatapu tribal girls of Andhra Pradesh. Journal of Human Ecology, 8(5), pp.355-359.

[14] Rao, V.L.N; Rao, D.B; Rao, Ch.S; Bharathi, K; Busi, B.R. (2006): Physical Growth among Gadaba tribal population of Vizianagaram district, A.P. South Asian Anthropologist, 6(2), pp.175-184.

[15] Rao, V.L.N; Rao, D.B; Rao, Ch.S; Busi, B.R. (2005): Patterns of Growth and Physiological Variables among Khond tribal population of Visakhapatnam district, Andhra Pradesh. Anthropologist, 7(4), pp.237-245.

[16] Sharma, J.C. (1991): Physical growth, sexual and skeletal maturity of Punjabi adolescents in relations to their socio-economic status. Indian Journal of Physical Anthropology & Human Genetics, 17 (2&3),1, pp.139-154.

[17] Singh, S.P. (1980): Physical growth of Gaddi Rajputs of Dhaula Dhar range of the Himalaya. Zeitschrift fuer Morphologie und Anthropologie, 71, pp.65-81.

[18] Sussane, C. (1984): Genetic and Environmental factors during the Growth Period. Plenum Press, New York.

[19] Tanner, J.M. (1978): Fetus into Man. Harvard University Press, Cambridge.

[20] Tanner, J.M. (1962): Growth at Adolescence. Blackwell, Oxford.

[21] Tanner, J.M. (1963): The regulation of Human Growth. Child Devevelopment, 34, pp.817-847.

[22] Weiner, J.S; Lowrie, J.A (1969): Human Biology. Handbook No.9, Blackwell Scientific Publications, Oxford and Edinburgh.

Table No.1: Mean and standard deviation of Body measurements among Konda Reddi Boys

Age (yrs.)	Sample Size	Body Weight (kgs)		Stature (cms)		Sitting Vertex (cms)		Biacromial Breadth (cm)		Hip Breadth (cms)		Chest Circum Ference(cm)		Waist Circum Ference(cm)		Hip Circum Ference(cm)		MidUpper Arm Circum Ference(cm)		Calf Circum Ference (cm)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
0+	30	5.93	1.31	64.05	7.28	38.96	4.09	15.82	1.95	11.80	1.41	41.54	2.87	39.73	3.00	39.73	3.49	13.12	1.16	15.50	1.65
1+	30	8.06	1.31	73.43	3.44	43.43	2.35	18.49	1.18	13.78	0.69	45.59	1.76	43.56	3.29	43.93	2.42	13.65	1.00	16.83	1.42
2+	30	9.52	0.99	79.97	3.02	47.79	3.37	18.47	1.23	13.95	0.93	48.10	2.96	47.69	2.29	45.77	3.17	13.95	1.12	17.58	1.44
3+	30	11.11	1.69	87.86	4.87	49.85	2.47	20.24	1.10	15.15	0.99	50.07	2.64	48.81	3.21	46.84	4.25	14.04	0.98	18.11	1.49
4+	31	12.25	1.40	93.50	6.47	51.31	3.51	20.95	1.56	15.87	0.81	51.89	2.39	49.24	2.85	49.26	3.01	14.07	1.10	19.21	1.62
5+	32	14.20	1.96	102.39	5.91	54.58	1.98	22.84	1.05	16.51	0.87	53.06	3.21	49.46	4.08	51.49	3.09	14.08	1.05	20.00	1.37
6+	30	16.60	2.07	109.84	5.61	57.81	1.96	24.27	1.18	17.26	1.26	55.64	3.76	52.11	3.94	55.18	3.77	15.21	1.04	21.41	1.43
7+	33	17.93	2.37	116.19	6.53	59.83	2.83	25.16	1.39	18.12	1.43	56.11	2.91	52.22	3.37	55.46	2.95	14.71	0.89	21.27	1.42
8+	33	19.61	2.49	119.39	6.00	61.57	3.02	26.07	2.04	19.21	1.39	58.56	3.13	54.31	3.35	58.71	3.88	16.02	1.45	22.33	1.52
9+	30	21.50	2.74	123.92	5.43	63.37	2.83	27.24	2.07	19.73	1.25	61.57	2.99	57.08	2.83	61.61	3.32	22.06	2.77	23.37	1.34
10+	34	25.06	2.66	131.30	5.02	65.91	2.77	28.88	1.80	21.34	0.99	64.41	3.44	58.79	4.16	65.95	3.52	17.63	1.03	24.92	1.20
11+	32	24.56	3.33	129.46	6.62	65.64	3.12	27.73	2.08	20.44	1.28	62.61	3.73	57.61	3.71	62.36	3.47	16.87	1.21	24.14	1.49
12+	33	28.60	5.72	136.76	9.14	68.82	4.42	29.31	2.86	21.81	2.12	64.60	5.32	58.84	5.01	65.52	4.95	17.58	1.78	25.50	1.95
13+	32	32.54	5.13	143.99	8.36	71.92	3.54	31.69	2.04	23.55	1.49	68.89	4.33	59.76	3.71	70.76	4.69	18.89	1.62	27.18	1.94
14+	33	38.98	3.59	151.06	5.40	76.53	2.69	33.87	1.33	25.28	1.11	73.49	3.49	61.98	2.89	74.48	3.06	19.73	1.21	28.83	1.77
15+	32	42.43	4.89	155.57	5.36	78.26	2.95	35.45	1.56	26.32	0.90	76.34	4.30	63.09	3.58	77.57	2.93	21.13	2.05	30.13	2.75
16+	32	44.15	5.06	154.79	6.35	76.53	3.74	35.55	1.91	26.31	1.67	77.74	4.27	63.22	4.02	78.48	3.01	21.69	1.37	30.88	1.73
17+	33	47.00	4.71	156.71	5.33	77.72	3.35	36.26	1.65	26.85	1.82	79.53	5.44	65.33	5.28	80.23	4.01	22.10	1.43	31.61	1.56
18+	33	48.59	5.59	158.39	5.13	80.16	2.94	36.67	1.62	27.44	1.21	81.58	4.59	66.72	3.96	81.30	4.73	22.67	1.38	31.41	1.70

