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Physical Growth Pattern of Girl Children from Deprived Communities

KEYWORDS: physical growth pattern, girl children, deprived communities

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ABSTRACT *The present study is made an attempt to study the growth pattern of girls aged 10 to 18 years from different communities. The selected sample units of 1035 girls both from rural, rural SC, ST, Urban elite and urban slum were selected by adopting multi stage sampling technique. Girls from main village and forward castes form as rural forward caste girls (RFC) and girls from rural SC and ST colonies form as girls of deprived communities (RSC). To match these two groups, urban girls from main urban towns of Tirupathi and Chittoor areas of high-socio-economic were acted as control (UE) and girls from different slums formed as fourth group as urban slum (USL). The height, weight of the girls were assessed by using standards. The measurements were taken and compared with the standards.All the groups of girls records significantly low levels of heights & weights with NCHS standards. Only urban elite group of girls who come from better income families are nearer to ICMR standards. None of the other groups were so nearer as that of U.E. The RFC group is somewhat better than these two worst affected ones. At all age levels, even during peak growing periods the RSC and USL are most affected than the RFC girls. Hence, the girls of RSC and USL require a very balanced and adequate nutrition in order to achieve full growth potentials.*

Introduction

The word 'adolescent' has its origin from a Latin word 'adolescent' which means to 'grow' or 'grow to maturity'. It is the process of development from childhood to maturity and adulthood, its period beginning with the appearance of secondary sex characteristics and terminating with the cessation of somatic growth. Adolescence comprises nearly half of the total growth period of human life. It has its beginning by about 10 to 12 years in boys and girls. The end of this stage 'adolescence' is not clearly delineated and it varies with physical, emotional, mental, social and cultural criteria that define the adult.

Growth during the adolescent period is an important determinant of adult body size WHO (1989) defined adolescence as the period between 10 to 19 years while in India it has been defined as the period between 10 to 18 years (NIPCCD, 1989).

Gender discrimination, poor food and nutrient intakes among rural girls or urban poor affect their growth, nutritional status, physical work capacity and developmental pattern. In the context of poor socio-economic status, girl children, specially during growing periods, are neglected and mostly have limited scope for attainment of full potential of peak growth and development. It is thus, hypothesized that a change in the socio-economic status and food intakes may affect or influence the growth pattern, physical work capacity and nutritional status of girls in different ages of growing periods. Girls from deprived communities suffer more than the urban elite.

Material & Methods

The present study aims at purposive sampling of growing girls from deprived communities like rural, rural scheduled caste, urban slum in relation to a control group of urban elite. The deprived castes, age, literacy status, the economic status and the food they eat, the practices they follow form as independent variables which affect and alter the dependent variables i.e., growth and development, nutritional status and physical work capacity of girl children. Therefore, the proposed study intends to study the physical growth pattern of girls from different communities.

1. Study Area

Chittoor district of Andhra Pradesh, was selected as the study area. The district consists of 66 mandals and by random sampling, ten rural mandals were selected. The following are the mandals : 1. Chandragiri, 2.Tiruchanoor, 3.Puttur, 4.Bangarupalem, 5.Palamaner, 6. Pakala, 7.Thamballapalle, 8.Vayalpadu, 9.Piler, 10. Tirupati rural. From each mandal, two villages i.e. a total of 20 villages from ten mandals having separate harizanawadas (the place the SC, ST population live) were selected. Further from each village, families consisting girls aged 10 to 18 year old were identified and number was noted both from main village area and harizanwadas of the village. For urban control group (age matched) high socio-economic families having girls from Tirupati and Chittoor were selected and girl population was identified and noted.

2. Sample Selection

The study sample of 10 to 18 year old girls both from rural, rural SC, ST, urban elite and urban slum were selected by adopting multistage sampling technique. This was done to maintain the characteristic of homogeneity among the sample. To meet the requirements of a group of young rural women, aged 19 to 21 year old (n=40), a forty of them from 4 different villages were selected for the study. Few of the case studies of adolescent pregnant girls, mothers-to-be, as and when they are found during study period were also noted and analysed for demographic, socio-economic, food intake and nutritional status variables. In each village selected (20 villages), the total population of girls from 10 years onwards was surveyed. By following demographic variables the study sample of rural and urban girls were classified into four groups as RFC, RSC, USL and UE. (Table-1)

Girls from main village and forward castes form as rural forward caste girls (RFC) and girls from rural SC and ST colonies form as girls of deprived communities (RSC). To match these two groups, urban girls from main urban towns of Tirupati and Chittoor areas of high socio-economic and elite families studying in public schools. The urban elite group (UE) acted as control and girls from different slums and deprived communities of these two urban areas formed as the fourth group as urban slum (USL) covering slum deprived families.

