

Growth Progression in Physical and Physiological Variables Among Yata's of Visakhapatnam District, Andhra Pradesh

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INTRODUCTION

Several studies in rural populations have observed that with the advancement in age there is a tendency for increase in all the physical traits except skin folds (Singh, 1980; ICMR, 1984; Bharati and Bharati, 1991; Sharma, 1991; Nath et al., 1991; Busi and Dharma Rao, 2003). Investigations carried out under different conditions by various research groups have shown positive correlations between blood pressure and age (Reddy et al., 1991), Heredity (Nirmala and Chengal Reddy, 1991), Body composition (Sambasiva Rao, 1983), Social status (Srivastava et al., 1977) and sex (Celine and Mathur, 1979). Another important dimension of the variation in arterial blood pressure is the interaction with other physiometric and anthropometric variation.

In India very few researches have been conducted in this field (Padmavathi and Gupta, 1959; Das and Mukherjee, 1963; Nirmala and Chengal Reddy, 1991; Dharma Rao and Busi, 2003) among others. However there is dearth of published data related to growth progression and blood pressure of yata boys and girls. Feeling the dearth of data a cross-sectional survey on growth of Yata boys and girls was undertaken in July 2002 to June 2003 covering 10 body measurements.

In the present study 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 adolescent growth spurt. It is further aimed to understand the association between blood pressure with stature, body weight and circumferences and its implications for health of the population and to compare this data with other available data from India in order to find out the population differences of physical and physiological variations.

MATERIAL AND METHODS

The Yatas are toddy tappers by profession.

They are mainly found in Srikakulam, Vizianagaram and Visakhapatnam districts of Andhra Pradesh and also in Ganjam district of Orissa state. Their population in Andhra Pradesh is 76,169 and in Visakhapatnam district is 38,011 according to 1981 census. Other names by which this caste is called in various parts of Andhra Pradesh are Settibalija, Idiga, Indras, Segidi, Srisayana and Gamandla. It is said that the variation in names is purely regional and marital alliances between them are much appreciated especially in East and West Godavari districts. They are known as Yatas or Segidi or Srisayana in Srikakulam, Vizianagaram and Visakhapatnam district, as Idigas, Settibalija or Indras in East and West Godavari districts and Gamandla in Nellore district. In Srikakulam district Segidi who call themselves as Srisayana are found in Sompeta and Ichapuram mandals also engage themselves in tapping toddy from dalipalm tree. Though it is accepted as a sub-division among the yatas yet both the sections have claims of superiority over each other. They are also known as Donga-Yatas and included in the list of criminal tribes. Donga Yatas are not found in Srikakulam district and are rarely found in Visakhapatnam. They speak in telugu. Literacy and educational standards in Yatas are very poor. The Yata men of old generation do not wear shirts usually except when they go out on a travel or on festive occasions. They wear panchalu or dhotis as lower garments. They keep on an upper cloth called towel on their shoulders. Women folk wear sarees as lower garments. Wearing of blouse or jacket to the breasts is uncommon among the folk of these parts.

Chodi ambali, rice and bajra are common cereals used for food. Brinjals, beans, bottle gourd, bitter gourd, snake gourd and brown hemp are the common vegetables eaten by the people. Red gram and green gram dal are also commonly consumed by them. Flesh of goat, sheep, pork, birds, chicken, goose, dove and fish are consumed by them. The habit of drinking tea or coffee is prevalent among some families and also drinking toddy and liquors is prevalent

in Yatas. Social status of Yata caste in the Hindu caste system is very low. The marriages are fixed by negotiations. Monogamy is present norm, but polygamy is permitted only in the case of infertility or suffers from prolonged illness. Nuclear families are more common now-a-days than the extended families which were very common till the recent past. The Yata women enjoy a secondary status compared to men in all walks of life. All women of yata community generally attend to the work of nallu muta for jellida, cheta, and rekalu. Women also sell the toddy to the customers. Besides their traditional occupation women participate in agricultural operation as agricultural labour, casual labour etc. and support their families. The Yatas also earn some additional revenue through their piggery.