Table No.2: Mean and standard deviation of Body measurements among Konda Reddi Girls

Age (yrs.)	Sample Size	Body Weight (kgs)		Stature (cms)		Sitting Vertex (cms)		Biacromial Breadth (cms)		Hip Breadth (cms)		Chest Circum Ference (cms)		Waist Circum Ference (cms)		Hip Circum Ference (cms)		MidUpper Arm Circum Ference (cms)		Calf Circum Ference (cms)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
0+	30	5.18	0.43	61.04	5.83	37.33	2.36	15.03	1.31	11.49	1.04	39.85	1.89	38.70	2.01	39.59	2.76	13.19	1.25	15.59	1.55
1+	30	7.82	1.36	72.64	4.70	43.05	2.27	17.33	1.92	13.01	1.30	49.81	6.39	44.39	2.83	43.44	3.52	13.29	0.89	16.73	1.60
2+	30	8.91	1.32	79.04	4.39	45.27	3.52	18.42	0.86	13.88	0.99	46.62	3.85	44.59	4.94	45.08	3.05	13.68	0.79	17.10	1.17
3+	30	9.90	1.02	85.45	3.41	48.21	2.32	19.21	1.86	14.58	0.82	48.48	2.22	45.77	3.33	45.72	2.62	13.65	0.79	17.80	1.01
4+	30	12.41	1.97	96.43	6.63	52.57	2.36	21.01	1.71	17.04	6.37	50.80	2.10	47.16	2.60	49.11	4.01	14.26	1.39	19.11	1.75
5+	30	15.78	3.31	106.90	9.62	56.06	3.26	24.13	1.74	17.82	1.51	55.61	3.89	52.05	3.46	54.92	4.53	15.25	1.27	20.82	1.73
6+	30	15.42	2.31	111.41	6.04	57.18	2.39	24.14	1.34	17.65	0.94	54.47	3.21	50.51	4.12	54.23	4.03	14.34	1.44	20.61	1.55
7+	30	20.40	3.85	122.00	10.17	60.57	3.48	26.45	1.60	19.90	1.71	60.26	4.58	55.49	5.00	61.40	4.91	16.59	1.48	23.07	1.87
8+	30	20.10	3.98	120.70	13.78	61.05	2.56	26.54	1.66	19.98	1.90	59.74	4.39	56.04	4.25	62.30	5.98	16.65	1.84	22.94	2.01
9+	30	22.50	4.13	123.11	7.82	62.40	3.27	27.57	1.59	21.15	1.63	62.00	4.99	58.82	4.32	65.77	4.91	17.77	1.44	24.32	1.73
10+	33	24.80	4.05	127.68	6.02	65.13	2.94	28.65	1.54	22.14	1.75	63.24	7.51	57.92	3.19	68.12	5.42	18.40	1.91	25.29	1.81
11+	33	28.06	5.36	134.15	9.89	67.88	4.83	29.46	2.02	23.30	1.94	66.89	5.90	59.38	3.55	71.28	6.22	19.04	1.77	26.43	2.20
12+	32	31.42	6.24	139.39	7.55	70.75	3.57	30.61	1.65	24.50	2.25	69.85	6.73	60.70	5.06	74.52	7.11	20.08	1.99	27.46	2.63
13+	32	40.81	6.53	146.02	4.99	74.02	2.86	33.31	1.78	27.61	1.83	79.29	5.86	65.69	5.27	84.25	5.99	23.06	2.35	30.20	2.86