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Table-1: Age-wise distribution of experimental subjects from four select different communities

Age in years	Age and number of girls studied from four communities			
	Urban Elite (UE)	Urban Slum (USL)	Rural Forward Caste (RFC)	Rural Scheduled Caste (RSC)
10+	25	30	30	30
11+	25	30	30	30
12+	25	30	30	30
13+	25	30	30	30
14+	25	30	30	30
15+	25	30	30	30
16+	25	30	30	30
17+	25	30	30	30
18+	25	30	30	30
Total No	225	270	270	270

The selected sample units of 1035 girls covering 9 age groups with an interval of one year i.e., from 10 years to 18 years i.e., 10+, 11+, 12+, … 18+, etc. From each age group, 30 girls from RFC, 30 girls from RSC, 30 girls from USL and 25 from UE were studied. A total of 115 numbers in each age group were chosen for the study. Thus, a representative sample of 270 from RFC, 270 from RSC and 270 from urban slum (USL) formed as experimental groups covering 9 age groups. Urban elite (UE) group of 225 numbers acted as experimental control group. The distribution of the study sample is presented in Table 1.

Measurement of growth, has been considered for a long time as a valuable tool for the assessment of nutritional status, particularly of children. It has now been generally accepted that nutritional anthropomentry has a significant role in the direct assessment of nutritional status in communities particularly in young children and adolescents. The methods and measurements can vary greatly in number and complexity. One should select a minimum number of relatively simple methods that can give useful, approximate, practical information on community. Growth retardation is not only an independent and objective manifestation of malnutrition but also perhaps is the first response to nutritional deprivation.

Because of considerable influence of both body size and leanness on energy metabolism, it is essential to have basic anthropometric information. The techniques used for taking the body measurements are taken according to Jelliffe (1966). The measurements taken include height, weight measurements. The measurements taken were classified and compared with the standards.

3. Height

The height of an individual is made up of the sum of four components i.e., legs, pelvis, spine and skull. Height was measured using a vertical anthropometric rod that contained height measurement in centimeters. After removing the slippers, the subject was made to stand erect on a flat platform by the scale with the back touching the measuring foot and the feet parallel and with heels, buttocks, head, shoulders and back of head touching upright. The head was made comfortably erect, with the lower border of the orbit in the same, horizontal plane as the external auditory meatus. The arms should be hanging at the sides in a natural manner. The head piece, which can be a metal bar or wooden block is gently lowered, crushing the hair and making contact with the top of the head. The presence of unusually thick hair requires to be taken into account. The measurements were recorded nearest to 0.2cms. (Jelliffe, 1966).

4. Weight

Weight is the most commonly used anthropometric measurement as it gives fairly good assessment of nutritional status. Body weight is an index of nutrition and growth which includes the whole body mass and height. Level actuated machine was used for taking weights. The subject was asked to stand upright on the centre of the weighing platform of the balance. The weight was recorded with out slippers to the nearest 0.1 kg with minimum clothing and without footwear (Jelliffe, 1966). The equipment used were of 'Detecto' Scales Inc, New York, U.S.A. Both height and weight were compared with NCHS and ICMR reference standards and percent deficit or excess was calculated.

RESULTS & DISCUSSION

Anthropometry

Nutritional anthropometry is concerned with measurement of the variation of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition. Growth is influenced by biological determinants, including sex, intrauterine environment, birth order, birth weight in single and multiple pregnancies, parental size and genetic constitution, and by environmental factors including climate, season and socio-economic level. In the final analysis the environment seems to produce its effect mostly by the presence (or absence) of infective, parasitic and psychological illness and above all by the plane of nutrition. In general, recent work tends to suggest that environmental influences, especially nutrition are of greater importance than genetic background or other biological factors. The physical dimensions of the body are much influenced by nutrition, particularly in the rapidly growing periods and nutritional Anthropometry is concerned with the variations of the physical dimensions of the human body at different age levels and degrees of nutrition.

