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Growth Progression and Maturational Sequence Among Savara Tribal Boys of Andhra Pradesh, India

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ABSTRACT The cross-sectional study was undertaken in rural schools situated in the Seetammapeta ITDA of Srikakulam district of Andhra Pradesh during April 1992 to August 1994. The sample consisted of 403 healthy Savara tribal boys aged 6+ through 18+years. The study reveals that Savara tribal boys attain maximum annual increase (adolescent spurt) between 13 and 14 years for all measurements except triceps and forearm skinfolds which in turn exhibit it a year delayed the spurt *i.e.* (14 and 15 years). There exists a second peak velocity in some of the measurements between 15 and 17 years. The Savara tribal boys exhibit the existence of cephalo-caudal as well as caudo-cephalic sequence of maturation within the constituent components of stature, upper arm, calf and chest circumferences, and all skinfolds. All measurements still requires a certain percentage of growth to reach complete maturation. Comparison with some other populations have been also attempted. The findings of the study can be used as a reference material for Savara tribal boys.

Physical growth is a vital process which brings about irreversible changes in the body and its organs, in their size, form, body weight etc. Many studies show that the patterns of physical growth and development though genetically determined, it is strongly influenced by socio-economic and/or nutritional status (Tanner, 1966; Eveleth and Tanner, 1976; Garn, 1980; Eveleth, 1985). Most published studies of physical growth in tribal populations have revealed that with the increase in age, there is a tendency for increase in all physical traits except skinfold measurements (Singh, 1980; Jhingon and Nath, 1985; Nath et al., 1991; Reddy, 1991; Kapoor and Kapoor, 1991 and Dharma Rao and Busi, 1994a, b). However, in the Seetammapeta ITDA of Srikakulam region there is dearth of published material related to growth and development of tribal boys and the Indian Council of Medical Research (ICMR 1984) in their nation wide growth survey did not include the Savara tribal boys of Srikakalam district. A cross-sectional growth study of Savara tribal boys was therefore undertaken in April 1992 to August 1994 covering 28 measurements. Although longitudinal observations on the same set of children are more informative especially for providing individual variations and rate of growth as also developmental changes, cross-sectional studies are useful nevertheless, in providing information on population differences. In India since repeated observations on the same children have not yet gained social acceptance, besides being expensive and time consuming we have to rely mostly on cross-sectional data.

The process of growth is organised into maturity gradients. A maturity gradient is running from an advanced maturity distally to a retarded maturity proximally, as demonstrated by Tanner (1962), and Singh and Sidhu (1981), as following a caudo-cephalic direction. This differentiation may probably be due to same differentiation in the concentration of some chemical substance in the limb buds during the embryonic state which gives rise to such differences in the developing physical structure (Tanner, 1978). As a result of differential growth rates different maturity gradients, *i.e.* cephalo-caudal, caudo-cephalic and the mixed or complex, may operate simultaneously at the same age in different dimensions of body.

In the present study an attempt has been made to study the effect of age from 6+through 18+years on eleven body measurements through out the growth period and also to study the adolescent growth spurt, and maturational

sequences of podu cultivated Savara tribal boys of Seetammapeta ITDA of Srikakulam district of Andhra Pradesh, who belong to lower socio-economic strata having poor nutritional conditions and to compare these boys with other tribal boys of India in order to find out the population differences of physical growth.

MATERIAL AND METHODS

Savaras are one of the important and primitive tribal groups living in Srikakulam, Vizianagaram districts of Andhra Pradesh and Ganjam district of Orissa. 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. This tribe is divided into six subdivisions—1. Sudda Savaras 2. Kapu Savaras 3. Lanjiya Savaras 4. Dulia Savaras 5. Baru Soraji or Toka Savaras 6. Parbat Savaras (Malia Savara, or Konda Savaras or Bheema Savaras).

The sub-groups mentioned at serial number 1 and 2 are settled in plain areas and pursuing settled cultivation. They are sufficiently acculturated groups and Sudda Savaras have completely become vegetarians, while Kapu Savaras gave up beef. The Savaras living in the interior hill areas eat beef. The subdivisions mentioned from serial numbers 3 to 6 are usually living in the hill areas and practising shifting cultivation.