14+	30	42.58	5.28	145.91	3.24	73.79	2.41	33.67	2.20	27.66	1.30	81.80	5.94	67.84	4.97	85.95	5.50	23.91	2.43	30.89	1.98
15+	32	43.76	5.33	147.28	4.52	76.27	2.15	34.50	2.10	28.67	1.56	80.28	3.95	66.48	4.72	88.48	5.88	23.44	1.93	31.43	2.25
16+	30	42.93	5.21	147.53	4.31	74.95	3.58	33.93	1.48	28.31	1.64	80.50	3.55	65.79	4.21	86.83	5.19	23.21	1.71	30.89	2.24
17+	30	41.81	3.63	148.06	4.86	75.88	2.34	33.77	0.89	28.09	1.03	78.12	3.11	62.76	4.08	86.78	3.92	23.42	1.60	31.25	1.93
18+	32	41.77	4.69	147.84	4.27	74.70	2.84	33.73	1.61	27.82	1.39	80.57	4.23	65.85	5.90	85.53	5.17	23.41	1.67	30.85	2.12

Table-3 t-test comparison between measurements of Konda Reddi boys versus girls according to age

Age (Yrs.)	Body weight	Stature	Sitting ht.vertex	Bi-acromial breadth	Hip breadth	Chest circumference	Waist Circumference	Hip Circumference	Mid upper arm Circumference	Calf circumference
0+	2.96**	1.76	1.89	1.82	0.96	2.67**	1.56	0.17	0.23	0.20
1+	0.68	0.73	0.64	2.80**	2.85**	1.40	1.05	0.63	1.45	0.26
2+	2.03	0.95	2.82**	0.17	0.26	1.67	0.08	0.68	0.02	0.04
3+	3.36**	2.21**	2.65	2.60**	2.41**	2.52**	3.59**	3.59**	1.70	0.96
4+	0.36	1.75	1.65	0.13	1.02	1.88	2.96**	0.16	0.58	0.24
5+	2.30**	2.23**	2.17**	3.52**	4.18***	2.82**	2.68**	3.49**	3.90**	2.07*
6+	2.08	1.04	1.11	0.41	1.34	1.30	1.53	0.94	2.66**	2.06*
7+	2.96**	2.69**	0.86	3.45**	4.54***	4.23***	2.93**	5.76***	5.99***	4.17**
8+	0.42	0.36	0.94	0.79	1.63	1.11	1.63	2.67**	1.39	1.21
9+	1.10	0.46	1.22	0.70	3.76**	0.41	1.84	3.84**	0.84	2.35*
10+	0.30	2.67**	1.11	0.56	2.27**	0.81	0.94	1.94	2.04*	0.98
11+	3.14**	2.23**	2.21**	3.40**	6.97***	3.48**	1.96	7.10***	5.74***	4.86***
12+	1.89	1.26	1.26	2.22**	4.95***	3.49**	1.48	5.93***	5.34***	3.41**
13+	5.62***	1.17	2.61**	3.35**	9.68***	8.06***	5.19***	10.02***	8.25***	4.94***
14+	3.18**	4.53***	4.22***	0.43	7.78***	6.83***	5.78***	10.35***	8.74***	4.35***
15+	1.03	6.68***	3.07**	2.04*	7.37***	3.81**	3.22**	9.38***	4.62***	2.07**
16+	0.93	5.22***	1.69	3.72**	4.73***	2.75**	2.45**	7.80***	3.86**	0.03
17+	4.85***	6.69***	2.49**	7.31***	3.29***	1.25	2.14*	6.55***	3.44**	0.82
18+	5.05***	9.22***	7.74	7.24***	1.06	0.75	0.63	3.41	2.07*	0.88

