

Growth Progression in Physical and Physiological Variables Among Jalaris of Visakhapatnam District, Andhra Pradesh

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INTRODUCTION

Several studies in rural and urban populations have observed that with the advancement in age there is a tendency for accelerations in all the physical traits except skin folds (Singh, 1980; ICMR, 1984; Nath, 1987; Bharati et al., 1991; Sharma, 1991; Nath et al., 1991; Dharma Rao and Busi, 1996-2000). 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, 1992) Body composition (Sambasiva Rao, 1993), 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; Gangopadhyay et al., 1988; Nirmala and Chengal Reddy, 1991; Dharma Rao and Busi, 1996, 2000) among others. However there is dearth of published data related to growth progression and blood pressure of Jalari boys and girls and the Indian Council of Medical Research (ICMR, 1984) in their nation wide growth survey did not include the jalari boys and girls of Visakhapatnam district. Feeling the dearth of data a cross-sectional survey on growth of Jalari boys and girls was undertaken in August 2000 to July 2001 covering 17 body measurements.

In the present study an attempt has been made to study the effect of age from 0+ to 18+ on seventeen 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, circumferences and skinfold thicknesses, 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

Andhra Pradesh is the fifth largest state in India having a long coastal line of 600 miles, extending from Itchapuram in Srikakulam district to Tada in Nellore district. It is situated between 13° N and 20° N. There are nearly 300 fishing villages on this coast with a population of roughly half-a-million. These include four endogamous fishermen populations namely the Jalari, Vadabalija, the Palli, and the Basta. They depend mainly on marine fishing. The fishermen community of Visakhapatnam district consists of mainly of three distinct caste groups namely the Jalaris, the Vadabalijas, and the Pallis. The Jalaris are an endogamous Hindu caste group. The settlements of Jalaris are clustered and small to medium in size. The number of houses ranges from 10 to 100. The huts are of special conical shape, thatched with palmyrah leaves. At certain places one occasionally comes across with linear, thatched huts with mud walls. The sanitation condition is extremely disappointing. A fisherman's hut usually consists of a single room which is used for all purposes. Occupationally the front yards of their houses are important because they provide space for drying the fish as well as the nets. It is observed that diseases such as skin, respiratory infections and anemia are found to be more prevalent in the fishermen community revealing the bad sanitary conditions they live in. The educational facilities are meager. Though the primary schools are available in each village most of the school going children are participating in fishing. Published information on the origin and history of the jalari is very scanty. The only available source is Thurston (1909) which states the Jalaris are Telugu fishermen and the name is derived from 'jala' 'a net'. They bear the name gangavamsam or people of ganga. The Jalaris claim that they are the traditional fishermen.

The social status of all the fishermen castes in the hindu caste system is very low. Among themselves it is found in the present investigation

that the Vadabaliya and Palli are traditionally ranked higher than the Jalaris in Hindu caste hierarchy. The male children of a family even before they attain the age of ten accompany the net group at the sea and also help in secondary activities. For a Jalari marriage with a person other than his own caste is strictly prohibited. Marriage and eating together are indications of equality and they are allowed only between members of the same community. Preferential marriages are most common among Jalaris. Separation and divorce are allowed among the fishermen. Widow remarriages and the marriage of separated women are known as 'marumanuvu'. The usual mode of post-marital residence is virilocal and the exclusive rights of ownership to the property of the household are recognised only to the male agnates of the household. The Jalaris conduct their fishing activity either independently or by joining a smaller net group using small boats or catamarans and nets of different types. A major portion of the fish catch is sold on shore itself and only a small portion of it is reserved for domestic consumption. Most of the Jalari women of the village engage themselves in fish trade. In almost all cases fish is sold on credit. As much as 70% of income is spent on food.

The Jalaris eat twice a day and the day time food consists chiefly millet gruel, either of ragi (*Eleusine corocana*) or jonna (*Sorghum vulgare*). Only during nights they eat cooked rice. However high income households supplement their food with cooked rice in place of gruel. Consumption of vegetables is very meager. They eat fish every day. Consumption of flesh foods and eggs is noticed on a lesser scale. They generally do not use milk and its derivatives. Their population in Andhra Pradesh is 23669 and the entire population live in Visakhapatnam district only according to 1981 Census. They have received benefits from special nutritional programmes through the ICDS, SNP and other schemes.

The material for the present study was based on a cross-sectional data collected on 834 Jalari boys and 852 Jalari girls drawn from 11 schools of Visakhapatnam (urban) mandal of Visakhapatnam district of Andhra Pradesh during the months of August 2000 to July 2001. 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 municipal

corporation. 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 years 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. Skinfolts were measured with Harpenden skinfold caliper. The Anthropometric measurements were taken after Weiner and Lourie (1969). 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, 1997). The hypertension followed after WHO (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 4. It can be inferred from the Tables 1 and 2 and figures 1 to 7 that the mean values for all the body measurements except skinfold thicknesses are progressively increasing with advancement of age from 0+ to 15+ years in boys and 0+ to 12+ years in girls and showed steady pattern of growth and afterwards almost stationary pattern with decelerating trend of growth progression in both sexes. From the table 3 and 4 it is clear that all the eight skinfold characters show non-normal distributions at several ages. Standard deviations for these characters have not shown any consistent pattern as found earlier in linear,

transverse and circumferential and skin fold measurements. The highest value of Standard deviation in stature (9.30cm) was found at 13+ and 14+ years in boys and chest circumference (8.62cm) in girls occurring at 12+ and 13+ years.

The mean Body weight of Jalari infants at 0+ age group is about 6.45 kg in boys and 6.39 kg in girls. Between 0+ and 18+ years the boys and girls marked a difference of 6.87 kg, 8.17 kg respectively between the lowest and highest annual increments in body weight. The highest peak velocity has occurred between 15+ and 16+ years in boys (+7.16 kg per year) and earlier by three years (12+ and 13+ year) in girls (+8.81 kg per year) is the growth of total body mass manifested.