The savara social structure in the past was not based either on clans or septs. The village exogamy was the guiding principle for acquiring mates. The boys and girls of the same village were considered brothers and sisters. The cross-cousin marriages were also encouraged. The Kapu Savaras who settled in plain areas adopted the surnames of the neighbouring Telugu castes. Savaras speak a dialect and this dialect can be included in the Mundari linguistic family. They call themselves as Soaramay. With regard to acquiring mates they resort to capture, negotiation, love and elopement and service. They also practice levirate type of marriage. The Savaras living in the interior places follow scrupulously the age old customs and traditions. One of the significant custom related to sexual relations is practised by Savaras even today. After birth of a child, the husband generally abstains from sex relation with the wife till the child is completely weaned. That is why the post-natal diseases among tribes in general and Savaras in particular are absent and proper spacing is given from one child to another.

The main crops are paddy, millet such as jowar, sama (little millet), Korra (Italian millet) Ragi, Chodi (Finger millet), Gantlu (pearl millet), Redgram, Turmeric oil such as Ippa, Kanugu, Castor oil etc. The Savara eat anything from rat to cow. The remains of the animals killed by tigers, panthers are also eaten. White ants is a very delicious food among Savaras. Toads, reptiles, various kinds of snakes (except cobras) and birds are also eaten by Savaras. The staple food of the Savaras are Bajra (pearl millet) and Jowar (Sorghum millet). These cereals are pounded into powder and mixed in boiling water to prepare gruel. Savaras are without any distinction of sex are habituated to indigenous liquors like Sagu Sara (liquor) which is commonly drunk. Ippa Sara (liquor of *Bassia latifolia*) is also taken. Mahua liquor is a favorite drink for Savaras and toddy from palmyrah and jeeluga is also consumed by Savaras.

The material of the present study was based on a cross-sectional data collected on 403 Savara tribal boys drawn from 10 ITDA schools of Seetammapeta, Srikakulam district of Andhra Pradesh during the months of April 1992 to August 1994. The age of these subjects range from 6+ to 18+ years. Date of births are derived from birth certificates which are required for admission into schools. In this field area local primary school teachers have been given the task of maintaining birth and death registers of their villages and some times of near by villages as well. They submit these records every year to the respective panchayat offices. Parents are expected to produce birth certificates when they admit their children in schools, especially at the primary level. The

doubtful cases were excluded from the present sample. All the subjects between age 6.00 to 6.99 years were in 6+age group and so on upto 18+ years was calculated after Eveleth and Tanner (1976). The measurements on each individual were taken during the working hours of the school with minimum clothing. All bilaterally represented measurements were taken on the left. The measurements– body weight, stature, upper arm, calf and chest circumferences; skinfold sites at triceps, biceps, sub-scapular, supra-iliac, medial calf and forearm were taken after Weiner and Lourie (1969).

The whole year mean increments have been calculated by subtracting the mean of the preceeding 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.

Velocity (V) = X (A + 1) - X.A

Growth gradient or attained size (the size of each dimension at a given age expressed in terms of percentage of its mature of final size) was calculated for each of the eleven measures to evaluate developmental progression.

Growth gradient or attained size = XA/Mx100

Where XA is the mean value of the measure at age A, and M is its mean value in the highest age group (*i.e.* 18+years in the present study).

RESULTS AND DISCUSSION

Mean values and standard deviations for each anthropometric measurements 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 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 skinfold characters show not normal distributions at several ages.

In the circumferential dimension of upper arm, calf and chest which give the composite measures of bone, muscles and fat, the maximum annual increase has occured between 13 and 14 years. Standard deviations for all of these characters have not shown any consistent pattern as found earlier in the linear and transverse measures (Dharma Rao and Busi, 1994a, b).

