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A Study of Physical Growth and Nutritional Status Among Savara Tribal Girls of Andhra Pradesh

B. Dharma Rao and B.R. Busi

Department of Anthropology, Andhra University, Visakhapatnam 530 003, Andhra Pradesh, India

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ABSTRACT A cross-sectional study was undertaken among Savara tribal girls in ITDA schools situtated in the Seetampeta mandal of Srikakulam district of Andhra Pradesh (South India) during April, 1992 to January, 1996. The sample consisted of 183 healthy girls aged 6+ to 18+ years. In this paper, data on stature, body weight, upper arm, calf, and chest circumferences and skinfolds at triceps, biceps, subscapular, suprailiac, medial calf and fore arm sites are presented including patterns of change in these physical traits and quantitative assessment of nutritional status with advancing age. Analysis of the data reveal that all the dimensions exhibited the maximum mean annual increments between 11 and 12 years. These girls are taller and heavier than the National standards (ICMR, 1984). Thus both extensive and intensive research is conducted among Savara tribal girls to suggest programmes and strategies for improvement of the nutritional status and proper management of health. The findings of the study can be used as a reference material for Savara tribal girls.

INTRODUCTION

Physical growth studies among tribal populations have been conductd in different regions of the country by several scholars (see review by Singh, 1980; Reddy, 1989; Nath et al., 1991; Kapoor and Kapoor, 1991; Sharma, 1991, and Dharma Rao and Busi, 1994, 1995, 1996 and others). However, in the Seetampeta ITDA of Srikakulam region there is dearth of published material related to growth and development of tribal girls; and the Indian Council of Medical Research (ICMR, 1984) in their nationwide growth survey did not include the Savara tribal girls of Srikakulam district. A cross-sectional growth study of Savara tribal girls was therefore undertaken in April 1992 to January, 1996 covering 23 measurements. In the present study an attempt has been made to study the effect of age from 6+ through 18+ years on eleven body measurements throughout the growth period, and also to study the adolescent growth spurt and nutritional status of Savara tribal girls, and to compare this tribal sample with other tribal girls of India in order to find out the population differences of physical growth and nutritional status. The present paper reports the eleven body measurements and nutritional status derived on the Savara tribal girls of Seetampeta ITDA of Srikakulam district of Andhra Pradesh.

MATERIAL AND METHODS

Savaras are one of the important and ancient tribal groups living in Srikakulam and Vizianagaram districts of Andhra Pradesh and Ganjam district of Orissa state. Their population according to 1981 census reports is 81,121. Savaras generally live on hill tops or valleys in linear shaped rows of huts parallel to each other. Konda Savaras of Srikakulam and Vizianagaram districts who are eking out their livelihood by shifting cultivation, are recognised as primitive tribal groups by Government of India for taking up special schemes for their development. For details refer Dharma Rao and Busi (1995).

The material of the present study comprises of cross-sectional data collected on 183 Savara tribal girls drawn from 10 ITDA schools of Seetampeta, Srikakulam district of Andhra Pradesh during the months of April 1992 to January 1996. The age of these subjects ranged from 6+ to 18+ years. The exact date of birth was collected for every subject either from the concerned school registers or from birth

records of the Panchayats. All the subjects between age 6.00 to 6.99 years were in 6+ age group and so on upto 18+ years is calculated after Eveleth and Tanner (1976). The measurements on each individual were taken during the working hours of the schools with minimum clothing. All bilaterally represented measurements were taken on the left. The Anthropometric measurements were taken after Weiner and Lourie (1969). The measurements were taken by the first author.

The whole year mean increments have been calculated by subtracting the mean of the preceding age group from that of the succeeding age group. The values for a growth velocity of a measurements are easily obtained by subtracting for that variable, say at age 'A' from its mean value at age (A+1 year) is as below.

$$\text{Velocity (V)} = \bar{X}\,(A+1) - \bar{X}.A.$$

For diet survey - individual dietary intake using 24 hours recall method (Thimmayamma and Parvathi Rau, 1983) was used for quantity of nutritional assessment. The information was obtained from the mothers. The quantity of food taken by an individual has been estimated. The values obtained is then converted into their nutritive values using the food composition table of Gopalan et al. (1989). The average nutritive values in terms of calories, protein, calcium, iron, and vitamins, thiamine, riboflavin, niacine and vitamin 'C' in the food consumed in a day by subjects of each age groups are assessed in this way.

