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Physical Growth and Blood Pressure Among Madiga (A Scheduled Caste) Boys of Visakhapatnam District of Andhra Pradesh

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ABSTRACT The cross-sectional purposive random sampling study was undertaken among Madiga boys in rural schools situated in the 4 Mandals *viz.* Visakhapatnam (Rural), Pendurthi, Anandapuram and Bheemunipatnam of Visakhapatnam district of Andhra Pradesh during February to December 1996. The sample consisted of 243 healthy Madiga boys aged 0+ through 18+ years. In this paper data on stature, body weight, upper arm, calf, chest, abdominal and head circumferences and skinfolds at triceps, biceps, subscapular, medial calf, fore arm, suprailiac abdominal and anterior thigh sites and blood pressure and pulse rate are presented, including patterns of change in these physical and physiological traits with advancing age. It has been observed that there is progressive increase in all the dimensions with advancement in age except skinfolds. Analysis of the data reveal that all the dimensions exhibited the maximum mean annual increments between 15+ and 16+ years, except triceps, subscapular and abdominal skinfolds which in turn exhibits it one year earlier the highest peak velocity *i.e.* 14+ and 15+ years, and two years earlier in calf circumference *i.e.* 12 + and 13+ years, and three years earlier in suprailiac, anterior thigh and medial calf skinfolds *i.e.* 11+ and 12+ years. Blood pressure and pulse rate increased with advancement in age with few fluctuations. These boys are shorter and lighter than the ICMR 1984 observations. The findings of the study can be used as a reference material for Madiga boys of Visakhapatnam district.

INTRODUCTION

Most published studies of physical growth in rural populations have revealed that with the increase in age, there is a tendency for increase in all physical traits except skinfold measurements (Sidhu, 1969; Sharma, 1970; Singh, 1980; Krishna Rao, 1981; ICMR, 1984; Jhingon and Nath, 1985; Reddy, 1989; Nath et al., 1991; Kapoor and Kapoor, 1991; Dharma Rao and Busi, 1994, 1995, 1996). Investigations carried out under different conditions by various research groups have shown positive correlation between blood pressure and age (Reddy et al., 1991), heredity (Nirmala and Chengal Reddy, 1992), body composition (Sambasiva Rao, 1983), and 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 variables. In India very few researches have been conducted in this field (Padmavati and Gupta; 1959; Das and Mukherjee, 1963; Gangopadhyay et al., 1988; Nirmala and Chengal Reddy, 1991; Verma, 1991; Dharma Rao and Busi, 1996) among others. However, from the Visakhapatnam region there is a dearth of published material related to growth and development, Blood pressure, and pulse rate of Madiga boys and the Indian Council of Medical Research (ICMR, 1984) in their nation wide growth survey did not include the Madiga boys of Visakhapatnam district. A corss-sectional growth study of Madiga boys was therefore undertaken in February to December 1996 covering 18 measurements.

Many researchers have tried to enumerate the trends of growth under different situations all over the world, but little attention has been paid towards Madiga (Scheduled caste) boys. In the present study an attempt has been made to study the effect of age from 0+ through 18+ years on 18 body measurements, through out the growth period and also to study the adolescent growth spurt, and aimed to understand the association between blood pressure and pulse rate with height, body weight, circumferences

and other skinfold thicknesses and its implications for health of the population and to compare these boys with other caste boys of India in order to find out the population differences to physical and physiological variables. The present paper reports the 18 body measurements derived on the Madiga boys of Visakhapatnam district of Andhra Pradesh.

