

A Study of Physical Growth Among Jatapu Tribal Boys of Andhra Pradesh

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ABSTRACT A cross-sectional study was undertaken among Jatapu tribal boys in rural schools situated in the Seetammapeta mandal of Srikakulam district of Andhra Pradesh (South India) during April, 1992 to September 1993. The sample consisted of 341 healthy boys aged 6 to 18 years. In this paper, data on height, body weight, upper arm circumference, calf circumference and skinfolds at biceps, triceps, subscapular, medial calf, forearm and suprailiac sites are presented, including patterns of change in these physical traits with advancing age. It has been observed that there is an increase in all the dimensions with increase in age except skinfolds. Analysis of the data reveal that all the dimensions exhibited the maximum mean annual increments between 12 and 15 years. There exists a second peak velocity in some of the measurements between 15 and 17 years. These boys are shorter and heavier than the National Standard (ICMR, 1984). The findings of the study can be used as a reference material for Jatapu tribal boys.

Growth trends do not exhibit much variation. The different parts of the body, despite the fact that they grow at different rate and time, express a fairly regular sequence of development. Many studies show that the patterns of physical growth and development, though genetically determined, is strongly influenced by socio-economic and/or nutritional status (Tanner, 1966; Eveleth and Tanner, 1976; Garn, 1980; Bharati, 1983; Eveleth, 1985).

Jelliffe (1966) shows that environmental influences, especially nutrition, are of greater importance in relation to growth than genetic background. Dugdale et al. (1970) show that genetic factors set a limit on growth, but became maximally effective in manifestation only when nutritional and other factors reach an optimal level. Several studies of physical growth in tribal population have observed that with the increase in age, there is a tendency for increase in all the physical traits except skinfolds (Singh, 1980; ICMR, 1984; Jhingon and Nath, 1985; Reddy, 1989; Nath et al., 1991; Kapoor and Kapoor, 1991; Dharma Rao and Busi, 1993). Many researchers have tried to

enumerate the trends of growth under different situations all over the world but little attention has been paid towards Podu cultivation and settled agricultural Jatapu tribal boys. In the present study an attempt has been made to study the effect of age from 6 through 18 years on ten physical traits of Jatapu tribal boys, who belong to lower socio-economic strata having poor nutritional conditions. The present paper, reports the ten body measurements derived on the Jatapu tribal boys of Seetammapeta ITDA of Srikakulam district of Andhra Pradesh.

MATERIAL AND METHODS

Jatapu is one of the predominant Scheduled Tribe populations of Srikakulam, Vizianagaram and Visakhapatnam districts of Andhra Pradesh and in the adjoining Koraput and Ganjam districts of Orissa. The total Jatapu tribal population in this field area is 86,762 for the present study (ITDA survey). Shifting cultivation or Podu cultivation is prevalent on hill slopes cleared by forest growth. Now-a-days Jatapu resort to plough cultivation. The

basic diet of the Jatapus consists of rice, lentils, meat and fish. Jatapus of this region used to practice any one of the three customary practices, viz. marriage by negotiation, by service, and elopement. Choice of marriage is governed by tribe endogamy.

The material of the present study comprises of cross-sectional data collected on 341 Jatapu tribal boys drawn from 10 ITDA schools of Sectammapeta, Srikakulam district of Andhra Pradesh during the months of April 1992 to September 1993. The age of these subjects range from 6+ to 18+ years. 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 measurements—body weight, stature, upper arm and calf circumferences, skinfolds on triceps, biceps, subscapular, suprailiac, medial calf and forearm 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. Growth velocity is increment per unit time of a measurement that is constantly growing and the concept is well understood if growth is thought of as a form of motion (Tanner, 1964). The values for a growth velocity of a measurement are easily obtained by subtracting for that variable, say at age 'A' from its mean value at age (A+1 year) is as below :

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

According to Thompson (1942) plotting their successive differences against time, we obtain a curve each point on which represents a certain rate at a certain time.....this shows a succession of varying velocities. This may be called the velocity curve.

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.

Table 1 : Mean and standard deviation of four body measurements among Jatapu tribal boys of Andhra Pradesh

Age (in years)	N	Stature		Body weight		Upper arm circumference		Calf circumference	
		$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
6+	54	109.76	5.37	16.55	1.58	14.80	0.82	20.34	1.14
7+	33	117.38	5.93	19.54	2.46	15.34	0.98	21.44	1.21
8+	23	121.40	4.62	20.58	1.64	15.92	0.67	22.48	1.02
9+	26	128.93	5.72	23.84	2.73	16.70	1.14	23.32	1.40
10+	24	130.37	4.73	25.35	2.37	16.74	0.95	23.64	1.79
11+	22	136.51	7.16	28.59	3.84	17.94	1.08	24.80	1.84
12+	22	138.12	5.10	30.18	3.41	18.25	1.38	26.04	1.68
13+	18	141.66	6.59	33.08	3.91	18.72	1.59	26.13	2.14
14+	24	148.36	4.79	37.04	3.60	19.91	1.72	27.76	1.58
15+	29	154.59	5.85	41.51	3.41	20.56	1.24	28.63	1.38
16+	29	157.05	5.67	45.79	3.77	21.38	2.31	29.89	1.96
17+	20	158.80	5.43	48.67	3.88	22.83	1.40	30.48	1.59
18+	17	158.17	6.31	48.50	5.26	23.18	1.93	30.08	2.03