***Significant at 5% level, **Significant at 1%level, *Significant at 0.1% level

Table 4: One-way ANOVA results among Konda Reddi Boys and Girls and Comparative values for Mean and Standard Deviation among Kolam Boys and Girls

Variable	Konda Reddi		Kolam*		F-value	*P* value
	Boys	Girls	Boys	Girls		
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD		
Body Weight	25.03±14.00	25.28±13.96	25.45±12.44	22.82±12.15	0.095	0.76
Stature	121.35±29.75	119.56±28.29	125.78±26.22	119.72±27.02	1.121	0.29
Sitting Height Vertex	62.99±12.54	62.16±12.28	63.71±11.42	60.57±11.54	1.340	0.25
Biacromial breadth	27.29±6.61	27.02±6.37	27.92±5.61	26.72±5.73	0.514	0.47
Hip breadth	20.18±4.93	21.38±5.96	20.81±5.00	20.49±5.40	1.452	0.00
Chest Circumference	61.98±12.27	63.79±14.34	62.12±11.04	60.11±12.61	5.491	0.02
Waist Circumference	55.46±8.57	56.24±9.56	57.05±8.76	54.76±8.67	2.187	0.14
Hip Circumference	61.67±13.33	66.23±17.24	63.18±12.69	62.45±13.69	26.06	0.00
Mid upper arm Circumference	17.39±7.02	18.31±4.29	17.50±4.57	16.95±3.49	7.26	0.01
Calf Circumference	23.83± 5.31	24.45±5.75	23.93±5.05	22.78±4.83	3.62	0.05