The mean Stature of infants at 0+ years age group is about 62.58 cm in boys and 62.61cm 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 (+9.04 cm per year) and earlier by two years 11+ and 12+ years (+6.27cm. per year) in girls. The mean Head circumference of infants at 0+ years age group is about 42.13cm in boys and 41.59cm in girls. The difference in minimum and maximum annual increments of head circumference of boys is higher than girls. The highest mean annual gain has occurred between 13+ and 14+ years in boys (+0.99 cm per year) and girls (+0.86 cm per year). (Tables 1 and 2).

The mean chest circumference of infants at 0+ year age group is about 41.39 cm in boys and 41.23 cm in girls. The maximum and minimum annual incremental difference of chest circumference in girls is higher than boys. The maximum mean annual increase has occurred between 15+ and 16+ years in boys (+6.67cm per year) and earlier by three years i.e. 12+ and 13+ years in girls (+9.48cm per year). The mean abdominal circumference of infants at 0+ years age group is 40.05cm in boys and 39.93cm in girls. The maximum and minimum mean annual incremental difference of abdominal circumference of girls are higher than boys. The highest mean annual gain has occurred between 15+ and 16+ years in boys (+2.62 cm per year) and earlier by three years in girls i.e. 12+ and 13+ years, (+ 6.51cm per year) .

The mean upper arm circumference of infants at 0+ years age group is about 13.53cm in boys and 13.34cm in girls. The mean calf circum-

ference of infants at 0+ year age group is about 15.15cm in boys and 15.65cm in girls. The maximum and minimum mean annual incremental difference of upper arm and calf circumference of boys is higher than girls. The maximum mean annual increase of Upper arm (+2.32cm per year) has occurred between 15+ and 16+ years in boys and earlier by three years in girls i.e. 12+ and 13+ years. In boys it is found in calf circumference between 13+ and 14+ years (+1.89 cm per year) and earlier by one year in girls i.e. 12+ and 13+ years (+2.87cm per year) (Tables 1 and 2).

Fat fold at Triceps region increased gradually from 0+ to 4+ years and almost stationary in boys and little accelerated in girls. The highest mean annual gain has occurred between 12+ and 13+ years (+0.82 mm per year) in boys and girls (+2.69 mm per year). The mean biceps increases gradually with minor irregularities in the means from 0+ to 4+ years and almost stationary in boys but it increases in girls. The highest mean annual gain has occurred between 12+ and 13+ years in boys (+1.10 mm per year) and girls (+1.17 mm per year). The mean subscapular skin fold of infants at 0+ years age group is 7.80 mm in boys and 8.07 mm in girls and then gradually increased with minor irregularities from 0+ to 18+ years in both sexes. The highest mean annual gain has occurred between 12+ and 13+ years in boys (+1.02 mm per year) and girls (+3.49 mm per year). (Tables 3 and 4).

The mean suprailiac skin fold of infants at 0+ years age group is about 8.04mm in boys and 8.49mm in girls, gradually declines by 5+ years in both the sexes and increases by 18+ years with minor fluctuations in both the sexes. The highest mean annual gain (+2.08 mm per year) has attained between 15+ and 16+ years in boys and it is earlier by three years in girls i.e. 12+ and 13+ years (+3.78 mm per year). The abdominal and anterior thigh skin folds from 0+ to 18+ years in both sexes accelerating trend is noticed with minor fluctuations. The highest mean annual gain of abdominal skinfold of boys (+1.69 mm) and girls (+4.24 mm) is attained between 12+ and 13+ years as similar to that of anterior thigh skin fold in boys (+1.30 mm per year) and girls (+5.13mm per year) i.e. 12+ and 13+ years (Tables 3 and 4).

The medial calf skin fold of infant at 0+ age group is about 12.79 mm in boys and 13.45 mm per year in girls. It decreases from 0+ to 5+ years

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

Age (in years)	No.	Body weight (kg)		Stature (cm)		Head Circumference (cm)		Chest Circumference (cm)		Abdominal Circumference (cm)		Upper arm Circumference (cm)		Calf Circumference (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+	35	6.45	1.66	62.58	4.78	42.13	2.70	41.39	3.30	40.05	4.09	13.53	1.26	15.15	1.51
1+	39	8.82	1.71	74.18	5.00	45.61	2.41	45.52	2.50	43.60	3.67	13.99	0.82	16.69	1.46
2+	43	11.20	1.67	82.76	4.94	47.17	1.35	48.08	2.38	47.45	2.91	14.64	1.08	17.86	1.30
3+	44	12.25	1.86	88.88	5.49	47.77	1.61	49.73	2.24	48.63	2.96	14.59	1.04	18.39	1.64
4+	38	13.45	1.57	94.32	5.81	48.42	1.59	50.26	1.73	48.66	2.13	14.64	1.04	19.28	1.32
5+	48	14.96	1.63	101.05	5.17	48.85	1.26	52.28	7.28	50.19	2.16	14.64	0.91	19.76	1.29
6+	60	15.85	2.40	106.24	5.45	49.17	1.29	52.30	3.19	49.70	3.59	14.43	1.24	19.79	1.66
7+	56	17.60	2.28	112.36	6.45	49.54	1.52	52.62	2.71	50.10	2.21	14.84	0.98	20.89	1.67
8+	58	19.60	2.58	116.61	6.00	50.07	1.66	55.80	2.83	51.81	3.03	15.19	1.02	21.80	2.10
9+	65	21.36	2.56	121.13	6.42	50.10	1.96	56.80	2.95	53.20	3.42	15.57	0.99	22.44	1.52
10+	59	22.64	3.19	125.29	5.27	50.69	2.00	57.58	3.20	54.34	3.66	15.99	1.33	22.79	1.52
11+	53	26.69	3.90	131.53	5.39	50.87	1.33	60.30	4.76	55.57	4.55	16.82	1.56	24.40	1.69
12+	37	26.92	4.23	133.36	6.57	51.29	1.56	58.90	4.11	55.30	4.01	16.83	1.40	24.88	2.07
13+	36	31.24	4.81	138.31	6.89	51.44	1.50	61.98	5.73	57.90	3.68	17.81	1.53	26.26	2.30
14+	38	36.72	5.80	147.35	9.30	52.43	2.00	66.61	5.14	60.30	4.65	18.85	2.03	28.15	2.39
15+	30	40.54	6.29	153.20	6.40	53.06	1.95	69.80	7.44	62.43	4.76	19.60	1.81	28.77	2.70
16+	30	47.70	4.07	159.30	3.64	53.56	1.87	76.47	4.65	65.05	3.84	21.92	1.91	30.45	1.42
17+	30	49.33	7.04	160.84	6.42	53.58	2.48	75.43	4.98	64.10	4.90	22.32	2.07	30.71	2.65
18+	35	53.54	5.11	164.74	5.68	54.15	2.23	80.16	5.23	67.74	4.60	23.22	1.65	32.04	2.11