The material for the present study was based on a cross-sectional data collected on 956 Yata boys and 899 Yata girls drawn from 11 schools of Anandapuram, Bheemunipatnam and K. Kotapadu mandals of Visakhapatnam district of Andhra Pradesh during the months of July 2002 to June 2003. The age of these subjects ranged from 0+ 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 village panchayats. The doubtful cases were excluded from the present sample. All the subjects between age 0.00 to 0.99 years were in 0+ age group, 1.00 to 1.99 years were in 1+ age group, 2.00 to 2.99 were in 2+ age group and so on up to 18+ years is calculated after Eveleth and Tanner (1976). All bilaterally represented measurements were taken on the left. The Anthropometric measurements were taken after Weiner and Lourie (1981). The measurements and blood pressure were taken by the second author. Blood pressures were determined on the subject by the method described by Rose et al., (1982) using the Sphygmomanometer with standard cuff and the Stethoscope after standardizing the method (Dharma Rao and Busi, 1997a,b). The Hypertension was followed after W.H.O. (1962).

Heart rate was conveniently measured as pulse rate by palpation of the radial artery at the wrist (with the help of three fingers) the number of beats occurring in half a minute being counted and doubled to give the rate per minute by using stop watch (Weiner and Lourie, 1981). The whole year mean annual increments have been

calculated by subtracting the mean of the preceding age group from that of the succeeding age group (Tanner, 1964). The usual statistical analysis was carried out using S.P.S.S.8.0 Program Package of our Intel Pentium III, 600 MHZ computer. The t-test significances were estimated after Fisher and Yates (1963). Distance curves are plotted after Tanner (1978) to estimate the amount of growth progression.

RESULTS AND DISCUSSION

The mean values and standard deviations for all the anthropometric measurements have been shown in Tables 1 to 2. It can be inferred from the Tables 1 and 2 that the mean values for all the body measurements are progressively increasing with advancement of age from 0+ to 14+ years in boys and 0+ to 13+ years in girls and showed steady pattern of growth and afterwards almost stationary pattern with decelerating trend of growth progression in both sexes. Standard deviations for these characters have not shown any consistent pattern as found earlier in linear, transverse and circumferential measurements. The highest value of standard deviation in abdominal circumference (11.29 cm) was found at 17+ and 18+ years in boys and stature (13.50 cm) in girls occurring at 14+ and 15+ years.

The mean body weight of Yata infants at 0+ age group is about 6.06 kg in boys and 6.09 kg in girls. Between 0+ and 18+ years, the boys and girls marked a difference of 4.52 kg, 5.96 kg respectively between the lowest and highest annual increments in body weight. The highest peak velocity has occurred between 14+ and 15+ years in boys (+ 5.36 kg per year) and earlier by two years (12+ and 13+ year) in girls (+ 5.99 kg per year) is the growth of total body mass manifested.

The mean stature of infants at 0+ years age group is about 60.92 cm, in boys and 61.59 cm, in girls. The difference in lowest and highest annual gain of stature of boys are higher than girls. The highest mean annual increments has occurred between 13+ and 14+ years in boys (+ 8.95 cm per year) and earlier by two years 11+ and 12+ years (+ 9.07 cm. per year) in girls. The mean head circumference of infants at 0+ years age group is about 41.34 cm in boys and 40.72 cm in girls. The difference in minimum and maximum annual increments of head

Table 1: Mean and standard deviation of seven body measurements among yata boys of Visakhapatnam district of Andhra Pradesh