*Source: *Bharathi and Rao, 2015*

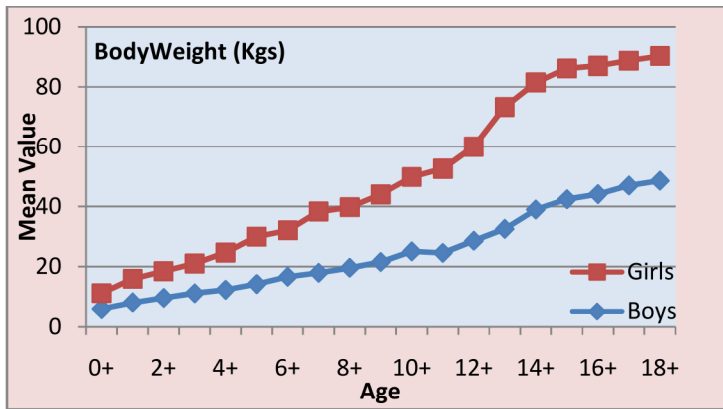# Distance Curves of Konda Reddi tribe

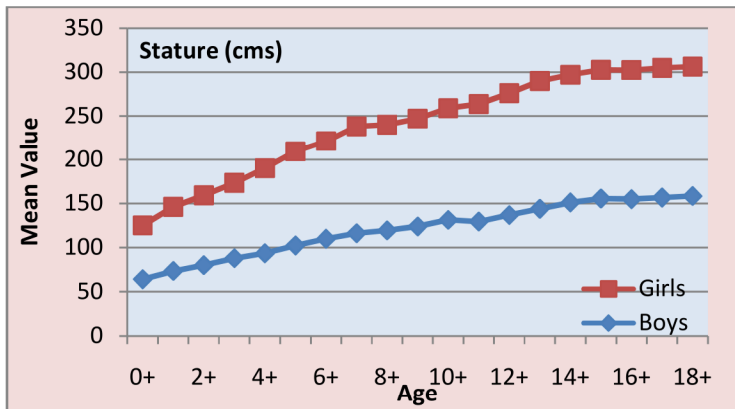**Fig.1: Distance curve of Bodyweight**
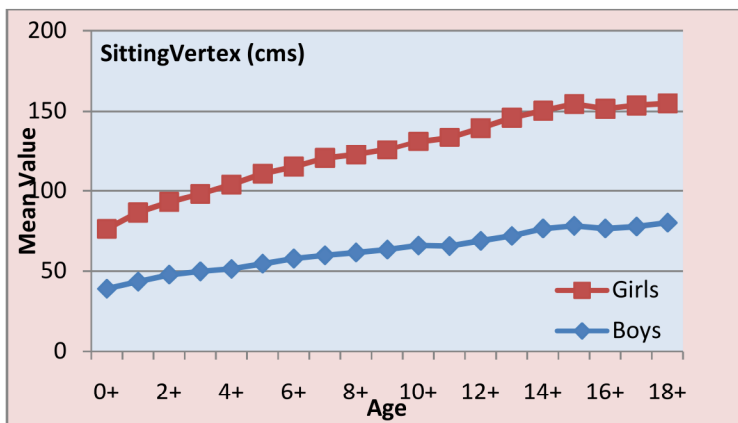

Fig.2: Distance curve of Stature

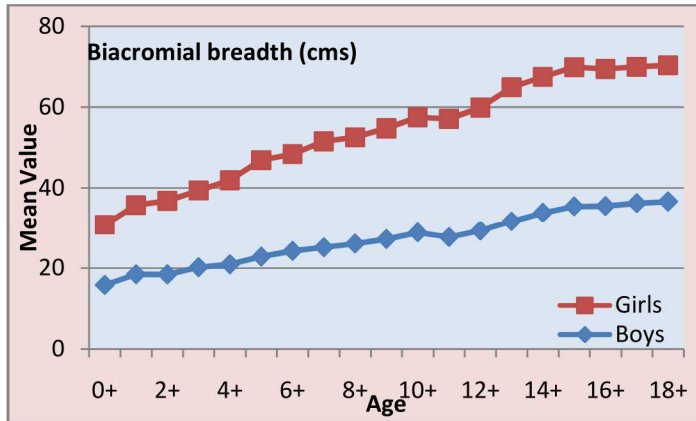
Fig.3: Distance curve of SittingVertex

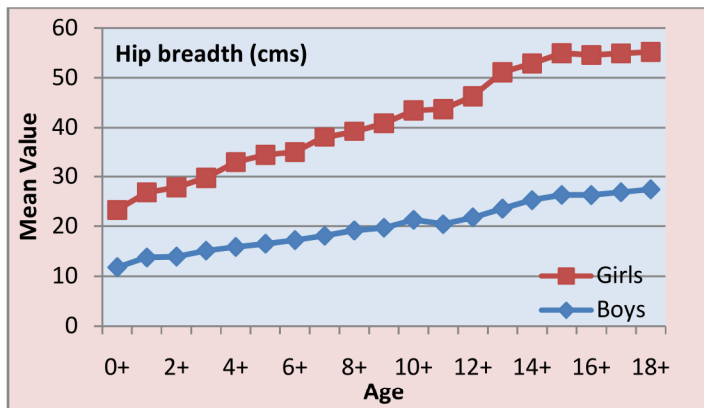**Fig.4: Distance curve of Biacromial breadth**
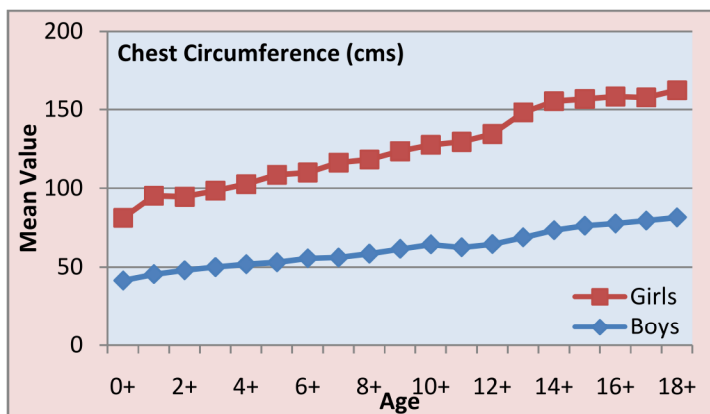