RESULTS AND DISCUSSION

Mean values and standard deviations for each anthropometric measurement for each individual year of age are depicted in tables 1 and 2. It can be inferred from the tables that the mean values for all of these physical traits increase with advancement of age with a few fluctuating discrepancies of a minor nature because the data are cross-sectional. In Savara tribal girls a steady increase in stature is noticed upto the age of 12 years. The mean stature of 6 years age group is about 109 cm and one and half times by 18 years. The highest mean annual gain (11.19 cm per year) has occurred between 11 and 12 years while the maximum mean annual loss (-0.05 cm per year) is noticed between 16 and 17 years. Like stature the mean body weight also increases continuously upto the age of 16 years. The mean body weight of 6 years age group is about 15 kg; it is doubled by 12 years, and thrice by 17 years. The highest mean annual gain (+6.32 kg per year) has occurred between 11 and 12 years while the maximum mean annual loss (-0.18 kg per year) is found between 9 and 10 years.

The mean upper arm circumference of 6 years age group is about 14 cm, it is one and half times by 16 years. An increment of 3 cm is noticed from 16 to 18 years. The mean calf circumference for 6 year age group is 20 cm. It is one and half times by 18 years. The maximum mean annual increase of upper arm (+2.18 cm per year) has occurred between 11 and 12 years. While the maximum annual loss of upper arm circumference (-0.17 cm per year) is found between 7 and 8 years. The highest mean annual gain (+2.39 cm) of calf circumference has occurred between 10 and 11 years while the maximum mean annual loss (-0.06 cm) is found between 9 and 10 and 14 and 15 years. The mean chest circumference at 6 years is about 52 cm, it is one and half times by 18 yeas. The highest mean annual gain (+4.28 cm) has attained between 11 and 12 years, while the maximum mean annual loss of chest circumference (-0.03 cm) per years is observed between 14 and 15 years.

From the table 2 it is clear that all the six skinfold characters show non-normal distribution at several ages. Fat fold at Biceps region increase gradually with minor irregularities in the mean from 6 to 17 years; the highest mean annual gain (+0.53 mm) has occurred between 12 and 13 years while the maximum mean annual loss of thickness (-0.91 mm per year) is found between 17 and 18 years; and then de-

Table 1 : Mean and standard deviation of five body measurements among Savara tribal girls of Andhra Pradesh

Age (in years)	N	Stature		Body weight		Upper arm		Calf circumference		Chest circumference	
		$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
6+	16	109.24	4.20	15.71	1.18	14.45	0.88	20.00	1.19	52.62	1.46
7+	11	117.10	4.30	18.90	1.75	15.56	0.83	22.18	1.07	54.77	2.73
8+	16	119.65	3.52	19.78	1.66	15.39	0.94	21.12	1.28	56.15	2.85
9+	12	124.99	6.71	22.87	3.39	16.00	1.02	22.74	1.45	56.91	3.44
10+	13	125.84	3.84	22.69	2.02	16.16	1.07	22.68	1.21	58.57	3.66
11+	14	132.22	4.76	25.53	1.59	16.79	0.92	25.07	1.85	61.36	2.93
12+	14	143.41	4.30	31.85	1.83	18.97	1.24	25.95	1.08	65.64	2.84
13+	12	144.47	3.34	35.16	2.20	19.22	0.57	25.70	1.23	69.77	2.64
14+	14	145.22	6.03	36.78	1.88	20.28	1.20	27.93	0.99	70.07	2.55
15+	15	149.23	2.87	37.00	1.51	20.52	1.36	27.87	1.11	70.04	4.63
16+	15	156.92	4.06	44.66	3.37	21.68	1.49	29.24	1.34	78.79	4.33
17+	15	156.42	9.09	46.66	4.08	23.15	1.88	29.70	1.83	75.20	3.29
18+	15	157.37	7.42	48.66	4.41	24.02	1.64	29.80	1.37	76.94	5.07

Table 2 : Mean and standard deviation of six body measurements among Savara tribal girls of Andhra Pradesh

Age (in years)	N	Triceps		Biceps		Subscapular		Medical calf		Supra iliac		Forearm	
		$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
6+	16	6.33	0.97	4.56	1.21	5.31	0.73	8.23	1.77	5.05	1.18	4.97	1.27
7+	11	6.89	1.28	5.05	0.73	5.65	0.93	9.10	2.01	5.52	0.84	5.16	0.81
8+	16	6.23	1.28	4.62	1.33	5.75	0.97	8.61	1.54	5.58	0.94	4.85	1.11
9+	12	6.23	1.22	4.56	0.60	6.45	1.74	8.95	1.61	5.70	1.21	5.13	0.95
10+	13	5.78	0.86	4.15	0.69	5.49	0.47	8.15	1.66	5.69	1.49	4.67	0.76
11+	14	7.10	1.78	4.30	1.40	6.75	0.93	8.57	1.17	6.34	1.25	4.72	0.95
12+	14	7.11	1.20	4.70	1.40	7.95	1.92	8.50	2.52	6.40	1.87	5.05	0.69
13+	12	7.43	0.81	5.23	0.87	7.01	0.52	9.06	1.95	7.31	1.42	4.98	0.42
14+	14	9.64	1.97	5.70	1.00	8.41	1.84	11.42	2.23	7.61	1.43	6.14	0.76
15+	15	8.74	2.66	5.68	0.75	7.25	2.25	9.44	1.69	7.18	2.62	5.22	0.64
16+	15	7.89	1.20	6.24	0.66	8.16	0.50	8.42	0.21	7.96	0.59	5.88	0.57
17+	15	9.22	1.44	6.69	0.86	8.58	0.48	11.82	1.84	6.69	0.61	6.37	0.68
18+	15	9.16	3.22	5.78	1.41	9.65	1.47	10.57	3.13	8.74	2.04	5.68	1.04

