J. Hum. Ecol., 8 (5) : 355-359 (1997)
DOI: 10.31901/24566608.1997/08.05.05

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

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KEY WORDS Jatapu. Andhra Pradesh. Anthropometric Measurements. Growth.

ABSTRACT The cross-sectional study was undertaken in rural schools situated in the Seetampeta ITDA of Srikakulam district of Andhra Pradesh during April 1992 to March, 1995. The sample consisted of 242 healthy Japtpu tribal girls aged 6+ through 18+ years. In this paper data on stature, body weight, upper arm, calf and chest circumferences and triceps, biceps. subscapular, medial calf. supra-iliac and fore arm skinfolds are presented including patterns of change in these measurements and quantitative assessment of nutritional status with advancing age. The study reveals that Jatapu tribal girls attain maximum annual increase between 11 and 12 years for all measurements except triceps, subscapular, supra-iliac and fore arm skin folds which in turn exhibit it a delayed spurt *i.e.* 12 and 13 years. These girls are shorter and lighter than the national standards (ICMR, 1984). Both extensive and intensive research is conducted among Jatapu 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. The findings of the study can be used as a reference material for Jatapu tribal girls.

INTRODUCTION

Physical growth studies among tribal population have been conducted 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; Dharma Rao and Busi, 1994; 1995; 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 Jatapu tribal girls of Srikakulam district. A cross-sectional growth study of Jatapu tribal girls was therefore undertaken in April 1992 to March 1995 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 Jatapu 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. The present paper reports the eleven body measurements and nutritional status derived on the Jatapu tribal girls of Seetampeta ITDA of Srikakulam district of Andhra Pradesh.

MATERIAL AND METHODS

Jatapu is one of the predominant Scheduled tribe population of Srikakulam, Vizianagaram and Visakhapatnam districts of Andhra Pradesh, and in the adjoining Koraput and Ganjam district of Orissa state. The total Jatapu tribal population in this field area is 86,762 for the present study (1981 census). Shifting cultivation or podu cultivation is prevalent on hill slopes cleared by forest growth (For details *see* Dharma Rao and Busi, 1994). The material for the present study is based on a cross-sectional data collected on 242 Jatapu tribal girls drawn from ten ITDA schools of Seetampeta, Srikakulam district of Andhra Pradesh during the months of April 1992 to March, 1995. During field data collection each girl was measured once only and the different girls were measured covering different age groups. The age of the 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 pan-

chayats. The doubtful cases were excluded from the present sample. All the subjects between ages 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 measurements were taken after Weiner and Lourie (1969).

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 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.

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

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 nutitive 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 group are assessed in this way.

RESULT AND DISCUSSION

Mean values and standard deviations for each anthropometric measurements for each individual year of age are depicted in table 1 and 2. It can be inferred from the tables that the mean values for all of these measurements increase with advancement of age with a few fluctuating discrepancies of a minor nature because the data are cross-sectional. From the table 2 it is clear that all the six skinfolds characters show non-normal distributions at several ages. In the circumferential dimensions of chest, upper arm, and calf circumferences which give the composite measurements of bone, muscle and fat, the maximum annual increase has occurred between 11 and 12 years.

In Jatapu 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 107 cm and one and half times by 18 years. The highest annual gain (+5.53 cm) has occurred between 11 and 12 years. In fact, after highest peak velocity between 11 and 12 years there should be decelerating phase. Like stature the mean body weight also increases continuously upto the age of 13 years. The mean body weight of 6 years age group is about 15 kg it is doubled by 12 years, and thrice by 18 years. The highest annual gain (+5.02 kg) has attained between 11 and 12 years. The mean upper arm circumference of 6 years age group is about 14 cm, it is one and half times by 14 years. The highest annual gain (+1.59 cm) has attained between 11 and 12 years. An increment of 3 cm is noticed from 14 to 18 years. The mean calf circumference of 6 years age group is about 19 cm, it is one and half times by 18 years. The highest annual gain (+2.22 cm) has attained between 10 and 11 years. An increment of 3 cm is noticed from 11 to 18 years.