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

Age (in years)	No.	Body weight (kg)		Stature (cm)		Head circumference (cm)		Chest circumference (cm)		Abdominal circumference (cm)		Upper arm circumference (cm)		Calf circumference (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+	48	6.39	1.51	62.61.	6.02	41.59	3.25	41.23	2.78	39.93	3.04	13.35	1.19	15.65	1.73
1+	39	8.96	1.38	72.72.	4.00	44.84.	1.37	45.08	2.19	44.05	3.03	13.96	0.94	16.76	1.36
2+	36	9.96	1.61	79.66	5.16	45.97	1.56	46.64.	2.31	45.38	2.65	14.08	1.07	16.93	1.46
3+	43	11.28	1.61	84.89	6.05	46.60	1.30	48.71	1.86	47.05	2.42	14.15	0.74	17.93	1.25
4+	54	13.33	2.31	92.61	5.71	47.37	1.21	49.56	2.76	48.85	2.66	14.42	0.84	18.90	1.37
5+	69	15.12	1.96	100.27	6.93	48.26	1.47	51.24	2.59	49.80	3.18	14.84	1.02	19.91	1.55
6+	56	15.70	1.64	104.86	4.44	48.39	1.35	51.78	2.13	50.26	2.86	14.63	0.84	20.05	1.32
7+	57	17.16	2.36	109.56	4.74	48.03	1.33	52.58	2.64	51.21	3.96	14.96	1.01	21.02	2.02
8+	57	18.45	2.14	115.14	5.23	48.94	1.29	53.58	2.50	51.04	2.79	15.17	0.86	21.40	1.39
9+	62	20.36	2.14	119.70	5.13	49.48	1.30	55.43	2.53	52.55	3.61	15.58	1.00	21.95	1.50
10+	63	22.84	2.60	125.74	6.35	50.06	1.50	57.31	2.99	54.15	3.86	16.50	1.00	23.49	1.73
11+	49	25.59	3.31	131.43	5.83	50.30	1.38	59.20	3.58	55.20	3.89	16.85	1.27	24.35	1.91
12+	53	30.36	3.50	139.26	6.47	51.08	1.17	63.44	6.14	57.43	4.89	18.27	1.40	25.97	1.87
13+	33	39.17	7.77	145.59	6.34	51.65	1.37	72.92	8.62	63.94	7.05	20.32	2.44	28.84	2.68
14+	29	40.48	4.63	147.91	4.67.	52.51	1.35	73.78	5.45	61.26	3.77	20.32	1.49	29.35	1.99
15+	30	42.41	5.07	149.00	4.64	51.95	1.02	74.87	6.73	63.10	5.30	21.02	1.70	29.68	2.11
16+	23	47.99	4.33	153.29	5.09	52.86	1.52	79.51.	5.44	66.50.	7.29	22.37	1.05	31.36	1.61
17+	22	46.40	3.68	152.95	5.31	52.50	0.77	80.11	4.97	66.04	4.88	21.58	1.10	29.90	1.49
18+	29	47.04.	5.17	150.91	5.59	52.83	2.34	82.41	7.26	67.13	7.04	21.97	1.98	30.62	2.34

Table 3: Mean and Standard deviation of eight skinfold measurements among Jalari boys of Visakhapatnam district of Andhra Pradesh