Age (in years) No.	Body Weight (kg)		Stature (cm)		Head circum- ference (cm)		Chest circum- ference (cm)		Abdominal circum- ference (cm)		Upper arm circum- ference (cm)		Calf circum- ference (cm)	
	$\bar{X}$	S.D	$\bar{X}$	S.D	$\bar{X}$	S.D	$\bar{X}$	S.D	$\bar{X}$	S.D	$\bar{X}$	S.D	$\bar{X}$	S.D
0+	6.06	1.83	60.92	7.04	41.34	4.03	38.97	4.09	38.45	4.18	13.01	1.51	14.53	2.25
1+	9.47	1.10	77.50	4.70	46.38	1.94	47.27	2.00	46.38	3.50	14.19	1.12	16.93	1.22
2+	10.31	1.51	80.35	6.92	46.88	1.43	47.92	2.86	46.49	2.91	14.06	0.74	17.25	1.38
3+	12.25	1.27	87.83	5.48	48.18	4.08	50.19	1.95	49.60	2.96	14.59	1.16	18.71	2.19
4+	13.98	1.64	96.63	6.36	48.40	1.60	51.66	3.02	50.39	2.26	14.57	0.82	19.15	1.25
5+	14.88	1.55	100.78	7.83	49.06	1.46	51.97	2.29	50.95	3.11	14.67	5.09	19.42	1.18
6+	17.05	2.04	108.95	6.19	49.82	1.47	53.63	3.87	51.83	2.98	14.90	1.01	20.74	1.99
7+	18.75	3.10	112.87	15.47	50.06	2.07	55.49	3.11	52.43	3.65	15.05	8.41	21.17	2.02
8+	20.89	2.90	120.20	6.20	51.72	9.37	56.88	3.27	53.01	5.94	15.42	0.99	21.90	1.61
9+	21.76	3.49	122.83	10.06	50.40	1.31	57.93	3.64	53.78	3.08	15.96	0.79	22.46	1.74
10+	24.12	2.72	128.42	6.75	50.74	1.05	60.17	3.80	55.51	2.89	16.31	1.23	23.10	1.42
11+	27.37	3.31	134.17	5.25	51.28	1.33	61.41	3.69	55.71	7.61	17.22	0.93	23.78	2.80
12+	29.45	5.52	135.80	10.12	51.69	2.66	62.85	5.34	57.89	4.08	17.91	1.54	24.61	1.94
13+	32.65	4.88	144.75	6.01	52.73	1.65	66.51	5.25	59.11	4.35	19.30	1.87	25.83	2.13
14+	38.01	5.01	149.64	5.97	52.95	1.58	69.40	5.21	61.68	4.44	20.38	1.65	27.47	1.97
15+	41.85	4.45	152.86	5.82	52.83	1.39	72.82	4.92	64.50	3.50	21.05	2.17	28.41	1.21
16+	44.48	4.92	158.67	5.79	53.66	2.53	74.66	3.44	64.50	3.85	20.95	1.96	28.31	2.26
17+	47.55	5.48	158.61	7.17	53.75	1.54	76.12	5.34	65.90	5.04	21.99	1.78	29.40	2.32
18+	48.98	8.04	157.68	6.44	53.85	1.13	80.12	5.82	69.10	11.24	23.20	2.37	29.80	2.72

Table 2: Mean and standard deviation of seven body measurements among Yata girls of Visakhapatnam district of Andhra Pradesh