The mean chest circumference at 6 years is about 51 cm, it is one and half times by 18 years. The highest annual gain (+4.74 cm) has attained between 11 and 12 years, while the maximum mean annual loss of chest circumference (-3.18 cm) is observed between 17 and 18 years. The skinfold at triceps region increase gradually with minor irregularities in the mean from 6 to 10 and 11 to 18 years; the highest annual gain (+1.81 mm) has attained between 12 and 13 years, while the maximum mean annual loss (-0.22 mm per year) is found between 6 and 7 years. The mean biceps skinfold at 6 years is 5 mm and then steadily increases from 6 to 13 years and decreases by 14 years and increase gradually with minor irreg-

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

Age (in years)	*N*	*Stature*		*Body Weight*		*Upper arm circumference*		*Calf circumference*		*Chest circumference*	
		$\overline{X}$	*S.D.*	$\overline{X}$	*S.D.*	$\overline{X}$	*S.D.*	$\overline{X}$	*S.D.*	$\overline{X}$	*S.D.*
6+	31	107.76	4.22	15.69	1.73	14.36	0.81	19.84	1.04	51.22	1.75
7+	32	117.66	4.46	19.06	1.68	15.38	0.82	21.32	1.50	54.53	2.27
8+	26	120.10	6.38	20.54	2.15	15.88	0.82	21.82	1.20	55.03	2.58
9+	19	126.90	6.00	23.29	2.24	16.32	0.76	23.58	1.71	56.84	2.31
10+	15	131.10	3.89	25.46	2.43	16.78	1.18	23.00	2.07	58.66	2.71
11+	20	136.57	2.79	29.05	2.47	18.15	1.11	25.22	1.25	61.00	2.80
12+	14	142.10	4.56	34.07	2.54	19.74	0.55	27.02	0.94	65.74	3.41
13+	14	143.25	4.25	36.25	3.95	20.95	1.61	27.09	2.35	68.10	3.36
14+	15	143.69	2.31	37.06	2.71	20.44	1.32	27.46	1.31	68.40	1.90
15+	15	148.62	3.96	41.46	3.27	22.20	1.00	29.64	1.00	68.60	4.30
16+	15	149.08	2.65	42.40	2.05	22.91	1.26	28.58	1.37	73.57	1.77
17+	14	150.24	4.12	44.21	3.33	23.09	2.24	28.07	3.03	75.35	4.53
18+	12	152.60	5.26	43.87	2.59	23.87	1.31	28.99	0.16	72.17	1.29

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

Age (in years)	*N*	*Triceps*		*Biceps*		*Subscapular*		*Medial calf*		*Spurailiac*		*Forearm*	
		$\overline{X}$	*SD*	$\overline{X}$	*SD*	$\overline{X}$	*SD*	$\overline{X}$	*SD*	$\overline{X}$	*SD*	$\overline{X}$	*SD*
6+	31	6.99	1.34	5.12	1.52	5.80	0.96	8.43	1.83	5.42	1.22	5.80	1.14
7+	32	7.21	1.39	4.96	1.36	5.81	1.01	8.70	1.76	5.97	1.75	5.48	1.24
8+	26	7.25	1.48	5.30	1.41	6.03	1.29	9.35	1.93	5.90	1.44	5.76	0.69
9+	19	7.41	1.02	5.80	1.16	6.75	1.30	9.81	1.68	6.80	1.45	5.44	0.79
10+	15	7.55	1.39	5.16	0.90	6.78	1.08	9.22	2.25	6.61	0.89	5.65	1.24
11+	20	8.65	2.07	6.25	2.07	7.48	1.37	10.42	1.79	6.97	1.60	6.09	1.51
12+	14	9.64	1.94	6.32	1.48	8.14	1.18	11.38	1.66	7.44	2.59	6.37	1.07
13+	14	11.45	3.44	7.10	1.70	10.28	3.21	10.92	2.58	9.60	3.85	7.40	2.32
14+	15	10.68	2.02	6.85	0.70	9.22	0.96	9.22	2.83	8.13	1321	5.80	1.10
15+	15	13.21	3.43	7.60	1.35	11.20	1.00	12.57	1.92	10.29	1.84	8.44	1.57
16+	15	12.66	1.93	6.86	1.26	9.72	3.57	11.26	0.99	9.41	1.76	7.64	1.32
17+	14	11.68	1.19	8.02	2.14	10.42	0.72	10.45	1.82	9.91	3.22	7.01	0.55
18+	12	15.40	4.64	6.91	1.15	10.58	2.46	11.96	3.46	10.61	1.47	6.60	0.86

Table 3 : Average daily intake of nutrients by Jatapu tribal girls age 6+ to 18+ years (24 hour recall method)