Standard deviations for these characters have not shown any consistent pattern as found earlier in linear, transverse and circumferential measures (Pakrasi et al., 1988; Das Gupta, 1990, 1991; Das Gupta and Das, 1990). The highest value of S.D. (7.16 - 6.59 cm) is found at 11 and 13 years, for body weight these are 5.26 kg and 3.88 kg occurring at 18 and 17 years, respectively. In Jatapu tribal boys a steady increase in stature is noticed upto the age of 15 years. The mean stature of 6 years age group is about 109 cm and one and half time by 18 years. The highest annual gain (+6.70 cm per year) has occurred between 13 and 14 years while the maximum mean annual loss (-0.02 cm per year) is noticed between 17 and 18 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 16 kg; it is doubled by 13 years, and thrice by 18 years. The highest annual gain (+4.47 kg per year) has occurred between 14 and 15 years while the maximum mean annual loss (-0.17 kg per year) is found between 17 and 18 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 was one and half times by 18 years. The maximum mean annual increase of upper arm and calf circumference (+1.19 cm and +1.63 cm per year) has occurred respectively, between 13 and 14 years, while the maximum annual loss of calf circumference (-0.03 cm per year) is found between 17 and 18 years. Fat fold at biceps region increase gradually with minor irregularities in the mean from 6 to 13 years; the highest annual gain (+0.40 mm) has occurred between 14 and 15 years while the maximum mean annual loss of thickness (-0.53 mm per year) is found between 8 and 9 years, and increase to 17 years and then decline. The mean triceps decreases continuously throughout 6 to 10 years; and from 11 to 13 years increases. The highest annual gain (+0.60 mm per year) has occurred between 12 and 13 years while the maximum mean annual loss of thickness (-0.81 mm per year) is found between 17 and 18 years and declines by 18 years.

Table 2 : Mean and standard deviation of six skinfold thickness measurements among Jatapu tribal boys of Andhra Pradesh

Age (in years)	N	Biceps		Triceps		Subscapular		Medial calf		Forearm		Suprailiac	
		X	S. D.	X	S. D.	X	S. D.	X	S. D.	X	S. D.	X	S. D.
6+	54	4.15	0.90	6.55	1.34	6.69	2.05	8.11	1.68	4.95	1.63	4.78	1.93
7+	33	4.49	1.22	6.34	1.28	5.48	0.83	8.41	2.00	4.89	1.15	5.18	1.17
8+	23	4.96	1.69	6.46	1.54	5.57	0.86	7.82	1.97	5.05	1.27	5.33	1.19
9+	26	4.42	1.14	6.29	1.08	5.50	0.67	8.24	1.62	5.00	0.95	5.01	0.94
10+	24	4.37	1.04	6.25	1.26	5.96	1.01	8.24	2.09	5.12	1.25	5.65	1.73
11+	22	4.78	0.98	6.84	1.06	6.20	0.73	9.05	1.82	5.15	0.98	5.57	0.79
12+	22	4.76	0.92	6.73	1.33	6.38	0.94	9.07	2.40	4.80	0.68	6.10	1.35
13+	18	5.00	1.23	7.33	1.51	6.96	1.40	8.95	1.76	5.35	0.73	6.50	1.75
14+	24	4.50	0.95	6.82	1.27	6.90	0.99	9.24	2.09	4.96	0.68	6.64	0.78
15+	29	4.90	0.78	7.04	1.32	7.23	1.05	9.61	1.35	5.02	0.75	6.90	1.38
16+	29	4.86	0.88	7.58	2.00	8.25	1.48	9.48	2.22	5.08	0.83	7.07	1.43
17+	20	5.04	0.89	7.65	1.36	8.84	1.44	9.32	2.73	5.32	0.86	7.21	1.28
18+	17	5.01	0.54	6.83	1.30	8.75	1.61	8.21	2.30	5.04	1.01	7.02	1.57

Table 3 : Annual increments for ten body measurements among Jatapu tribal boys of Andhra Pradesh