MATERIAL AND METHODS

The Madigas are concentrated in Andhra Pradesh but distributed in all the southern states, namely Karnataka, Tamil Nadu, Kerala and Maharashtra. The Madigas are also known as left hand caste among themselves. The Madigas of Andhra Pradesh are also referred to as Arundhatiya, Jambavalu, Jambhavanthulu, Adi-Andhra etc. There are many legendary accounts of the origin of the Madiga. The Madiga and Mala have common legends that speak of their origins. Many legends say that the devine cow, Kamadhenu, was killed by two watchmen of Eeswara and as a consequence they were cursed by him. The descendants of these two watchmen were the Madiga and Mala. Most Madigas live in their own hamlets (Madiga palle) segregated from the main village. According to the 1981 census, the population of the Madiga in Visakhapatnam District is 82,279 and in Andhra Pradesh is 3,572,072. They are predominantly found in rural areas. However, a considerable number of them, *i.e.*, 477,596 persons (13.37 per cent of the total population) are returned from urban areas. The Dravidian language, Telugu, and the Telugu script are used for both intra and intergroup communication. The morphometric features of the Madiga in Andhra Pradesh fall between the tribal communities and the agricultural and economically dominant castes and, in general, are similar to the average physical features of the state's population. The Madiga are predominantly round-headed, of below medium to short height and have a broader facial profile. The Madiga are non-vegetarians and are in the habit of taking alcoholic drinks frequently. It is stated that their untouchable status was due to their habit of eating beef. Rice is the staple cereal consumed.

There are many subdivisions among them. The Gampa Domati, Chela Domati, Teli Domati, Vastra Domati and Bhoomi Domati are some of the subgroups. Each of these subgroups has several surnames such as Kornapati, Kolakaluri, Unnam, Davuluri etc. They observe surname exogamy and practise cross-cousin marriages. Marriages are mostly arranged by the elders but a few instances of elopement are also reported. Remarriages are allowed among them. A marriage was an elaborate affair in the olden days, but nowadays the ceremonies are conducted within one day. The predominant family type is nuclear. In the life-cycle ceremonies, they observe pollution, especially on occasions like childbirth, menstruation and death. The officiating priest on all such occasions is a Madiga Dasu.

The traditional occupation of the Madiga is leather work and making of footwear. Most of them are also working as agricultural labourers, as the Andhra villages do not normally require the services of more than four or five families engaged in leather work. The kula panchayats among them were common till recently, but with the advent of law courts, these community councils have become defunct. They are Hindu by faith and worship Siva and Vishnu. Many of them have embraced Christianity. Their social interaction with the other communities in the village is limited, but in urban areas, many Madigas are now able to secure good jobs by virtue of their education.

They have responded favourably to various developmental activities and realize that these activities have helped change their lives. Their only complaint is that development measures are not reaching them in full, and this is because middlemen exploit their ignorance. They have not made satisfactory progress in the field of education and their literacy rate, according to the 1981 census, is only 11.31 per cent

(15.93 per cent males and 6.53 per cent females).

The material of the present study was based on a corss-sectional data collected on 243 Madiga boys drawn from 8 schools from 4 selected mandals, *viz.*, Visakhapatnam (Rural), Pendurthi, Anandapuram and Bheemunipatnam of Visakhapatnam district of Andhra Pradesh during the months of February to December 1996. The age of these subjects range 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 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 and 1.00 and 1.99 years were in 1+ 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 anthropometric measurements were taken after Weiner and Lourie (1969). The weight of each individual was recorded in Kilograms using a portable weighing machine. The measurements were taken by the first author.

The blood pressure was measured on the subject using Diamond B.P. apparatus, Deluxe, Pune, by one of the authors (B.D. Rao). The procedure of the measurement of blood pressure was thoroughly practised as per the manual of the instrument for a week in the presence of a medical doctor of the University Health Centre and the readings were checked each time with that of the doctor till the readings were consistent. Thus after standardisation of the technique, the blood pressure readings were taken thrice on each subject giving 2 minutes gap in between the measurements. The readings of the electronic instruments were checked periodically. *i.e.* once in a week with that of the readings obtained through a mercury sphygmomanometer, to ascertain the former. Blood pressure measurment of the subject were taken in the morning. *i.e.*, before 10 A.M. in seated position at their home environment. The subjects were asked to relax on a stool or flat raised platform for about 10 minutes, resting his left arm on a table or on a flat place at heart level. Pulse rate was taken after 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. Growth velocity is annual 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.