Age in years	*Protein Mean (gms)*	*Calories Mean (K.cal)*	*Calcium Mean (mg)*	*Iron Mean (mg)*	*Thiamine Mean (mg)*	*Riboflavin Mean (mg)*	*Naicin Mean (mg)*	*Vitamin C Mean (mg)*
6+	39.02	1278.15	281.28	14.49	0.55	0.64	6.09	3.72
7+	47.58	2212.40	996.03	17.08	2.62	0.75	6.37	3.18
8+	49.08	1414.62	121.28	19.92	1.25	0.31	4.43	13.69
9+	51.26	2484.63	114.38	21.94	1.57	0.85	11.39	2.17
10+	61.75	2956.30	170.19	6.96	0.70	0.58	17.04	12.24
11+	63.30	3095.28	116.08	19.86	1.68	0.96	14.75	2.17
12+	59.78	2496.46	441.20	10.61	0.83	0.93	12.21	0.59
13+	41.66	2144.60	137.12	6.69	0.38	0.41	11.55	8.28
14+	43.20	2180.61	241.34	9.38	0.55	0.96	12.29	2.17
15+	62.49	2537.71	214.07	18.07	0.87	0.61	14.24	9.76
16+	57.07	2889.61	131.11	6.33	0.52	0.56	16.01	9.58
17+	48.36	2291.88	235.37	11.18	0.63	0.48	12.29	2.94
18+	57.62	2939.88	160.84	9.53	0.53	0.58	16.16	12.08

ularities in the mean from 15 years age group with advancing ages till 18 years with mean values 7 mm. The highest annual gain (+0.32 mm), (+0.34 mm) has attained between 10 and 11 years and 16 and 17 years, respectively. From 17 years the mean values gradually decreases to 18 years.

The mean subscapular skinfold thickness at 6 years is 5.80 mm and then gradually increases with minute irregularities from 6 to 18 years. The highest annual gain (+2.14 mm) has attained between 12 and 13 years while the maximum mean annual loss (-0.01 mm) is noticed between 6 and 7 years. The mean medial calf skinfold increase 6 to 12 years and decreases by 13 and 14 years. The highest annual gain (+1.20 mm per year) has attained between 10 and 11 years, while the maximum mean annual loss of thickness (-0.46 mm per year) is observed between 12 and 13 years and the remaining mean values 14 to 18 years is almost stationary.

The mean supra iliac skinfold at 6 to 13 years gradually accelerated and also same trend from 14 to 18 years. The highest annual gain (+2.16 mm) has occurred between 12 and 13 years, the maximum mean annual loss (-0.07 mm per year) is noticed between 7 and 8 years (Table 2). The mean fore arm skinfold increases 6 to 13 years and with minor irregularities it declines by 14 and again increases by 15 years and it declines. The highest mean annual gain (+1.03 mm per year) has attained between 12 and 13 years while the maximum mean annual loss of thickness (-0.32 mm per year) is noticed between 6 and 7; and 8 and 9 years.

The adolescent growth spurt of calf circumference (2.22 cm), biceps (1.09 mm) and medial calf skinfold (1.20 mm) is attained between 10 and 11 years, which is early by a year than stature (5.53 cm), body weight (5.02 kg), upper arm circumference (1.59 cm), chest circumference (4.74 cm) were attained between 11 and 12 years, which is earlier by two years than triceps skinfold (1.81 mm), subscapular (2.14 mm), suprailiac (2.16 mm) and fore arm (1.03 mm) *i.e.* 12 and 13 years. Adolescence has a special significance in the study of human growth since extrauterine growth in terms of velocity accelerates only during the first half of the adolescent period (Heald et al., 1969). This is the period of maximal increment and development of the body.

The data on diet history of the Jatapu tribal children concerned suggest the nature of variation in their diet throughout the year or seasons. The quantitative data on nutritional assessment through diet reflect a gross deficiency of calories intake in the Jatapu tribal girls and particularly from 8 and 13 years. However, the nutritional data indicate lower consumption of nutrients like protein, calcium, iron and vitamin like thiamine, riboflavin, niacin and vitamin 'C' were observed. These suggest that the prolonged deficiency of calories intake in the preceding years is reflected in the 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 period (Table 3).

It will be evident from the foregoing results that the findings among Jatapu tribal girls reveals that they are more or less similar to the findings of Singh (1990), Dharma Rao and Busi (1994); taller than the findings of Nath et al. (1991), and shorter and lighter and bigger chest circumference than the National standards (ICMR, 1984), and shorter than the findings of Sharma (1991). These findings are general, universal in character and are observed in many populations (Johnston et al., 1975). The Jatapu tribal girls are lighter in weight and smaller in stature than the well-off populations of the world. The calories intake in the Jatapu girls are lower than the recommended dietary allowances prescribed by ICMR (1968). Thus both extensive and intensive research is conducted among Jatapu tribal girls to suggest programmes and strategies for improvement of

the nutritional status and proper management of health. The results generated in this paper can therefore be utilized as reference material for the Jatapu tribal girls in Seetampeta ITDA of Srikakulam district of Andhra Pradesh. Goldstein and Tanner (1980) have pointed out that the findings obtained from such studies would be useful as an alternative to the growth standards.

ACKNOWLEDGEMENT

Dr. B. Dharma Rao acknowledges the financial support from I.C.M.R. as Research Associate which enabled the author to carryout the analysis and preparation of the paper.

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