Age (in years)	Height	Body weight	Upper arm circum- ference	Calf circum- ference	Skinfolds					
					Biceps	Triceps	Sub- scapular	Medial calf	Forearm	Sup- railiac
6+	—	—	—	—	—	—	—	—	—	—
7+	7.62	2.99	0.54	1.10	0.34	0.20	-1.20	0.30	-0.05	0.40
8+	4.02	1.04	0.58	1.04	0.47	0.12	0.09	-0.58	0.16	0.15
9+	7.53	3.26	0.78	0.84	-0.53	-0.16	-0.06	0.42	-0.05	-0.31
10+	1.44	1.51	0.04	0.32	-0.04	-0.04	0.46	0.00	0.12	0.64
11+	6.14	3.24	1.20	1.17	0.41	0.59	0.24	0.81	0.03	-0.07
12+	1.61	1.59	0.31	1.24	-0.02	-0.10	0.18	0.02	-0.35	0.53
13+	3.54	2.90	0.47	0.09	0.24	0.60	0.58	-0.11	0.55	0.40
14+	6.70	3.96	1.19	1.63	-0.50	-0.50	-0.05	0.32	-0.38	0.14
15+	6.23	4.47	0.65	0.87	0.40	0.22	0.33	0.34	0.06	0.26
16+	2.46	4.28	0.82	1.26	-0.04	0.54	1.01	-0.12	0.06	-0.17
17+	1.75	2.88	1.45	0.59	0.18	0.07	0.58	-0.15	0.24	0.14
18+	-0.02	-0.17	0.35	-0.39	-0.03	-0.81	-0.09	-0.10	-0.27	-0.18

The mean subscapular skinfold decreases 6 to 9 years and increases by 18 years. The highest annual gain (+0.58 mm per year) has occurred between 12 and 13 years while maximum mean annual loss (-1.20 mm per year) is noticed between 6 and 7 years. The mean medial calf skinfold decreases 6 to 8 years and increases by 12 years. The highest annual gain (+0.34 mm) has attained between 14 and 15 years while the maximum mean annual loss of thickness (-0.58 mm per year) is noticed between 7 and 8 years and it increases by 17 years and it declines by 18 years. The mean forearm skinfold increases 6 to 11 years. The highest annual gain (+0.55 mm) has attained between 12 and 13 years, the maximum annual loss (-0.38) is observed between 13 and 14 years, and it decreases by 14 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 (+0.53 mm) has attained between 12 and 13 years, the maximum mean annual loss (-0.31 mm per

annum) is noticed between 8 and 9 years. From table 3, it is evident that skinfold thickness increases gradually with minor irregularities in the means from 6 to 11 years reaching a peak value between 12 to 15 years. From 16 to 18 years again gradual downwards trend in thickness is clearly noticed.

The juvenile maximum mean annual increments of stature (7.62 cm), body weight (2.99 kg), calf circumference (1.10 cm), medial calf (0.30 mm), suprailiac (0.40 mm) skinfolds is attained between 6 to 7 years which is delayed by a year than biceps (0.47 mm), triceps (0.12 mm) and forearm (0.16 mm) skinfolds *i.e.* (7 and 8 years) and three years than upper arm circumference (0.78 cm) *i.e.* (8 and 9 years) and four years than subscapular skinfold (0.46 mm) *i.e.* (9 and 10 years).

The maximum mean annual increments or highest peak velocity of triceps (0.60 mm), subscapular (0.58 mm), forearm (0.55 mm), skinfolds were attained between 12 to 13 years which is earlier by a year than stature (6.70 cm), upper arm circumference (1.19 cm), calf circumference (1.63 cm) *i.e.* (13 and 14 years)

and two years earlier than body weight (4.47 kg), biceps (0.40 mm) and medial calf (0.34 mm) *i.e.* (14 and 15 years). Apart from the highest peak velocity some measurements showed second highest peak velocity for the lower intensity. The highest peak velocity of suprailiac skinfold (0.26 mm) is attained between 14 and 15 years which is earlier by a year than calf circumference (1.26 cm), triceps (0.54 mm), and subscapular skinfold (1.01 mm) *i.e.* (15 and 16 years); and earlier by two years than upper arm circumference (1.45 mm) and forearm (0.24 mm) *i.e.* (16 and 17 years) (Table 3).

The occurrence of second highest peak velocity in case of the six measurements is probably due to the fact that the Jatapu tribal boys, as they belong to a tribal set up lack many resources and belong to the lower socio-economic level of the society. As a result inadequacy in their nutritional intake causes poorer health condition in general there by affecting their general pattern of growth causing bimodality of growth spurt. The cross-sectional nature of data appears to be not responsible for causing the bimodality as Nath (1972) reported normal unimodal curves on a sample of Jat boys of Meerut, U.P. (India) and also boys of Maharashtra belonging to a similar socio-economic strata as that of the Jatapus. Increase of the sample size could have smoothen the nature of the curves but it was not possible to collect a larger than present one in a tribal set-up where the study was conducted (Table 3).

It will be apparent from the foregoing results that the findings among tribal boys were more or less similar to the findings of Singh (1980), Injeti (1980), Jhingon and Nath (1985), Reddy (1989), and shorter and lighter than the findings of Kapoor and Kapoor (1991), and shorter and heavier than the National standards (ICMR 1984). The results generated in this paper can therefore be utilised as reference material for the Jatapu tribal boys in Sectammapeta 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.

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