Age (in years)	No.	Triceps (mm)		Biceps (mm)		Subscapular (mm)		suprailiac (mm)		Abdominal (mm)		Anterior thigh (mm)		Medial calf (mm)		Forearm (mm)	
		\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
0+	35	8.81	1.48	7.66	2.11	7.80	3.08	8.04	2.70	11.19	5.68	14.99	3.49	12.79	4.19	9.65	2.40
1+	39	9.70	1.22	7.08	1.60	6.62	1.54	6.34	2.11	7.55	2.91	12.74	2.74	11.63	2.37	8.91	1.32
2+	43	10.28	1.70	7.01	1.86	7.18	1.81	6.50	2.08	7.15	2.43	12.46	2.75	11.68	2.57	8.24	2.02
3+	44	10.20	2.15	7.80	1.86	7.32	1.68	6.28	2.28	7.06	2.12	11.46	2.95	10.64	2.07	8.19	1.59
4+	38	9.91	1.82	7.38	2.08	6.77	1.88	5.94	3.54	6.86	2.75	11.61	2.73	10.66	2.74	7.33	1.58
5+	48	9.36	1.47	6.66	1.81	6.70	1.61	5.76	2.49	6.75	2.59	10.49	2.38	9.12	1.59	6.63	1.18
6+	60	8.61	1.97	6.02	1.60	6.81	2.65	5.36	2.70	6.33	2.83	9.93	2.81	9.05	1.98	6.26	1.70
7+	56	8.03	1.74	5.37	1.98	5.95	1.78	4.68	1.69	6.03	2.09	9.74	1.95	8.91	2.15	5.55	1.27
8+	58	8.03	1.91	5.60	1.94	6.10	1.75	5.12	2.18	6.14	2.90	9.92	2.90	8.91	1.78	5.52	1.38
9+	65	7.86	2.10	5.09	1.60	6.19	1.46	4.98	1.70	6.27	2.32	9.26	1.97	8.88	2.10	5.59	1.51
10+	59	8.02	2.64	5.20	1.82	6.45	2.44	5.65	3.41	6.78	3.47	9.81	2.76	8.81	2.61	5.74	1.85
11+	53	8.30	2.69	5.11	1.83	7.06	3.37	5.77	2.74	7.24	3.96	10.60	4.36	9.61	2.51	5.61	1.41
12+	37	7.50	2.17	4.70	1.43	6.16	1.84	5.34	2.27	5.96	2.45	10.26	3.09	9.76	2.31	5.57	1.35
13+	36	8.32	2.54	5.80	1.47	7.18	2.90	6.29	3.16	7.65	3.81	11.56	3.54	10.22	2.40	5.49	1.15
14+	38	8.19	2.90	5.05	1.50	7.57	2.71	6.28	2.25	7.38	3.44	11.97	4.03	11.08	3.39	5.37	1.21
15+	30	7.60	2.90	5.84	2.39	7.58	2.58	6.47	2.29	7.17	3.32	11.74	4.43	10.79	3.83	5.69	1.76
16+	30	7.56	1.86	5.72	2.30	8.89	1.53	8.55	3.31	10.84	4.70	13.59	3.57	12.31	3.73	5.54	1.01
17+	30	7.04	1.92	5.07	1.46	7.61	2.29	8.55	3.33	8.47	2.50	12.78	3.76	10.80	3.04	5.37	1.17
18+	35	7.10	2.98	5.70	3.05	9.09	3.12	8.54	4.96	9.54	5.45	13.26	5.86	10.73	3.70	5.48	1.43

Table 4: Mean and Standard deviation of eight skinfold measurements among Jalari girls of Visakhapatnam district of Andhra pradesh

Age (in years)	No.	Triceps (mm)		Biceps (mm)		Subscapular (mm)		Supra iliac (mm)		Abdominal (mm)		Anterior thigh (mm)		Medial calf (mm)		Fore arm (mm)	
		\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
0+	48	9.53	1.89	7.30	1.69	8.07	1.70	8.49	2.77	9.95	3.59	15.69	3.84	13.45	3.96	10.04	2.66
1+	39	9.80	1.30	7.12	1.89	7.08	1.31	7.27	2.17	7.69	2.55	13.96	2.50	12.26	2.81	9.20	1.55
2+	36	10.09	2.00	7.76	1.78	7.63	2.11	7.20	2.51	7.16	2.23	12.98	3.37	11.78	3.44	8.96	2.11
3+	43	10.88	1.87	8.00	1.76	7.84	1.51	6.32	2.07	8.55	2.87	13.29	3.10	11.58	3.07	8.40	1.87
4+	54	10.26	1.44	7.42	1.65	7.75	1.76	6.81	1.99	7.81	2.20	11.95	2.75	11.40	2.83	7.66	1.53
5+	69	9.54	1.55	6.82	1.61	7.25	1.64	6.72	2.96	8.23	3.22	11.84	3.02	9.96	2.23	6.61	1.22
6+	56	9.30	1.60	6.58	1.62	7.58	1.77	7.04	2.40	8.46	2.89	11.50	2.29	9.75	1.86	6.55	1.64
7+	57	9.16	2.11	6.42	1.75	7.82	1.60	7.33	2.87	8.74	3.15	12.17	2.88	9.90	1.84	6.62	1.53
8+	57	8.47	1.64	6.06	1.80	7.51	1.75	6.65	2.33	8.00	2.99	11.88	3.02	9.74	1.85	6.48	1.47
9+	62	8.67	1.56	6.14	2.95	8.10	1.60	7.49	2.65	9.18	3.01	13.18	2.45	9.95	2.03	6.20	1.44
10+	63	9.09	2.01	6.07	2.13	8.58	2.00	7.59	2.89	9.74	3.58	13.29	3.57	10.83	2.87	6.52	1.57
11+	49	9.17	2.72	5.93	2.02	8.88	2.13	7.96	2.86	10.40	4.26	14.35	4.56	11.00	2.50	6.28	1.54
12+	53	9.66	3.00	6.78	2.22	10.06	2.52	9.73	3.59	12.09	3.65	16.24	4.09	11.51	2.59	6.55	2.05
13+	33	12.35	4.23	7.95	3.23	13.55	5.41	13.51	5.02	16.33	6.76	21.37	4.94	14.83	4.16	7.49	2.50
14+	29	11.63	2.46	7.14	1.54	12.54	2.65	11.90	2.63	14.64	3.49	20.17	4.34	15.60	4.37	7.08	2.03
15+	30	13.80	5.48	9.57	2.95	15.77	5.50	14.59	4.69	17.87	5.74	21.78	6.22	15.34	3.97	7.83	1.80
16+	23	13.70	3.32	9.07	3.71	18.71	6.19	16.59	6.10	21.17	4.77	25.77	4.98	19.82	5.35	8.26	1.15
17+	22	13.14	3.43	8.85	2.07	15.88	4.62	13.61	4.12	19.01	4.94	24.46	8.04	16.95	2.96	6.75	1.57
18+	29	15.04	3.93	9.71	3.00	18.61	6.04	16.74	4.49	19.77	5.75	25.25	5.24	17.59	4.38	8.40	2.03