Age (in years)	No.	Body Weight (kg)		Stature (cm)		Head circum- ference (cm)		Chest circum- ference (cm)		Abdominal circum- ference (cm)		Upper arm circum- ference (cm)		Calf circum- ference (cm)	
		$\bar{X}$	S.D	$\bar{X}$	S.D	$\bar{X}$	S.D	$\bar{X}$	S.D	$\bar{X}$	S.D	$\bar{X}$	S.D	$\bar{X}$	S.D
0+	30	6.09	1.51	61.59	5.70	40.72	2.78	40.47	3.99	38.66	5.78	13.42	1.51	14.99	2.44
1+	33	8.83	2.41	73.91	7.13	44.61	1.97	44.29	2.76	43.17	3.82	13.91	1.12	16.44	1.36
2+	30	10.67	1.45	82.33	6.01	46.93	1.44	48.13	2.36	48.66	3.41	14.20	0.74	17.59	0.82
3+	30	11.71	2.18	88.61	7.23	46.96	1.76	48.65	2.55	48.28	3.45	14.31	1.16	18.05	1.63
4+	34	13.51	1.58	96.42	6.54	47.58	1.34	50.58	3.25	50.77	4.86	14.60	0.82	19.14	2.01
5+	56	14.51	1.37	101.12	9.58	47.92	1.05	51.00	1.88	50.75	2.74	15.41	5.09	19.09	1.87
6+	43	16.23	2.27	108.60	8.60	48.76	1.32	52.16	2.75	50.70	3.17	14.79	1.01	20.62	2.01
7+	37	18.00	3.21	113.41	10.64	48.86	1.67	53.96	3.12	51.92	3.58	15.96	5.98	20.83	1.65
8+	29	19.29	2.76	117.69	6.22	49.46	1.62	55.52	2.12	52.48	2.84	15.45	0.99	21.52	1.56
9+	25	22.72	2.74	125.53	7.07	50.32	1.42	57.27	3.04	52.58	3.04	16.23	0.79	22.96	1.17
10+	22	25.54	2.93	130.74	3.91	50.32	1.17	60.66	4.29	55.17	4.24	17.04	1.23	23.43	1.48
11+	22	26.45	3.04	133.31	6.65	50.46	1.49	59.51	3.36	56.17	2.98	16.75	0.93	24.05	1.42
12+	37	31.60	4.84	142.38	5.71	51.43	1.68	65.12	5.57	48.43	5.66	18.19	1.54	25.41	1.79
13+	27	37.59	5.92	144.75	6.57	52.35	1.55	71.81	7.52	62.37	5.10	20.16	1.87	28.50	6.11
14+	29	38.36	4.18	147.35	5.75	52.22	1.88	73.49	5.02	62.01	4.35	20.55	1.65	27.74	1.50
15+	28	38.39	8.49	144.67	13.50	52.02	1.68	72.75	7.93	61.73	4.56	20.40	2.17	27.58	2.80
16+	20	42.55	4.99	147.98	5.66	52.30	0.96	77.15	7.91	65.17	11.35	22.16	1.96	28.57	1.81
17+	23	44.19	4.66	150.04	4.38	52.23	1.61	78.24	3.83	66.21	3.58	21.82	1.78	28.70	2.33
18+	31	41.54	10.37	148.46	7.34	52.34	1.64	77.53	7.62	64.50	7.14	21.54	2.37	28.34	2.67

circumference of boys is higher than girls. The highest mean annual gain has occurred between 12+ and 13+ years in boys (+ 1.04 cm per year) and 11+ and 12+ years in girls (+ 0.97 cm per year) (Tables 1 and 2). Extreme growth curve were represented in head circumference (quick development) than body weight (slow development). Some of the measurements followed the pattern of growth in stature, and chest, abdominal, upper arm and calf circumferences.

The mean chest circumference of infants at 0+ year age group is about 38.97 cm in boys and 40.47 cm in girls. The maximum and minimum annual incremental difference of chest circumference in boys is higher than girls. The maximum mean annual increase has occurred between 14+ and 15+ years in boys (+ 3.42 cm per year) and earlier by two years i.e. 12+ and 13+ years in girls (+ 6.69 cm per year). The mean abdominal circumference of infants at 0+ years age group is 38.45 cm in boys and 38.66 cm in girls. The maximum and minimum mean annual incremental difference of abdominal circumference of boys is higher than girls. The highest mean annual gain has occurred between 14+ and 15+ years in boys (+ 2.82 cm per year) and earlier by two years in girls i.e. 12+ and 13+ years (+ 3.94 cm per year).

The mean upper arm circumference of infants at 0+ years age group is about 13.01 cm in boys and 13.42 cm in girls. The mean calf circumference of infants at 0+ year age group is about 14.53 cm in boys and 14.99 cm in girls. The maximum and minimum mean annual incremental difference of upper arm and calf circumference of girls is higher than boys. The maximum mean annual increase of upper arm (+ 1.08 cm per year) has occurred between 13+ and 14+ years in boys and earlier by one year in girls i.e. 12+ and 13+ years in boys. It is found in calf circumference between 13+ and 14+ years (+ 1.64 cm per year) and earlier by one year in girls i.e. 12+ and 13+ years (+ 3.09 cm per year) (Tables 1 and 2).