In Savara tribal boys a steady pattern in stature is noticed upto the age of 13 years. The mean stature of 6 years age group is about 109 cm and one and half times by 18 years. The highest annual gain (+8.30 cm) has occured between 13 and 14 years. In fact, after peak velocity between 13 and 14 years there should be deccelerating phase. Like stature the mean body weight also steadily increases upto the age of 14 years. The mean body weight of 6 years age group is about 15 kg; it is doubled by 13 years, and thrice by 16 years. The highest annual gain (+7.04 kg) has attained between 13 and 14 years. An increment of 5 kg is noticed from 16 to 18 years. The mean upper arm circumference of 6 years age group is about 13 cm, it is one and half times by 14 years. The highest annual gain (+2.09 cm) has attained between 13 and 14 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 doubled by 14 years. The highest annual gain (+2.26 cm) has attained between 13 and 14 years. An increment of 3 cm is noticed from 14 to 18 years.

The mean triceps skinfold at 6 years is 5 mm and then steadily increases from 6 to 9 years and decreases by 10 years and increase gradually with minor irregularities in the mean from 12 years age group with advancing ages till 15 years with mean value 7 mm and declines by 16 years. The highest annual gain (+0. 32 mm), (0. 34 mm) has attained between 14 and 15 years and 16 and 17 years, respectively. While the maximum mean annual loss (-0.77mm per year) is noticed between 9 and 10 years. From 17 years the mean values gradually increases to 18 years. The skinfold at biceps

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

Age in years	N	Stature		Body weight		Upper arm circumference		Calf circumference		Chest circumference	
		X	S. D.	X	S. D.	X	S. D.	X	S. D.	X	S. D.
6+	18	109.41	3.68	15.77	1.66	13.92	0.84	19.70	1.10	54.02	2.56
7+	20	117.34	4.73	18.97	1.60	15.44	2.45	21.47	2.29	57.65	4.34
8+	24	122.42	6.35	21.85	2.04	16.08	0.74	22.44	1.75	59.03	3.33
9+	31	127.26	6.17	23.77	2.96	16.40	0.77	23.32	1.19	60.94	2.49
10+	26	131.25	5.12	25.25	2.71	16.96	1.04	23.95	1.28	62.17	3.04
11+	32	131.72	5.97	25.93	3.07	17.42	1.07	24.18	1.16	63.22	2.79
12+	41	137.81	4.38	29.00	3.35	18.35	1.33	26.01	1.98	65.98	4.31
13+	40	141.70	5.98	31.80	4.22	18.36	1.53	26.15	1.67	66.63	4.41
14+	46	150.00	6.23	38.84	4.51	20.46	1.83	28.41	1.98	72.08	5.18
15+	51	155.40	6.19	41.46	4.40	20.71	1.64	28.81	1.64	73.69	5.09
16+	34	158.89	4.80	46.07	3.80	22.30	1.76	29.59	1.88	76.55	5.04
17+	20	159.65	5.33	49.42	3.79	22.35	1.67	30.69	1.71	77.65	4.39
18+	20	160.37	6.22	51.85	6.62	23.75	1.88	31.32	2.10	82.10	4.53

Table 2: Mean, standard deviation of six skinfold measurements among Savara tribal boys of Andhra Pradesh

Age in years	N	Triceps		Biceps		Subscapular		Medial calf		Suprailiac		Forearm	
		X	S. D.	X	S. D.	X	S. D.	X	S. D	X	S. D.	X	S. D.
6+	18	5.74	0.93	4.29	0.52	4.91	0.65	7.62	2.00	4.67	1.20	4.70	0.78
7+	20	5.85	1.46	3.92	1.07	5.31	1.01	7.52	1.98	4.57	0.98	4.53	0.88
8+	24	6.14	1.56	4.12	1.09	5.67	0.91	7.71	2.44	5.23	1.33	4.62	0.94
9+	31	7.34	1.45	5.06	1.70	6.25	1.03	9.34	1.82	6.20	1.18	5.09	0.84
10+	26	6.56	1.09	4.40	0.95	5.92	1.17	8.30	1.36	5.66	0.67	5.15	0.69
11+	32	6.60	1.44	4.48	0.99	6.01	0.90	8.29	1.89	5.67	0.99	4.86	0.57
12+	41	6.92	1.59	4.62	0.90	6.46	1.35	8.97	2.17	6.22	1.35	4.92	0.77
13+	40	6.72	1.10	4.47	0.75	6.43	1.03	8.29	1.74	6.12	1.25	4.81	0.78
14+	46	6.96	1.39	4.78	0.81	7.44	1.34	8.66	2.34	6.74	1.40	4.86	0.88
15+	51	7.28	1.75	4.90	0.82	7.93	1.50	8.62	1.91	6.84	1.09	5.11	0.62
16+	34	6.67	1.14	4.97	0.84	8.48	1.46	8.35	1.33	7.16	1.29	5.10	0.72
17+	20	7.01	1.21	4.95	0.86	8.69	1.13	8.05	1.95	7.20	1.17	5.13	0.64
18+	20	7.13	2.81	5.06	0.90	9.11	1.71	8.55	2.03	7.59	2.01	4.82	0.79