Fig.5: Distance curve of Hipbreadth

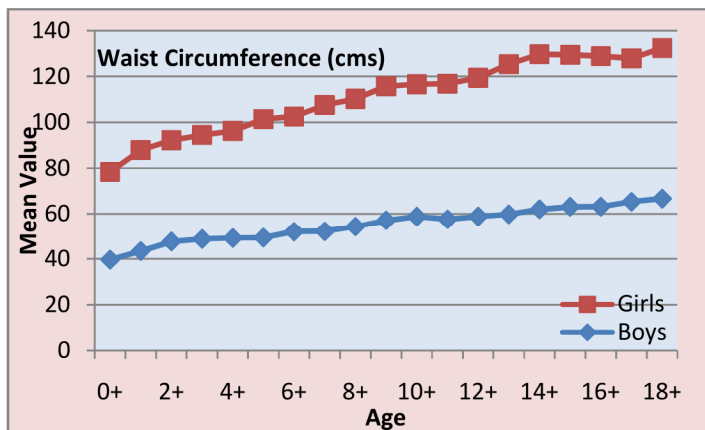**Fig.6: Distance curve of Chest Circumference**
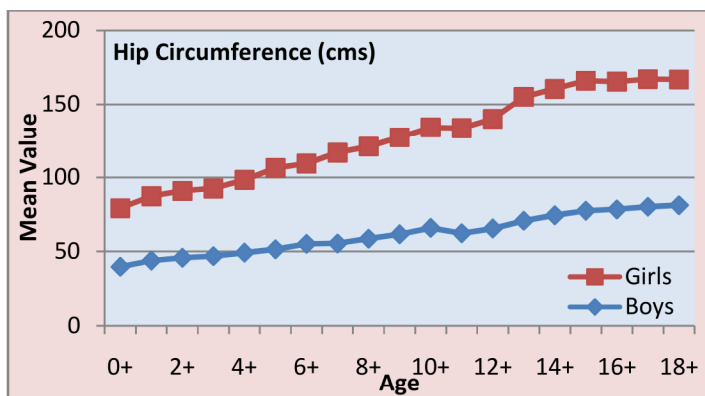
Fig.7: Distance curve of Waist Circumference
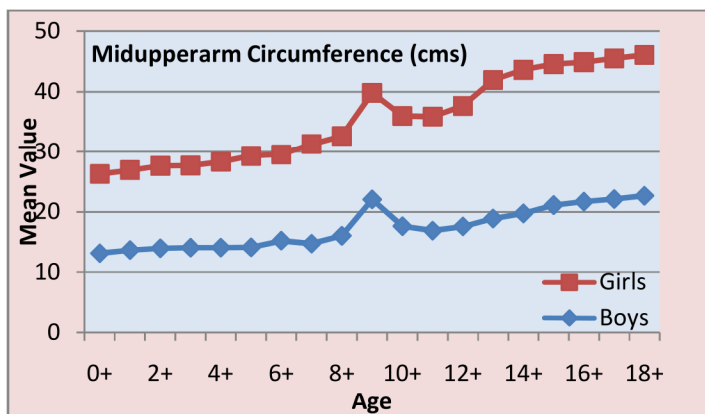