Table 3 : Average daily intake of nutrients by Savara tribal girls age 6+ to 15+ years (one day diet survey)

Age (in years)	Protein Mean (gms)	Calories Mean (K.cal)	Calcium Mean (mg)	Iron Mean (mg)	Thiamine Mean (mg)	Riboflavin Mean (mg)	Niacin Mean (mg)	Vitamin C Mean (mg)
6+	22.51	1097.21	274.60	7.10	0.50	0.35	6.61	31.47
7+	33.43	1540.71	236.81	8.81	0.49	0.54	8.26	2.72
8+	44.86	1428.83	537.91	18.38	1.10	0.90	13.41	78.60
9+	36.10	1296.35	134.99	7.05	0.49	0.37	7.64	4.82
10+	41.00	2002.81	590.00	16.01	0.81	4.18	7.80	15.80
11+	48.26	1777.68	176.09	9.90	0.74	0.48	10.45	7.04
12+	62.46	2977.80	106.03	19.25	1.48	1.07	15.04	17.76
13+	81.03	4163.00	119.98	28.83	2.08	1.48	22.87	78.85
14+	86.45	4086.79	142.00	24.24	2.01	1.55	21.46	33.28
15+	55.76	2765.70	767.16	18.99	1.17	0.98	13.80	6.93
Total in all age groups	45.47	2010.53	552.00	14.83	0.64	1.38	11.35	29.59

cline. The mean triceps decreases continuously throughout 6 to 10 years; and from 11 to 14 years increases. The highest mean annual gain (1.32 mm per year) has occurred between 10 and 11 years while the maximum mean annual loss of thickness (-2.21 mm per year) is found between 13 and 14 years increases by 18 years.

The mean subscapular skinfold decreases 6 to 9 years and increases by 14 years. The highest mean annual gain (+1.40 mm per year) has occurred between 13 and 14 years while the maximum mean annual loss (-1.16 mm per year) is noticed between 14 and 15 years and it increases by 18 years. The mean medial calf skinfold increases 6 to 17 years with minor irregularities. The highest mean annual gain (+2.36 mm) has attained between 13 and 14 years while the maximum mean annual loss of thickness (-1.98 mm per year) is noticed between 14 and 15 years and it declines by 18 years.

The mean fore arm skinfold increases 6 to 9 years. The highest mean annual gain (+1.16 mm) has attained between 13 and 14 years, the maximum annual loss (-0.92 mm) is observed between 14 and 15 years, and it increases by 17 years and declines by 18 years. The mean suprailiac skinfold at 6 years gradually increases from 6 to 18 years (Table 2). The highest annual gain (+0.65 mm) has attained between 10 and 11 years, the maximum mean annual loss (-1.27 mm per annum) is noticed between 16 and 17 years.

The maximum mean annual increments or highest peak velocity of calf circumference (2.39 cm), triceps (1.32 mm), subscapular skinfolds (1.26 mm) were attained between 10 to 11 years which is earlier by a year than stature (11.19 cm), body weight (6.32 kg), upper arm circumference (2.18 cm) *i.e.* 11 and 12 years; and two years earlier than biceps (0.53 mm) and suprailiac (0.91 mm) *i.e.* 12 and 13 years; and three years earlier than medical calf (2.36 mm) and fore arm (1.16 mm), skinfolds *i.e.* 13 and 14 years.

The mean consumption of calories, protein, calcium, iron, thiamine, riboflavin, niacin and vitamin 'C', however appear to be rather inadequate in terms of the daily requirements prescribed by ICMR (1968). The quantitative data on nutritional assessment through diet recall reflect a gross deficiency of calories intake in Savara tribal girls particularly from 9 and 11 years. These suggests that the prolonged deficiency of calories intake in the preceding years is reflected in the delayed or sharp adolescent spurt and post adolescent spurt. The fat fold recession just before the spurt age indicates the assimilation of body fat during deprived condition. They also strengthen the suggestions of the role of specific nutrients in specific growth periods. Thus both extensive and intensive research is conducted among Savara tribal girls to understand the Nutritional deficiency disorders and to suggest programmes and strategies for improvement of the nutritional status and proper management of health (Table 3).