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

RESULTS AND DISCUSSION

Mean values and standard deviations for each anthropometric measurements for each individual year of age are depicted in table 1 and 2. It can be inferred from the tables that the mean values for all of these measurements accelerating 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 eight skinfold characters show non normal distributions at several ages. In the circumferential dimensions of upper arm, calf and chest, which give the composite measures of bone, muscles and fat, the maximum annual increase has occurred between 13+ and 16+ years. Standard deviations for all of these characters have not shown any consistent pattern as found earlier in the linear, transverse, circumferential, and skinfold measures (Dharma Rao and Busi, 1996).

In Madiga boys a steady pattern of stature is noticed upto the age of 15+ years. The mean stature of infant at 0+ years age group is about 62.73 cm. The stature doubled by 10+ years,

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

Age in years	N	Body weight		Stature		Upper arm circumference		Calf circumference		Chest circumference		Abdominal circumference		Head circumference	
		$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
0+	8	5.56	1.24	62.73	6.91	13.15	0.80	15.21	1.18	41.00	2.93	40.38	1.60	41.39	2.38
1+	10	7.15	0.97	71.80	2.44	13.80	1.16	15.73	1.15	44.00	1.56	42.07	1.78	45.43	1.27
2+	8	8.69	1.19	80.65	5.13	13.71	1.07	17.13	1.06	46.50	2.07	44.00	2.14	46.20	1.54
3+	12	10.54	1.05	86.25	5.09	13.86	0.56	18.30	1.01	48.29	1.86	45.58	3.31	47.33	1.30
4+	5	11.40	1.81	93.60.	3.75	14.12	0.86	18.00	1.06	48.00	2.65	46.24	3.67	46.94	0.74
5+	13	13.73	2.06	101.28	10.24	13.87	0.65	19.20	1.27	50.07	2.14	47.23	2.42	48.18	1.68
6+	21	15.21	2.14	108.19	7.20	14.01	0.93	19.55	1.42	51.60	2.50	50.71	3.66	48.43	1.30
7+	18	17.33	2.50	114.21	7.86	14.59	1.14	20.82	1.65	53.39	2.66	51.30	4.40	49.10	1.34
8+	18	17.86	2.02	116.70	4.89	14.86	0.88	21.38	1.30	54.12	2.99	50.86	3.61	49.79	1.74
9+	19	20.60	2.18	123.48	4.41	15.54	0.96	22.25	1.17	56.83	3.32	52.53	3.82	49.45	1.57
10+	18	21.97	2.03	129.31	4.87	15.46	0.91	22.31	1.37	56.84	3.06	52.63	5.31	50.11	1.16
11+	16	24.69	1.90	132.21	4.26	16.56	0.91	23.55	1.14	59.44	3.61	54.98	4.05	50.06	1.33
12+	14	29.68	4.88	141.75	5.57	17.10	1.61	24.55	2.25	61.60	3.53	57.01	6.15	51.50	2.61
13+	14	32.39	3.12	146.28	5.21	17.64	1.19	26.03	1.79	62.92	4.19	56.36	4.16	50.99	1.14
14+	17	34.94	4.46	150.96	7.46	18.48	1.21	26.90	1.81	65.24	5.86	59.25	4.33	51.54	1.33
15+	7	38.93	5.78	153.20	6.28	19.06	1.43	28.11	2.34	69.60	4.17	58.43	3.78	52.14	2.04
16+	7	43.29	5.70	164.20	5.36	19.86	1.38	28.64	1.89	69.71	5.59	64.29	5.02	55.17	5.72
17+	8	45.50	4.46	162.89	4.58	21.20	1.17	29.08	2.81	74.50	3.25	61.56	4.14	53.81	1.07
18+	10	43.95	3.75	159.50	6.62	21.45	1.46	28.07	1.24	74.02	4.35	63.71	4.10	53.75	1.75

Table 2 : Mean and standard deviation of eight skinfold measurements among Madiga boys of Visakhapatnam district of Andhra Pradesh