region increase gradually with minor irregularities in the mean from 6 to 9 and 10 to 18 years; the highest annual gain (+0.31 mm) has been attained between 13 and 14 years, while the maximum mean annual loss (-0.65 mm per year) is found between 9 and 10 years.

The mean medial calf skinfold increase 6 to 9 years and increases by 12 years. The highest annual gain (+0.68 mm per year) has attained between 11 and 12 years, while the maximum mean annual loss of thickness (-1.04 mm per year) is observed between 9 and 10 years and the remaining mean values of 10 to 18 years is almost stationary. The mean suprailiac skinfold at 6 to 9 years gradually and also observed same trend from 10 to 18 years. The highest annual gain (+0.62 mm) has occured between 13 and 14 years, the maximum mean annual loss (-0.53 mm per annum) is noticed between 9 and 10 years (Table 2).

The mean subscapular skinfold at 6 years is 4.91 mm and then gradually increases with minor irregularities from 6 to 18 years. The highest annual gain (-1.01 mm) has attained between 13 and 14 years while the maximum mean annual loss (-0.32 mm per year) is noticed between 9 and 10 years. The skin and subcutaneous tissue exhibits greater values during post-adolescent years. The mean forearm skinfold increases 6 to 9 years and with minor irregularities then declines by 10 and again increases from 11 to 17 years and then declines. The highest mean annual gain (+0.25 mm per year) has attained between 14 and 15 years while the maximum mean annual loss of thickness (-0.31 mm per year) is noticed between 17 and 18 years.

The juvenile spurt of stature (7.93 cm), body weight (3.20 kg) and upper arm circumference (1.51 cm), calf circumference (1.77 cm) chest circumference (3.63 cm) is attained between 6 and 7 years which is early by two years than triceps (1.20 mm), biceps (0.94 mm) and subscapular (0.58 mm), medial calf (1.63 mm) spurailiac (0.97 mm) and forearm (0.47 mm) skinfold *i.e.* 8 and 9 years.

The adolescent growth spurt of stature (8.30 cm), body weight (7.04 kg) upper arm circumference (2.09 cm) calf circumference (2.26 cm) chest circumference (5.45 cm), biceps (0.31 mm), suprailiac (0.62 mm) and subscapular skinfold (1.01 mm) were attained between 13 and 14 years which is earlier by a year than triceps (0.32 mm) and forearm (0.25 mm), skinfold (14 and 15 years), and delayed by two years than medial calf skinfold (0.68 mm) *i.e.* 11 and 12 years (Table 3). 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. In the circumferential dimensions of upper arm, calf and chest give the composite measures of bone, muscle and fat, the mean annual increase has occured between 13 to 14 years.

The occurence of second spurt in case of all measurements is probably due to the fact that Savara 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 inadequany 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 biomodality as Jhingon and Nath (1985) reported bimodality curves on a sample of Warli tribal boys of Maharashtra and Dharma Rao and Busi (1994b) reported bimodality curves on a sample of Jatapu tribal boys of Andhra Pradesh belonging to a similar socio-economic strata as that of the Savaras. Increase of the sample size could have smoothen the nature of the curves but this was not possible to collect a larger sample than present in a tribal set-up where the study was conducted.