Table 5: t-test comparison between fifteen measurements of Jalari boys versus girls according to age

Age (in years)	Body weight	Stature	Head circumference	Chest circumference	Abdo. minimal circumference	Upper arm circumference	Calf circumference	Triiceps+	Biceps+	Supra Pular+	Supra iliac+	Abdo. minimal+	Anterior thigh+	Medial calf+	Fore arm+
0+	0.18	0.03	0.81	0.24	0.15	0.67	1.34	1.85*	0.87	0.50	0.72	1.21	0.85	0.73	0.70
1+	0.40	1.42	1.74*	0.83	0.59	0.15	0.24	0.35	0.10	1.44	1.90*	0.23	2.04**	1.07	0.89
2+	3.32***	2.72***	3.69***	2.71***	3.28***	2.29**	2.97***	0.45	1.80*	1.02	1.34	0.34	0.76	0.15	1.55
3+	2.59***	2.57***	3.74***	2.29*	2.72***	2.26**	1.48	1.64	0.51	1.51	0.09	2.75***	2.84***	1.66	0.57
4+	0.29	1.40	3.57***	1.37	0.36	1.40	1.33	1.01	0.09	2.54**	1.49	1.84*	0.60	1.23	0.99
5+	0.47	0.66	2.26*	2.24*	0.73	1.10	0.53	0.64	0.53	1.80*	1.82	2.64**	2.58***	2.20**	0.08
6+	0.37	1.48	3.18***	1.01	0.93	0.99	0.93	2.05**	1.86*	1.80*	3.49***	4.00**	3.28**	1.96*	0.93
7+	1.01	2.62**	2.66**	2.06*	1.83*	0.65	0.36	3.08***	2.98***	5.85***	5.96***	5.38***	5.22***	2.62**	4.04***
8+	2.60***	1.40	4.04***	4.43***	1.40	0.13	1.22	1.30	1.30	4.30***	3.64***	3.36***	3.54***	2.45**	3.60***
9+	2.38***	1.37	2.05*	2.91***	1.04	0.02	1.81*	2.44**	2.50**	7.02***	6.05***	6.11***	9.93***	2.92***	2.34**
10+	0.39	0.46	1.99*	0.46	0.27	2.38**	2.35**	2.53**	2.40**	5.27***	3.39***	4.63***	5.98***	4.06***	2.50**
11+	1.53	0.08	2.15*	1.31	0.42	0.09	0.16	1.62	2.13*	3.23**	3.58**	3.87**	4.26**	2.80**	2.28*
12+	4.20***	4.22+**	0.71	3.91***	2.19*	4.80***	2.00**	3.74**	5.03***	8.02***	6.57***	8.89***	7.50***	3.39***	2.53**
13+	5.14***	4.55***	0.59	6.25***	4.50***	5.15***	4.29***	4.84***	4.86***	6.16***	7.21***	6.64***	9.53***	5.74***	4.31***
14+	2.86***	0.29	0.16	5.51***	0.89	3.30***	2.18*	5.12***	5.58***	7.48***	9.40***	8.52***	7.97***	4.77***	4.29***
15+	1.27	2.90***	2.74***	2.73***	0.51	3.12***	1.44	5.46***	5.37***	7.38***	8.51***	8.83***	7.19***	4.51***	4.64***
16+	0.24	5.01***	1.45	2.190*	0.93	1.02	2.17*	8.52***	4.03**	8.37***	6.14**	7.86**	10.36**	6.01**	9.96***
17+	1.78*	4.69***	1.95*	3.35***	1.41	1.52	1.79	8.14***	7.69***	8.47***	4.89***	10.7***	6.95***	7.28***	3.62***
18+	5.03***	9.75***	2.36*	1.43	0.41	2.73***	2.54**	9.18***	5.26***	8.10***	6.86***	7.28***	8.53***	6.79***	6.56***