Age in years	N	Triceps		Biceps		Subscapular		Suprailiac		Abdominal		Anterior thigh		Medial calf		Fore arm	
		$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
0+	8	9.40	1.57	7.80	1.60	9.03	1.70	8.15	1.67	9.78	6.68	14.28	2.16	13.00	2.20	8.95	1.20
1+	10	8.92	2.14	6.90	1.57	7.00	0.89	6.68	1.17	6.74	2.49	11.86	2.66	10.76	1.66	9.70	1.74
2+	8	9.68	1.14	7.58	1.77	8.10	3.80	6.85	2.37	7.23	2.73	11.60	1.26	10.70	2.37	10.13	2.19
3+	12	10.40	1.59	7.80	1.44	7.15	1.54	5.95	1.93	6.68	2.12	12.38	2.33	11.10	1.78	8.68	0.90
4+	5	8.92	1.70	7.32	2.03	6.84	1.27	5.28	2.28	6.24	1.76	10.60	2.32	10.20	1.62	8.96	1.29
5+	13	8.28	1.66	5.40	1.16	5.82	1.19	4.35	1.00	6.25	1.97	9.34	1.40	8.65	1.84	6.20	1.67
6+	21	7.78	1.21	4.98	1.00	5.67	1.11	4.12	0.74	5.94	3.30	9.03	1.58	8.80	1.69	5.67	1.39
7+	18	7.44	1.79	5.05	1.26	5.36	1.03	4.10	0.81	4.96	1.31	8.81	1.99	8.89	2.30	4.98	1.14
8+	18	7.18	1.76	4.91	1.53	6.31	1.96	4.57	1.58	5.90	2.20	9.22	2.26	10.75	3.55	5.52	1.55
9+	19	7.09	1.38	4.68	1.24	5.71	1.44	4.31	0.71	5.31	1.78	9.18	1.24	9.25	1.56	5.09	1.03
10+	18	7.04	1.82	5.29	2.11	6.08	1.62	5.00	1.57	5.73	1.66	8.48	1.65	8.59	2.41	4.43	1.19
11+	16	7.88	1.79	4.51	1.28	6.94	1.83	4.79	1.32	6.84	2.15	10.69	2.72	10.16	1.97	5.33	1.26
12+	14	8.33	3.45	5.31	3.20	7.51	3.60	6.19	2.70	8.27	4.17	13.16	4.59	12.01	2.83	5.06	2.03
13+	14	7.91	2.76	4.90	1.90	7.99	2.64	7.24	2.76	9.54	4.93	13.49	2.70	11.93	2.75	4.86	1.32
14+	17	6.59	2.01	4.04	0.96	7.58	1.78	6.08	1.41	8.29	2.34	11.02	3.20	11.24	2.75	4.44	1.09
15+	7	8.31	1.36	4.77	1.04	8.60	1.68	6.86	2.10	10.31	2.24	11.60	2.45	11.63	3.34	5.97	2,81
16+	7	6.71	1.06	6.09	2.09	8.28	1.52	7.09	1.57	8.34	1.94	11.31	1.78	12.69	2.19	7.66	7.31
17+	8	6.85	2.18	4.85	2.18	8.20	1.86	6.43	1.91	8.50	3.11	10.75	3.64	10.33	3.58	4.33	0.70
18+	10	6.08	2.08	4.82	1.86	838	1.55	6.62	2.73	8.92	1.80	10.58	2.55	9.78	2.05	4.16	1.34

two and half times by 16+ years. The highest mean annual gain (+8.57 cm) has occurred between 15+ and 16+ years. Infact, after highest peak velocity between 15+ and 16+ years there should be decelerating phase. Like stature the mean body weight also steadily increases upto

the age of 15+ years. The mean body weight of infant of 0+ years age group is about 5.56 kg; it is doubled by 4+ years, and thrice by 6+ years, about 5 times by 12+ years. The highest mean annual gain (+4.35 kg) has attained between 11+ and 12+ years. An increment of 15 kg is noticed from 12+ and 18+ years. The mean upper arm circumference of infant at 0+ years age group is about 13.15 cm, it is one and half times by 16+ years. The highest mean annual gain (+1.34 cm) has attained between 16+ and 17+ years. An increment of 2 cm is noticed from 17+ and 18+ years. The mean calf circumference of infant at 0+ years age group is about 15.21 cm it is doubled by 10+ years. The highest mean annual gain (+1.49 cm) has attained between 12+ and 13+ years. An increment of 3 cm is noticed from 13+ to 18+ years.