It will be evident from the foregoing results that the findings among Savara tribal girls reveals that they are taller and heavier than the findings of Singh (1980), and Dharma Rao and Busi (1994), and taller than the findings of Nath et al. (1991) and taller and heavier and narrow chest than the National standards (ICMR 1984), and similar to the findings of Sharma (1991). These findings are general, universal in character and observed in many populations (Johnston et al., 1975). The results generated in this paper can therefore be utilised as reference material for the Savara tribal girls in Seetampeta ITDA of Srikakulam district of Andhra Pradesh. Goldstein and Tanner (1980) have recently pointed out that the findings obtained from such studies would be useful as an alternative to the growth standards.

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REFERENCES

Dharma Rao, B. and Busi, B.R. : Patterns of physical growth and maturational sequence among Chenchu Tribal boys of Andhra Pradesh, *Bionature, Vol.* **14** (1995).

Dharma Rao, B. and Busi, B.R. : A study of physical growth among Jatapu tribal boys of Andhra Pradesh. *J. Hum. Ecol.*, **5** : 281-286 (1994).

Dharma Rao, B. and Busi, B.R. : Growth progression and maturational sequence among Savara tribal boys of Andhra Pradesh, India. *J. Hum. Ecol.*, **6** : 89-96 (1995).

Das Gupta : Changes in chest and calf circumferences and biceps and suprailiac skinfolds of Bengali boys. *Ind. J. Phys. Anthrop. Hum. Genet.*, **17** : 195-204 (1991).

Eveleth P.B. and Tanner, J.M. : *World Wide Variation in Human Growth.* Cambridge University Press Cambridge (1976).

Goldstein, H. and Tanner, J.M. : Ecological considerations in the creation and use of child growth standards. *Lancet*, **1** : 582-585 (1980).

Gopalan, C. and Rao, B.S. Narasinga : Dietary allowances for Indians. *Special Report Series No.* **60** ICMR (1968).

Heald, F.P., Reminall, P.S. and Mayer, J. : Calorie, protein and fat intakes in children and adolescents. pp. 17-36 In : *Adolescent Nutrition and Growth.* F.P. Heald (Ed.). Butterworth, London (1969).

ICMR : Growth and physical development of Indian infants and children. *ICMR Technical Report Series No.* **18** (1984).

Johnston F.E., Bordon, M. and Macvean R.B. : The effects of Genetic and environmental factors upon the growth of children in quatemala city - In : *Bio-social Inter-relations in Population Adaptation* - E.S. Welts, F.E. Johnston and G.W. Lasker (Eds.) Mouton Publishers, The Hague (1975).

Kapoor, S. and Kapoor, A.K. : Growth in physical and physiological variables of Santhal tribals, West Bengal, *Ind. J. Phys. Anthrop. Hum. Genet.*, **17** : 219-222 (1991).

Nath, S., Sachdeva, V. and Chauhan, N. : Progression of maturational sequence in stature and linear measures of the extremities and sex differences among Lodhas of West Bengal. *Ind. J. Phys. Anthrop. Hum. Genet.*, **17** : 205-218 (1991).

Patwardhan U.N. : Dietary allowances for Indians : Calories and proteins. *Special Report Series No.* **35**, ICMR (1960).

Reddy, K.N. : *Growth and Physical Changes During Adolescence Among Bhil Boys of Rajasthan,* Anthropological Survey of India, Calcutta (1989).

Sharma, J.C. : Physical growth and sexual and skeletal maturity of Panjabi adolescents in relation to their socioeconomic status. *Ind. J. Phys. Anthrop. Hum. Genet.*, **17** : 139-154 (1991).

Singh, S.P. : Physical growth of Gaddi Rajputs of Dhaula Dhar range of Himalayas. *Z. Morph. Anthrop.*, **71** : 65-81 (1980).

Singh, S.P., Sidhu, L.S. and Malhotra, P. : Growth performance of Punjabi children aged 6-12 years. *Ann. Hum. Biol.*, **14** : 169-179 (1987).

Tanner, J.M. : Human growth and constitution. pp. 289-397. In : *Human Biology.* G.A. Harrison, J.S. Weiner, J.M. Tanner and N.A. Barnicot (Eds.). Oxford Univ. Press, London (1964).

Tanner, J.M., Whitehouse, R.H. and Takaishi, M. : Standards from birth to maturity for height, weight, height velocity and weight velocity, British Children 1965. *Arch. Dis. Childh.*, **41** : 454-471, 613-635 (1966).

Thimmayamma, B.V.S. and Rao, Parvathi : Food consumption patterns of rural families by weighment and expenditure pattern of diet survey. *Ind. J. Nut. Dietet.*, **24** : (1987).

Weiner, J.S. and Lourie, J.A. : *Human Biology Handbook No. 9.* Blackwell Scientific Publications, Oxford and Edinburgh (1969).