Distance curves of Jalari

Legend: ■ Boys ● Girls

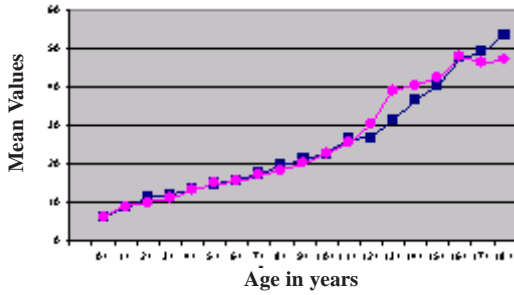


Fig. 1. Distance curve of Body weight

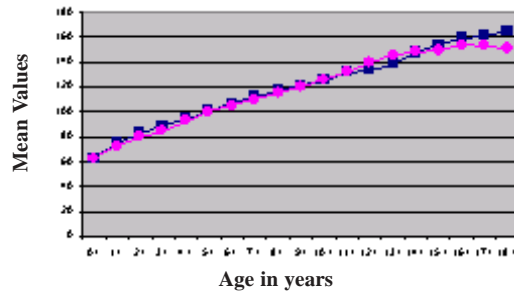


Fig. 2. Distance curve of Stature

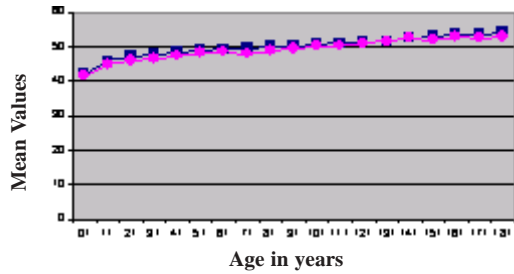


Fig. 3. Distance curve of Head circumference

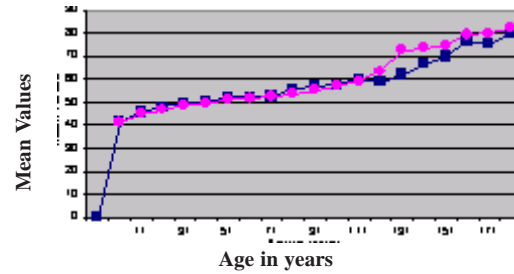


Fig. 4. Distance curve of chest circumference

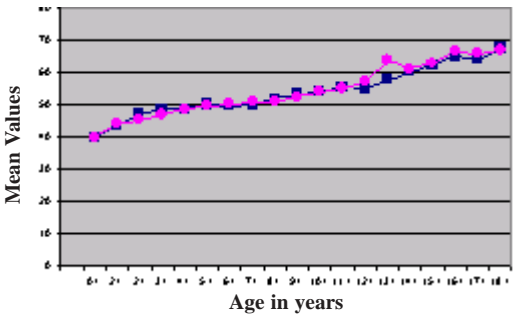


Fig. 5. Distance curve of Abdominal circumference

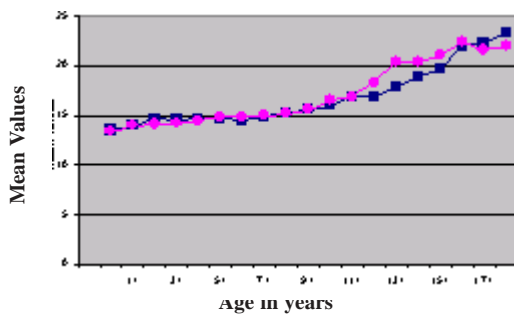


Fig. 6. Distance curve of upper arm circumference

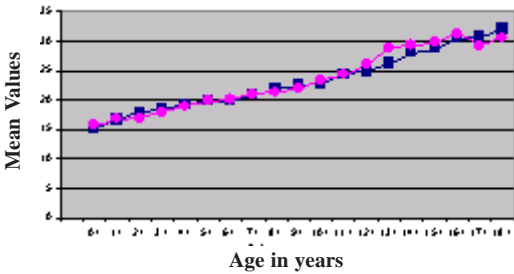


Fig. 7. Distance curve of Calf circumference

Distance curves of Jalari

Legend: ■ Boys ● Girls

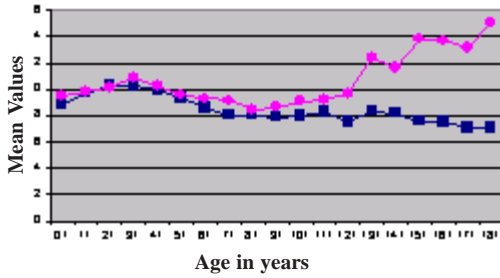


Fig. 8. Distance curve of Triceps skinfold

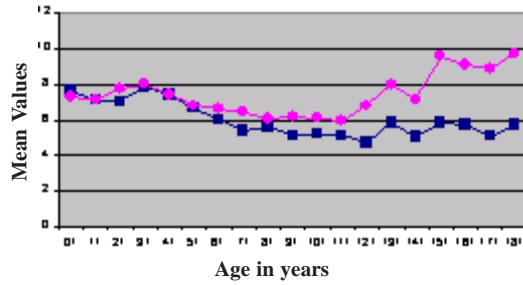


Fig. 9. Distance of Biceps skinfold

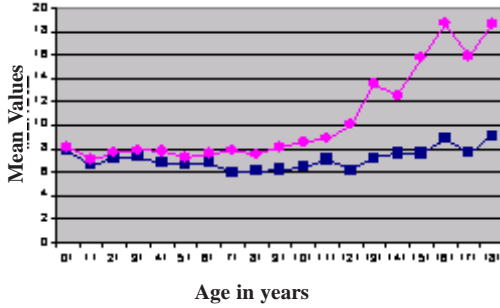


Fig. 10. Distance curve of Subscapular skinfold

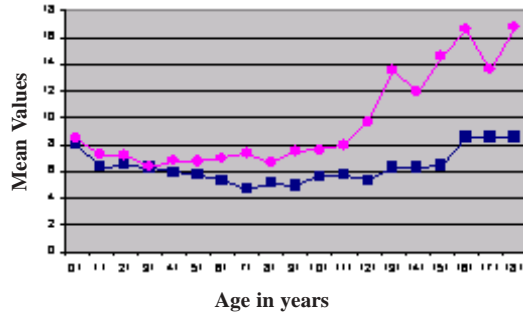


Fig. 11. Distance curve of supra iliac skinfold

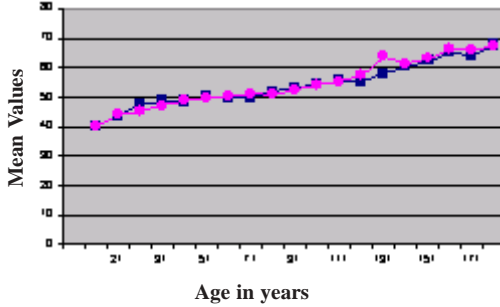


Fig. 12. Distance curve of Abdominal skinfold

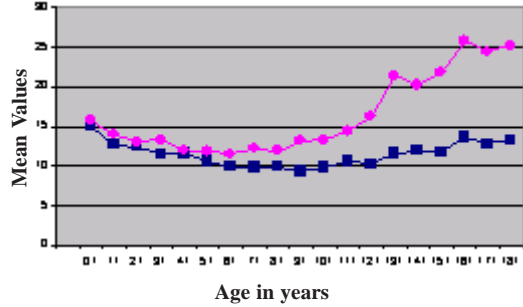


Fig. 13. Distance curve of anterior thigh skinfold

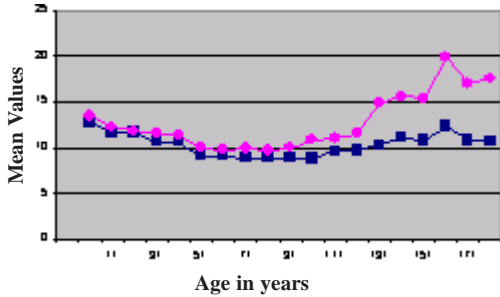


Fig. 14. Distance curve of medial calf skinfold

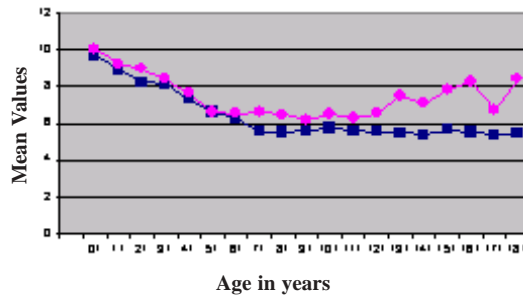


Fig. 15. Distance curve of fore arm skinfold

Distance curves of Jalari

Legend: ■ Boys ● Girls

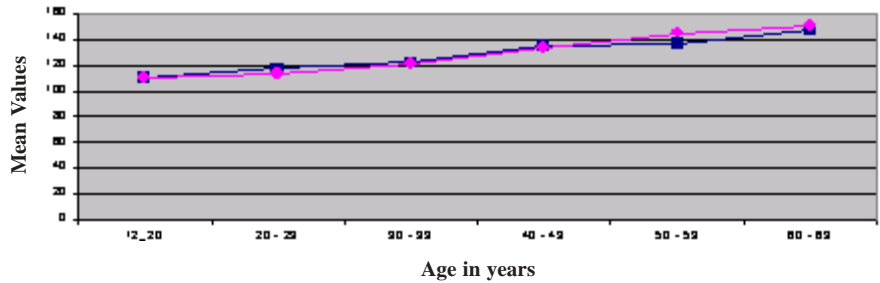


Fig. 16. Distance curve of systolic Blood Pressure

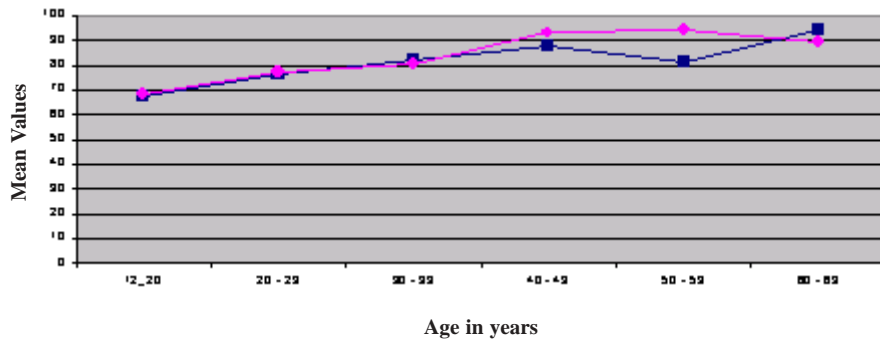


Fig. 17. Distance curve of Diastolic Blood Pressure

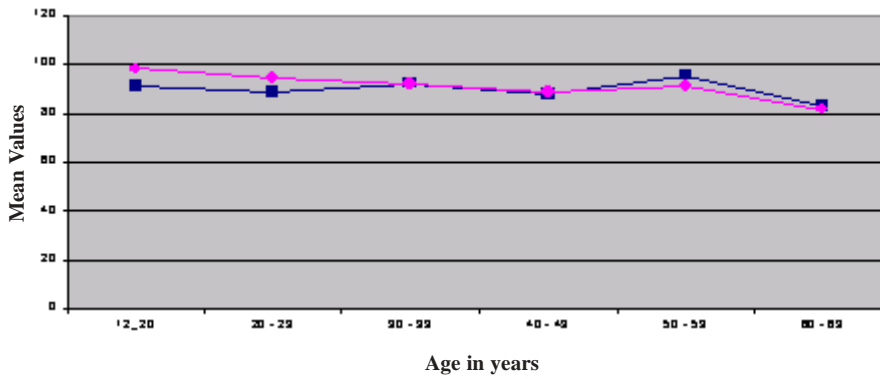