The mean chest circumference of infant at 0+ age group is 41.00 cm. It is one and half times by 12+ years. The maximum mean annual increase (+4.79cm) has occurred between 16+ and 17+ years. The mean Abdominal circumference of infant at 0+ age group is 40.38 cm. It is one and half times by 12+ years. The highest mean annual gain (+5.86 cm) has occurred between 15+ and 16+ years. The mean head circumference of infant at 0+ age group is 41.39 cm. The highest mean annual gain (+3.03 cm) has occurred between 15+ and 16+ years while the maximum mean annual loss (-1.36 cm) per year is found between 16+ and 17+ years.

The mean triceps skinfold of infant at 0+ years is 9.40 mm and then steadily increases from 0+ to 3+ years and decreased by 10+ years and increase upto 12+ years and gradually decelerated with minor irregularities in the mean from 13+ to 18+ years. The highest mean annual gain (+1.72 mm) has attained between 14+ and 15+ years while the maximum mean annual loss (-1.48 mm per year) is noticed between 3+ and 4+ years. From 16+ years the mean values gradualy declines to 18+ years. The skinfold at Biceps region almost stationery period of growth from 0+ to 4+ years and it declines by 5+ to 18+ years; the highest mean annual gain (+1.31 mm) has attained between 15+ and 16+ years, while the maximum mean annual loss (-1.92 mm) per year is found between 4+ and 5+ years.

The mean subscapular skinfold of infant at 0+ age group is 9.03 mm and then gradually decreases with minute irregularities from 0+ to 9+ years. The highest mean annual gain (+1.02 mm per year) has occurred between 14+ and 15+ years while the maximum mean annual loss (-2.03 mm per year) is noticed between 0+ to 1+ years. The mean suprailiac skinfold of infant at 0+ age group is about 8.15 mm, gradually declines to 9+ years and accelerates to 18+ years with minor fluctuations. The highest mean annual gain (+1.40 mm) has attained between 11+ and 12+ years, the maximum annual loss (-1.47 mm per year) is noticed between 0+ and 1+ years.

The mean abdominal and anterior thigh skinfold of infant from 0+ to 7+ years decelerating trend and accelerating by 14+ and from 15+ to 18+ years almost stationary period of growth. The highest mean annual gain of abdominal and anterior thigh skinfold is +2.02 mm and 2.47 mm, respectively occurred between 14+ and 15+ years and 11+ and 12+ years while the maximum mean annual loss of abdominal skinfold (-3.04 mm per year) is found between 0+ and 1+ years and maximum mean annual loss of anterior thigh skinfold is (-2.47 mm) found between 13+ and 14+ years.

The mean medial calf skinfold of infant at 0+ age group is 13.00 mm and declines by 7+ years and accelerating with minor fluctuations of inconsistant trend. The highest annual gain (+1.85 mm per year) has attained between 11+ and 12+ years, while the maximum mean annual loss of thickness (-2.37 mm per year) is observed between 16+ and 17+ years.

The mean forearm skinfold increased from 0+ to 3+ years and declines by 10+ years and again increases from 11+ to 16+ years and it declines. The highest mean annual gain (+1.69 mm per year) has attained between 15+ and

16+ years while the maximum mean annual loss of thickness (-3.34 mm per year) is noticed between 16+ and 17+ years.