The juvenile spurt of upper arm circumference (+ 0.54 cm) in Yata boys is attained between 8+ and 9+ years which is delayed by a year than head circumference (+ 1.66 cm) i.e. (7+ and 8+ years) and which is delayed by two years than chest circumference (+ 1.86 cm) i.e. (6+ and 7+ years) and which is delayed by three years than abdominal circumference (+ 0.88 cm) body

weight, calf circumference (+ 1.32 cm) (5+ and 6+ years) which is delayed by four years than stature (+ 8.80 cm) i.e. (+ 3 and 4+). The juvenile spurt of upper arm circumference (+ 2.05 cm) in Yata girls is attained between (6+ and 7+ years) and also delayed by one year than head circumference (+ 0.84 cm), calf circumference (+ 1.53 cm) i.e. 5+ and 6+ years and delayed by two years than bodyweight (+ 1.80 kg), stature (+ 7.81 cm), chest circumference (+ 1.93 cm), abdominal circumference (+ 2.49 cm) i.e. 3+ and 4+ years.

The highest peak velocity or adolescent growth spurt is a constant phenomenon and occurred in all children in this period (12+ and 15+ years) there is a marked acceleration of Yata boys in body weight (+ 5.36 kg) and abdominal circumference (+ 2.82 cm) i.e. 14+ and 15+ years. It is delayed by one year than stature (+ 8.95 cm), upper arm circumference (+ 1.39 cm) and calf circumference (+ 1.64 cm) i.e. 13+ and 14+ years and which is delayed by two years than head circumference (+ 1.04 cm) chest circumference (+ 3.66 cm) i.e. 12+ and 13+ years. The adolescent growth spurt of Yata girls in bodyweight (+ 5.99 kg), chest circumference (+ 6.69 cm), abdominal circumference (+ 3.94 cm), upper arm circumference (+ 1.97 cm) and calf circumference (+ 3.09 cm) is attained between 12+ and 13+ years which is delayed by a year than stature (+ 9.07 cm) and head circumference (+ 0.97 cm) i.e. (11+ and 12+ years). The differential growth rates by sex operating only at adolescence as a direct result of the differential hormonal secretion. The t-test comparison between seven measurements of Yata boys versus girls according to age shows significant differences (Table 3). The growth curves shows as measure of population well-being, secular trend and the much neglected subject of the relation between mental and physical development.

In the present study, stature, body weight and all circumferences (0+ and 18+ years) as well as systolic blood pressure, diastolic blood pressure and pulse rate (12+ to 69+ years) is progressively accelerated with advancement in age with few fluctuations. These standards suggests to introduction of preventive measures such as weight control, dietary changes and physical activity especially for hypertension subjects. The deviations from the expected trend observed in the present study must have been

Table 3: t-test Comparison between seven measurements of Yata boys versus girls according to age.

Age (in years)	Body Weight	Stature (cm)	Head circum- ference	Chest circum- ference	Abdominal circum- ference	Upper arm circum- ference	Calf circum- ference
0+	0.06	0.40	0.68	1.43	0.16	1.03	0.75
1+	1.21	2.14**	3.37****	4.49***	3.24***	0.99	1.40
2+	0.94	1.18	0.12	0.31	2.22**	0.58	1.15
3+	1.15	0.46	1.50	2.63**	1.56	1.03	1.32
4+	1.19	0.12	2.27**	1.41	0.39	0.12	0.02
5+	1.19	0.17	4.35***	2.19**	0.32	1.05	1.03
6+	1.78*	0.21	3.53***	2.64**	1.71*	0.57	0.27
7+	1.14	0.18	2.98***	2.33**	0.67	1.82*	1.21
8+	2.29**	1.64	1.28	1.95*	0.44	0.11	0.98
9+	1.16	1.17	0.24	0.74	1.55	1.06	1.25
10+	1.92*	1.47	1.46	0.46	0.37	2.43**	0.87
11+	1.02	0.52	2.07**	1.90*	0.26	1.05	0.40
12+	1.81*	3.47***	0.50	1.82*	0.48	0.73	1.87
13+	3.30***	0.01	0.85	2.96***	2.50**	0.76	2.10**
14+	0.29	1.53	1.67*	3.13***	0.29	0.17	0.58
15+	2.22**	3.48***	2.19**	0.04	2.86***	1.59*	1.70*
16+	1.32	6.31***	2.28**	1.47	0.28	2.59**	0.40
17+	2.29**	4.69***	3.36**	1.57	0.25	0.36	1.05
18*	3.35***	5.55***	4.47***	1.60	1.97*	3.09***	2.22**

* significant at 5% level ** significant at 1% level *** significant at 0.1% level

due to the differences in body composition, habitual physical activities, cholesterol, diet, income, smoking, alcoholism etc. (Tables 4, 5).