Fig.8: Distance curve of Hip Circumference
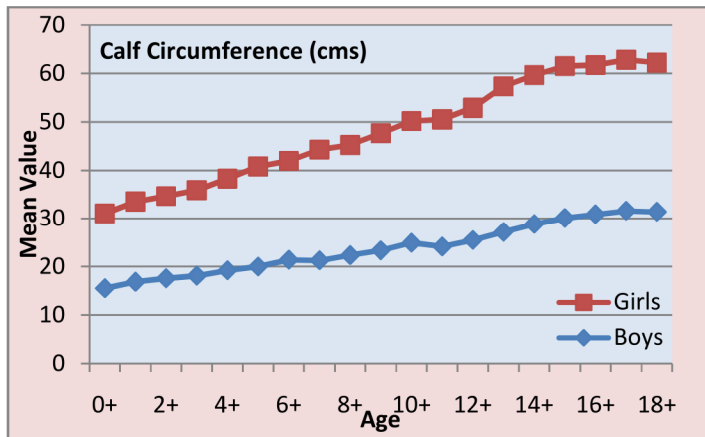

Fig.9: Distance curve of Midupperarm Circumference

Fig.10: Distance curve of Calf Circumference

Descriptives among Konda Reddi Children and Adolescents

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
bodyweight	1	603	25.0348	14.00075	.57015	23.9151	26.1546	2.90	58.00
	2	584	25.2846	13.96761	.57798	24.1494	26.4198	4.30	61.00
	Total	1187	25.1577	13.97912	.40575	24.3616	25.9538	2.90	61.00
stature	1	603	1.2135E2	29.75345	1.21165	118.9692	123.7284	50.30	170.20
	2	584	1.1956E2	28.29621	1.17091	117.2640	121.8634	51.20	185.50
	Total	1187	1.2047E2	29.04713	.84310	118.8164	122.1247	50.30	185.50
sittingvertex	1	603	62.9993	12.54275	.51078	61.9962	64.0025	29.80	86.40
	2	584	62.1651	12.28120	.50820	61.1669	63.1632	32.60	85.50
	Total	1187	62.5889	12.41654	.36039	61.8818	63.2960	29.80	86.40
Biacromialbreadth	1	603	27.2962	6.61380	.26933	26.7672	27.8251	12.50	40.80
	2	584	27.0257	6.37199	.26367	26.5078	27.5436	12.50	43.40
	Total	1187	27.1631	6.49463	.18851	26.7933	27.5329	12.50	43.40
Hipbreadth	1	603	20.1809	4.93287	.20088	19.7864	20.5754	8.40	30.00
	2	584	21.3899	5.96422	.24680	20.9052	21.8746	9.10	50.20
	Total	1187	20.7757	5.49572	.15951	20.4628	21.0887	8.40	50.20
chest_circumference	1	603	61.9837	12.27799	.50000	61.0018	62.9657	34.10	89.00
	2	584	63.7981	14.34750	.59370	62.6321	64.9642	32.10	97.70
	Total	1187	62.8764	13.36157	.38782	62.1155	63.6373	32.10	97.70
waist_circumference	1	603	55.4657	8.57348	.34914	54.7800	56.1514	32.50	91.10
	2	584	56.2449	9.56747	.39590	55.4673	57.0224	32.00	84.20
	Total	1187	55.8490	9.08066	.26357	55.3319	56.3661	32.00	91.10