Fig. 18. Distance curve of Pulse rate

Table 6: Mean, standard deviation of blood pressure and pulse rate of Jalari men by age

Age (in years)	N	Systolic blood pressure		Diastolic blood pressure		N	Pulse rate	
		\bar{X}	SD	\bar{X}	SD		\bar{X}	SD
12 - 20	204	110.58	14.16	64.92	16.47	188	94.11	13.37
20 - 29	71	119.29	18.23	76.33	17.58	59	104.69	14.44
30 - 39	30	127.00	22.15	82.66	17.40	14	87.14	12.29
40 - 49	9	134.44	17.40	86.66	14.14	5	90.40	8.60
50 - 59	11	116.36	21.10	79.09	13.00	10	96.40	13.55
60 - 69	6	155.00	30.82	88.33	14.71	4	128.00	18.00

Table 7: Mean, standard deviation of blood pressure and pulse rate of Jalari women by age

Age (in years)	N	Systolic blood pressure		Diastolic blood pressure		N	Pulse rate	
		\bar{X}	SD	\bar{X}	SD		\bar{X}	SD
12 - 20	205	109.91	16.72	68.00	14.59	186	102.86	13.99
20 - 29	96	112.08	14.43	73.70	12.93	53	99.43	10.31
30 - 39	45	118.88	20.91	79.55	15.66	6	95.83	11.38
40 - 49	26	125.00	17.72	82.30	15.04	3	84.00	13.46
50 - 59	25	135.20	26.00	82.00	16.83	10	92.40	9.00
60 - 69	6	140.00	29.66	83.33	12.11	5	100.00	10.43

and accelerates by 18+ years in both sexes with minor fluctuations. The highest mean annual gain has attained between 15+ and 16+ years (+1.52 mm per year) in boys and it is earlier by three years 12+ and 13+ years in girls (+3.32 mm per year). The mean fore arm skin fold declines by 5+ years and it is almost stationery by 18+ years in both sexes. The highest mean annual gain has attained between 14+ and 15+ years (+0.32 mm per year) in boys and it is early by two years 12+ and 13+ years (+0.94 mm per year). It is inferred that the maximum and minimum annual incremental differences of all fat folds of girls is better than boys (Tables 3 and 4).