The adolescent growth spurt or the highest peak velocity of suprailiac (+1.40 mm), anterior thigh (+2.47 mm), medial calf (+1.85 mm), skinfold thicknesses, were attained between 11+ and 12+ years, which is earlier by a year than calf circumference (+1.49 cm) *i.e.* 12+ and 13+ years and earlier by three years than tricpes (+1.72 mm), subscapular (+1.02mm), abdominal (+2.02mm) *i.e.* 14+ and 15+ years and earlier by four years than body weight (+4.35 kg), stature (+11.00 cm), head circumference (+3.03 cm), abdominal circumference (+5.86cm), biceps (+1.31 mm) and fore arm (+1.69mm) *i.e.* 15+ and 16+ years and earlier by five years than chest circumference (+4.79 cm) *i.e.* 16+ and 17+ years. Adolescence has a special significance in the study of human growth since extrauterine growth in terms of velocity accelerates only during the first half of the adolescent period (Dharma Rao and Busi, 1996). This is a period of maximal increment and development of the body.

In the present investigation body weight, stature and all circumferences as well as the systolic, diastolic blood pressure and pulse rate is accelerated with increase in age with minor fluctuations. It supports that the systolic blood pressure is below the normal range (*i.e.* 99.00 mm Hg) in between 13+ and 14+ years while the diastolic is below the normal range (*i.e.* 77.33 mm Hg) in between 15+ and 16+ years. The systolic and diastolic blood pressure attained the highest peak in between 15+ and 16+ years. The marked increase corresponding to adolescent growth spurt was found in both systolic and diastolic in age group 15+ to 16+ years. The peak value for pulse rate was obtained in the 14+ and 15+ years. It is well known that the blood pressure is influenced by a large number of external factors. The deviations from the expected trend observed in the present study must have been due to the differences in body composition, habitual physical activity, diet, income, smoking, etc. (Table 3). The positive interrelationship between blood pressure and weight, circumferences and skinfold thicknesses clearly showed that the health personnel providing care to children in the frame work of curative and/or preventive services (*e.g.* school health services) should consider the modification of the environmental component contributing to the blood pressure and introduce preventive measures such as weight control, dietary changes and increased physical activity, especially for those at the risk of developing high blood pressure.

It will be apparent from the foregoing results that the findings among Madiga boys reveals that they were taller and lighter and similar upper arm and calf muscles with higher Triceps and subscapular skinfolds than the findings of Singh (1980), it may be associated with load carrying in the hills and body fat in this caste may contribute to increase the mechanical efficiency in carrying loads up hill and also shorter and heavier than the findings of Jhingon and Nath (1985), shorter and lighter than the findings of Kapoor and Kapoor (1991). These boys are shorter and lighter than

Table 3 : Values of mean, standard deviation of blood pressure and pulse rate of Madiga boys by age

Age in years	*N*	*Systolic blood pressure*		*Diastolic blood pressure*		*N*	*Pulse rate*	
		$\bar{X}$	*S.D.*	$\bar{X}$	*S.D.*		$\bar{X}$	*S.D.*
12+	4	115.00	12.90	75.00	5.77	2	81.00	4.24
13+	7	101.43	6.90	62.86	12.54	5	95.60	17.57
14+	10	99.00	12.87	68.00	11.35	7	85.71	8.11
15+	4	115.00	10.00	77.50	5.00	3	92.67	13.31
16+	3	120.00	00.00	80.00	0.00	3	77.33	3.06
17+	5	112.00	10.95	72.00	13.04	5	82.40	4.77
18+	9	107.78	6.67	66.67	8.66	9	85.11	7.00

the standards of ICMR (1984) and these boys were more or less similar to the findings of Wolanski (1961), Tanner et al. (1966), Sidhu (1969), Malcom (1970), Sharma (1971), Low (1971), Johnston et al. (1975), Malhotra (1975), and Injeti (1980), Krishna Rao (1981), Reddy (1989), Nath et al. (1991), Dharma Rao and Busi (1988, 1994 and 1995). These findings are general, universal in character and observed in many populations (Johnston et al., 1975). The results generated in this paper can therefore be utilized as reference material for the Madiga boys in Visakhapatnam district of Andhra Pradesh. Goldstein and Tanner (1980), Dharma Rao and Busi (1996) have recently pointed out that the findings obtained from such studies would be useful as an alternative to the growth standards. This investigation is conducted among Madiga boys to suggest programmes and strategies for improvement of the nutritional status and proper management of health.

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