hip_circumference	1	603	61.6781	13.33143	.54290	60.6119	62.7443	31.40	97.00
	2	584	66.2366	17.24107	.71344	64.8354	67.6379	35.40	101.40
	Total	1187	63.9209	15.54127	.45109	63.0359	64.8059	31.40	101.40
mid_upperarm	1	603	17.3952	7.02460	.28606	16.8334	17.9570	9.90	168.80
	2	584	18.3094	4.29582	.17776	17.9603	18.6585	11.00	30.10
	Total	1187	17.8450	5.85896	.17006	17.5113	18.1786	9.90	168.80
calf_circumference	1	603	23.8385	5.31036	.21625	23.4138	24.2632	11.70	36.00
	2	584	24.4502	5.75629	.23820	23.9823	24.9180	12.40	36.30
	Total	1187	24.1394	5.54036	.16081	23.8239	24.4549	11.70	36.30
biceps	1	603	3.2828	.91916	.03743	3.2092	3.3563	1.80	8.40
	2	584	4.4502	2.27134	.09399	4.2656	4.6348	1.80	22.80
	Total	1187	3.8571	1.81817	.05277	3.7536	3.9607	1.80	22.80
triceps	1	603	5.3355	1.57779	.06425	5.2093	5.4617	2.20	10.60
	2	584	8.4680	3.52998	.14607	8.1811	8.7549	3.20	26.80
	Total	1187	6.8767	3.13743	.09106	6.6980	7.0553	2.20	26.80
subscapular	1	603	5.1678	1.53822	.06264	5.0448	5.2908	2.40	13.40
	2	584	8.2176	4.68843	.19401	7.8366	8.5987	3.00	31.60
	Total	1187	6.6683	3.78590	.10989	6.4527	6.8839	2.40	31.60
suprailiac	1	603	5.7680	2.08855	.08505	5.6010	5.9350	2.40	18.60
	2	584	9.8938	6.37890	.26396	9.3754	10.4123	1.40	49.60
	Total	1187	7.7979	5.14532	.14934	7.5049	8.0909	1.40	49.60
abdominalskinfold	1	603	5.1030	1.75233	.07136	4.9628	5.2431	2.00	15.60
	2	584	7.6183	3.88462	.16075	7.3026	7.9340	2.60	24.00
	Total	1187	6.3405	3.24949	.09432	6.1555	6.5256	2.00	24.00

1 represents 'Male'; 2 represents 'Female'.

ANOVA Results among Konda Reddi Children and Adolescents

		Sum of Squares	df	Mean Square	F	Sig.
bodyweight	Between Groups	18.507	1	18.507	.095	.758
	Within Groups	231744.530	1185	195.565		
	Total	231763.037	1186			
stature	Between Groups	945.352	1	945.352	1.121	.290
	Within Groups	999724.987	1185	843.650		
	Total	1000670.339	1186			
sittingvertex	Between Groups	206.486	1	206.486	1.340	.247
	Within Groups	182639.567	1185	154.126		
	Total	182846.053	1186			
Biacromialbreadth	Between Groups	21.708	1	21.708	.514	.473
	Within Groups	50004.036	1185	42.197		
	Total	50025.744	1186			
Hipbreadth	Between Groups	433.620	1	433.620	14.521	.000
	Within Groups	35387.061	1185	29.862		
	Total	35820.681	1186			
chest_circumference	Between Groups	976.631	1	976.631	5.491	.019
	Within Groups	210761.909	1185	177.858		
	Total	211738.540	1186			
waist_circumference	Between Groups	180.122	1	180.122	2.187	.139
	Within Groups	97615.604	1185	82.376		
	Total	97795.726	1186			
hip_circumference	Between Groups	6164.955	1	6164.955	26.064	.000
	Within Groups	280291.007	1185	236.532		
	Total	286455.962	1186			
mid_upperarm	Between Groups	247.963	1	247.963	7.262	.007
	Within Groups	40464.374	1185	34.147		
	Total	40712.338	1186			
calf_circumference	Between Groups	111.007	1	111.007	3.624	.057
	Within Groups	36294.007	1185	30.628		
	Total	36405.015	1186			
biceps	Between Groups	404.327	1	404.327	136.259	.000
	Within Groups	3516.301	1185	2.967		

		Sum of Squares	df	Mean Square	F	Sig.
	Total	3920.627	1186			
triceps	Between Groups	2911.112	1	2911.112	393.652	.000
	Within Groups	8763.252	1185	7.395		
	Total	11674.364	1186			
subscapular	Between Groups	2759.465	1	2759.465	229.640	.000
	Within Groups	14239.544	1185	12.016		
	Total	16999.009	1186			
suprailiac	Between Groups	5050.155	1	5050.155	227.127	.000
	Within Groups	26348.430	1185	22.235		
	Total	31398.585	1186			
abdominalskinfold	Between Groups	1877.032	1	1877.032	208.928	.000
	Within Groups	10646.149	1185	8.984		
	Total	12523.181	1186			