Progression of dimensional maturation among Savara has been evaluated through the growth gradients (Table 4). The percentage of growth attained at each age from 6 to 17 years among Savara boys relative to their final size taken at 18 years, helps us in assessing the extent of maturity achieved by the constituent components of Stature, body weight, upper arm, calf and chest circumferences, and skinfold sites at triceps, biceps, subscapular, medial calf, suprailiac, and forearm. The maturational sequence is evolved on the basis of advanced or retarded maturity of the concerned body measurements in terms of percentage of growth achieved at each age level. It is common knowledge that the growth rates vary for different children and even within the same child at subsequent ages. This variation is a result of the fact that growth and differentiation do not occur at the same rate and time within different body measurements (Nath and Chacko, 1988; Tanner, 1962). Due

Table 3: Annual increments for eleven body measurements among Savara tribal boys of Andhra Pradesh

Age in years	Stature	Body weight	Upper arm circum-ference	Calf circum-ference	Chest circum-ference	Skinfold thickness					
						Triceps	Biceps	Sub-scapular	Medial calf	Supra-iliac	Forearm
6+	—	—	—	—	—	—	—	—	—	—	—
7+	7.93	3.20	1.51	1.77	3.63	0.11	-0.37	0.40	-0.10	-0.10	0.17
8+	5.08	2.88	0.64	0.97	1.38	0.29	0.20	0.36	0.19	0.66	0.09
9+	4.84	1.92	0.31	0.88	1.91	1.20	0.94	0.58	1.63	0.97	0.47
10+	3.99	1.48	0.55	0.63	1.23	-0.77	-0.65	-0.32	-1.04	-0.53	0.06
11+	0.47	0.68	0.45	0.23	1.05	0.04	0.08	0.09	-0.01	0.01	-0.28
12+	6.09	3.07	0.92	1.83	2.76	0.32	0.14	0.45	0.68	0.55	0.07
13+	3.89	2.80	0.01	0.14	0.65	-0.19	-0.15	-0.03	0.67	-0.10	-0.10
14+	8.30	7.04	2.09	2.26	5.45	0.24	0.31	1.01	0.37	0.62	0.05
15+	5.40	2.62	0.25	0.40	1.61	0.32	0.12	0.49	-0.03	0.10	0.25
16+	3.49	4.61	1.58	0.78	2.86	-0.60	0.07	0.55	-0.27	0.32	-0.01
17+	0.76	3.35	0.05	1.10	1.10	0.34	-0.02	0.21	-0.30	0.04	0.03
18+	0.72	2.43	1.39	0.63	4.45	0.12	0.11	0.42	0.50	0.39	-0.31

Table 4: Percentage of growth achieved by the eleven body measurements of their final size among Savara tribal boys of Andhra Pradesh

Age in years	Stature	Body weight	Upper arm circum-ference	Calf circum-ference	Chest circum-ference	Triceps	Biceps	Sub-scapular	Medial calf	Supra-iliac	Forearm
6+	68.22	30.41	58.61	62.89	65.80	80.50	84.78	53.89	89.12	61.52	97.51
7+	73.16	36.58	65.01	68.55	70.21	82.04	77.47	58.28	87.95	60.21	93.98
8+	76.33	42.14	67.70	71.64	71.90	86.11	81.42	62.23	90.17	68.90	95.85
9+	79.35	45.84	69.05	74.45	74.22	102.94	100.00	68.60	109.24	81.68	105.60
10+	81.84	48.69	71.41	76.46	75.72	92.00	86.95	64.98	97.07	74.57	106.84
11+	82.13	50.00	73.34	77.20	77.00	92.56	88.54	65.97	96.96	74.70	100.83
12+	85.93	55.93	77.26	83.04	80.36	97.05	91.30	70.91	104.91	81.95	102.07
13+	88.35	61.33	77.30	83.49	81.16	94.24	88.34	70.58	96.96	80.63	99.79
14+	93.53	74.90	86.14	90.70	87.79	97.61	94.46	81.66	101.28	88.80	100.82
15+	96.90	79.96	87.20	91.98	89.75	102.10	96.84	87.04	100.81	90.11	106.01
16+	99.07	88.85	93.89	94.47	93.24	93.54	98.22	93.08	97.66	94.33	105.80
17+	99.55	95.31	94.10	97.98	94.58	98.31	97.82	95.38	94.15	94.86	106.43
18+	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