The juvenile spurt of biceps skinfold (+0.23 mm), suprailiac (+0.44 mm) abdominal skinfold (+0.11 mm), in jalari boys is attained between 7+ and 8+ years which is delayed by a year than bodyweight (1.75 kg), upper arm circumference (+0.41 cm) i.e (6+ and 7+ years) and which is delayed by three years than stature (+6.73 cm), chest circumference (+2.02 cm) abdominal circumference (+1.53 cm) i.e (4+ and 5+ years) and which is delayed by four years than head circumference (+0.65 cm) calf circumference (+0.89 cm) anterior thigh skinfold (+0.15 mm), medial calf (+0.02 mm) skin fold i.e. (3+ and 4+ years). The juvenile spurt of stature (+7.66

cm), head circumference (+0.89 cm) chest circumference (+1.68 cm) upper arm circumference (+0.42 cm) calf circumference (+1.01 cm) abdominal skinfold (+0.42 mm) of jalari girls is attained between 4+ and 5+ years, which is earlier by a year than sub scapular skinfold (+0.33 mm) supra iliac skinfold (+0.32 mm) i.e. 5+ and 6+ years and it is delayed by one year than body weight (+2.05 kg) abdominal circumference (+1.80cm) biceps skinfold (+0.58 mm) i.e. (3+ and 4+ years) and also earlier by one year than anterior thigh skinfold (+0.67 mm), medial calf (+0.15 mm) and forearm skinfold (+0.07 mm) i.e. 6+ and 7+ years (Figs.1 to 15).

The highest peak velocity or adolescent growth spurt is a constant phenomenon and occurred in all children in this period (13+ and 15+ years) there is a marked acceleration of jalari boys in body weight (+7.16 kg), chest circumference (+6.67 cm) abdominal circumference (+2.62 cm), upperarm circumference (+2.32 cm, suprailiac skinfold (+2.08 mm) medial calf skinfold (+1.52 mm) is attained between 15+ and 16+ years which is delayed by a year than forearm skinfold (+0.32 m) and two years than stature (+9.04 cm), head circumference (+0.99 cm), calf circumference (+1.89 cm) i.e. 13+ and 14+ years and which is

delayed by three years than triceps, (+0.82 mm) biceps (+1.10 mm) subscapular (+1.02 mm) and abdominal (+1.69 mm) skin fold anterior thigh skinfold (+1.30 mm) i.e. 12+ and 13+ years. The adolescent growth spurt of Jalari girls in stature (+7.83cm) is attained between 11+ and 12+ years which is earlier by a year than bodyweight (+8.81 kg), chest circumference (+9.48cm) abdominal circumference (+6.51 cm) upperarm circumference (+2.05 cm), calf circumference (+2.87 cm) triceps skinfold (+2.69 mm), biceps (+1.17 mm), subscapular (+3.49 mm) Abdominal (+4.24 mm), anterior high (+5.13 mm), medial calf (+3.32 mm) and for earm (+0.94 mm) (12+ and 13+ 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 fifteen measurements of jalari boys versus girls according to age shows significant differences (Table 5) (Figs. 1 to 15).

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 hypertensive subjects. The deviations from the expected trend observed in the present study must have been due to the differences in body composition, habitual physical activities, cholesterol, diet, income, smoking, alcoholism etc. (Table 6-7) (Figs. 16 to 18).

It will be apparent from the foregoing discussions that the findings on jalari boys and girls indicate that they are heavier in weight and taller in height than the findings obtained by Singh (1980), Sharma (1991), Bharati et al. (1991) and Dharma Rao and Busi (1993, 1994, 1997, 1998) and also shorter than the findings of Hauspie et al. (1980). These boys and girls are taller and heavier, broader head and 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, 1998). The findings generated in this study can therefore be utilized as reference material for the jalari boys and girls in Visakha-patnam district

of Andhra Pradesh. Goldstein and Tanner (1980), Dharma Rao and Busi (1998) have pointed out that the findings observed from such studies would be useful as an alternative to the growth standards.

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KEY WORDS Jalari. Physical Growth. Stature. Body Weight. Blood Pressure. Pulse Rate. Andhra Pradesh.

ABSTRACT A cross sectional study was undertaken on 834 jalari boys and 852 jalari girls aged between 0+ to 18+ years in urban schools situated in Visakhapatnam district of Andhra Pradesh (South India) during August 2000 to July 2001. In this paper data on body weight, stature, head, chest, abdominal, upper arm and calf circumferences and skin folds at triceps, biceps, sub scapular, supra iliac, abdominal, anterior thigh, medial calf, forearm sites and blood pressures are presented including patterns of change in these physical and physiological traits with advancement of age. It has been observed that there is progressively accelerating trend in all the dimensions with advancement in age except skin folds. The study reveals the highest peak velocity of girls (12+ and 13+) is attained earlier by two years than boys (14+ and 16+ years). Blood Pressure and pulse rate increased with advancement in age with few fluctuations. Analysis of the data reveals that all the measurements show significant differences by sex according to age. jalari boys and girls are taller and heavier than ICMR (1984) National standards. The findings of the study can be used as reference materials for jalarii boys and girls of Visakhapatnam district.

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