It will be apparent from the foregoing discussion that the findings on Yata boys and girls indicate that they are heavier in weight and shorter in height than the findings obtained by Singh (1980), Sharma (1991), Bharati and Bharati (1991) and Dharma Rao and Busi (1997 and 1998) and also shorter than the findings of

Hauspie et al. (1980). These boys and girls are shorter and heavier, similar head and broader chest circumferences than the I.C.M.R (1984) standards. These results are general and universal in character and are observed in many populations (Johnston et al., 1975). These boys are more or less similar to the finding of Tanner et al. (1966), Dharma Rao and Busi (1997 and 1998). The findings generated in this paper can therefore be utilized as reference material for the

Table 4: Mean, standard deviation of blood pressure and pulse rate of Yata men by age

Age (in years)	Systolic Blood pressure		Diastolic Blood pressure		N	Pulse rate	
	N	$\bar{X}$	S.D	$\bar{X}$		$\bar{X}$	S.D
12-20	18	108.70	67.23	68.18	185	95.58	15.58
20-29	94	110.57	13.20	77.76	94	93.06	14.04
30-39	14	103.57	14.49	70.00	14	94.85	14.07
40-49	53	109.77	16.23	75.09	52	93.96	13.46
50-59	17	114.35	26.45	83.52	17	96.47	18.21
60-69	31	133.03	29.77	75.16	29	90.20	12.35

Table 5: Mean, standard deviation of blood pressure and pulse rate of Yata women by age

Age (in years)	Systolic Blood pressure		Diastolic Blood pressure		N	Pulse rate	
	N	$\bar{X}$	S.D	$\bar{X}$		$\bar{X}$	S.D
12-20	184	103.75	16.68	64.64	184	102.76	13.51
20-29	109	101.08	19.42	67.06	103	97.80	14.56
30-39	32	104.37	16.44	67.18	32	102.37	13.67
40-49	34	115.00	24.64	73.52	31	92.90	9.83
50-59	23	128.86	25.66	78.26	22	92.36	10.02
60-69	25	131.20	30.61	78.96	25	98.64	19.56

Yata boys and girls in Visakhapatnam district of Andhra Pradesh. Goldstein and Tanner (1980), Busi and Dharma Rao (2003) have pointed out that the findings observed from such studies would be useful as an alternative to the growth standards and also useful as an index of good health accepted in the field of preventive medicine and treatment in growth disorders in Auxology and to estimate the genetically engineered growth hormones deficiency and pathological growth of stature.

ACKNOWLEDGEMENTS

The financial assistance provided by University Grants Commission, New Delhi for the major research project entitled: physical growth, health, and nutritional status among some selected occupational groups of Visakhapatnam district of Andhra Pradesh (F5-6/2000(HRP) is gratefully acknowledged.

KEYWORDS Physical Growth. Anthropometry. Blood Pressure. Pulse Rate. South India.

ABSTRACT A cross sectional study was undertaken on 956 Yata boys and 899 Yata girls aged between 0+ and 18+ years in rural schools situated in Visakhapatnam district of Andhra Pradesh (South India) during July 2002 to June 2003. In this paper data on body weight, stature, head, chest, abdominal, upper arm and calf circumferences, blood pressures and pulse rate are presented including the patterns of change in these physical and physiological traits with advancement of age. It has been observed that there is progressively increasing trend in all the dimensions with advancement in age. The study reveals the adolescent growth spurt or highest peak velocity of girls (12+ and 13+) is attained earlier by two years than boys (14+ and 15+ years). Blood pressure and pulse rate increased with advancement in age with few fluctuations. Analysis of the data reveals that all the measurements showed significant differences by sex according to age. Yata boys and girls are shorter heavier with broader chest and similar head circumference than ICMR (1984) National standards. The findings of the study can be used as reference materials for Yata boys and girls of Visakhapatnam district.

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