to the differential rate of maturation the spurt in stature, body weight, upper arm, calf and chest circumference and other skinfolds such as biceps, subscapular, medial calf, suprailiac is more due to the increased rate of growth as against the increase in triceps and forearm skinfolds because these measurements exhibit an increased rate of growth one year earlier the onset of spurt in stature or body weight or all circumferences and some other skinfolds.

This fact is supplemented by the results of the present data as we observe that the stature, body weight and upper arm, calf and chest circumferences and other skinfolds attains maximum annual increase between 13 and 14 years (Table 3) in contrast to the period of maximum annual increase in triceps and

forearm skinfolds which happens to be during 14 and 15 , and 16 and 17 years.

The maturational sequence for stature reveal that at age 6 is advanced in maturation and has achieved 68.22 per cent of its final size as compared to upper arm circumference and calf and chest circumference which has attained 58.61 and 62.89 per cent, and 65.80 per cent of growth indicating the cephalo-caudal direction of maturation between these two measurements, respectively. This trend remains unaltered till 17 years. The maturational sequence of stature is 99.55 per cent in contrast to 94.10 and 97.98 per cent, and 94.58 per cent of growth attained by upper arm and calf and chest circumference, respectively.

However, both the components require a little amount of growth to reach their final size. This is indicative of the fact that the growth in stature, and upper arm, calf, and chest circumferences is not yet complete at age 17 (Table 4). On comparing the stature, and triceps skinfold, it is observed that the skinfold at triceps, medial calf, and forearm is ahead in maturation over the stature from 6 to 15 years, thus exhibiting caudo-cephalic sequence of maturation. This trend is reversed to cephalo-caudal between 16 and 17 years. At age 17 stature requires 0.45 per cent of growth to reach its final size as against triceps which requires 1.69 per cent, medial calf, 5.85 per cent to reach its final size (Table 4). This situation has rightly been assessed as following the smaller area gradient (Tanner, 1964) of more complex system of gradients that are operative for shorter duration (Marshall, 1977).

The developmental sequence within the constituent components of stature also deviate like triceps, medial calf, and fore arm from the expected norms of advanced maturity distally to retarded maturity proximally (Tanner, 1962; Scammon, 1953), or caudo-cephalic of maturation.

Savara boys exhibit the existence of cephalo-caudal as well as caudo-cephalic direction of maturation between the constituents of stature, upper arm, calf and chest circumferences, and triceps, biceps, subscapular, medial calf, suprailiac, and forearm skinfolds. But the existence of these gradients is witnessed for very long duration between stature, upper arm, calf and chest circumferences; and very short duration between stature, and triceps, medial calf and forearm skinfold thickness. However, the Savara boys exhibit the existence of mixed gradients or smaller area gradients more often within the constituent components of these measurements at most ages. At age 17 all body measurements required a certain amount of growth yet to be achieved at this age.

It will be apparent from the foregoing results that the findings among Savara tribal boys were taller and heavier; and larger upper arm, and calf muscles with higher triceps, biceps, and subscapular skinfolds than the findings of Singh and Sidhu (1981), it may be associated with load carrying in the hills and body fat in this tribe may contribute to increase the mechanical efficiency in carrying loads up hill and also shorter and heavier than findings of Jhingon and Nath (1985), taller and heavier than findings of Kapoor and Kapoor (1991). These boys are shorter and heavier than the standards of ICMR (1984) and these results are also more or less similar to the findings of Wolanski (1961), Tanner et al. (1966), Malcolm (1970), Low (1971), Johnston et al. (1975), Reddy (1989), Dharma Rao and Busi (1994 a, b). The results generated in this paper can therefore be utilized as reference material for the Savara tribal boys in Seetammapeta 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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