Height

Height is best parameter for growth assessment. Although world's children appears to follow similar growth pattern, still there are variations due to ethnic / geographical/ regional factors, giving adult statures and rates of maturation. Therefore for comparison, National well-nourished age sex matched sample of population ideal as growth standards percentile tables / charts are used to monitor growth. The Indian affluent children growth data are closer to Asian counterparts from China, Japan, Hong Kong and Thailand. Indian children were lower than the NCHS (by 1cm at 24 months, 3cm at 5-6 years and 7cm at 17-18 years of age) and Europeans.

The mean heights of (10 to 18 years) four groups of rural and urban girls was presented in Table 2 and compared with ICMR and NCHS standards along with 't' values calculated for the differences. In comparison to ICMR and NCHS standards, all the four experimental groups of girls recorded significantly low levels of heights at all ages tested. Girls from urban slum (USL) and rural scheduled caste (RSC) were very poor and below in their heights in comparison to RFC and UE. Urban elite (UE) control had better height profiles than girls from rural FC, rural SC and urban slum. It is important to note that even the urban elite (control) group are significantly shorter in their heights in relation to NCHS standards (mean difference 5 to 7cms) where as they were nearer to ICMR standards (mean difference 2 to 4cms). Rural forward caste girls seem to be better in height than USL and RSC girls at all ages tested.

The mean international NCHS standards are at higher level than the ICMR standards. Hence, all the groups of girls recorded significantly low levels of heights with NCHS standards. It is important note that even with ICMR standards, our Indian rural girls RFC and RSC as well as urban slum (USL)

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recorded far below and significantly low level of heights. Only urban elite group of girls who came from better income families are nearer to ICMR standards. None of the other groups were so nearer as that of UE. This observation clearly indicates that girls from better income families with possible better quality food intakes are able to achieve their genetic height potentials during growing periods. The girls of UE group recorded better heights at every age level tested than the other 3 groups from deprived family backgrounds. This trend of results confirm that families of better socio-economic standards, can provide better food in quality and quantity and better environment for their daughters than families of deprived sections.

Table 2 : Mean Heights of adolescent girls from different deprived communities over a period of 8 growing years: A Comparison with reference standards (ICMR & NCHS) and calculated 't' test values for the differences.

Age (Yrs)	ICMR R_1 (Cm)	NCHS R_2 (Cm)	Mean Heights (in Cms) of adolescent girls from four different communities and 't' values against R_1 and R_2											
			UE Mean (n=25)	't' value UE Vs R_1	't' value UE Vs R_2	USL Mean (n=30)	't' value USL Vs R_1	't' value USL Vs R_2	RFC Mean (n=30)	't' value RFC Vs R_1	't' value RFC Vs R_2	RSC Mean (n=30)	't' value RSC Vs R_1	't' value RSC Vs R_2
10+	138.90	141.23	135.32 ± 3.53	4.46**	8.251**	127.75 ±3.09	11.08**	15.47**	131.85 ±3.22	13.72**	14.81**	123.50 ±4.02	14.53**	21.32**
11+	145.00	147.89	142.73 ±4.04	10.497**	15.914**	128.00 ±2.64	17.61**	12.55**	133.35 ±4.74	12.92**	16.87**	124.50 ±2.83	13.54**	27.24**
12+	150.98	154.25	150.13 ±2.90	1.497**	11.443**	130.85 ±2.90	11.43**	19.10**	135.05 ±5.36	18.60**	12.20**	126.75 ±3.88	12.35**	26.55**
13+	153.44	158.80	150.90 ±4.46	13.662**	15.143**	131.75 ±3.43	13.96**	13.85**	137.50 ±4.97	4.72**	13.96**	128.95 ±2.65	12.92**	25.99**
14+	155.04	161.00	151.19 ±5.26	10.73**	12.37**	134.85 ±2.02	10.82**	13.28**	140.75 ±3.91	15.98**	17.97**	131.05 ±3.29	15.68**	22.64**
15+	155.98	162.10	152.19 ±3.38	13.77**	16.00**	139.45 ±4.04	18.65**	11.12**	145.75 ±4.85	17.37**	17.91**	134.50 ±4.46	17.42**	27.78**
16+	156.00	162.71	153.38 ±2.06	12.312**	13.82**	142.75 ±3.54	15.02**	12.14**	149.85 ±4.63	14.16**	16.12**	139.05 ±2.83	14.16**	26.12**
17+	156.00	163.37	154.88 ±3.93	6.05**	15.80**	145.65 ±4.13	18.44**	11.62**	152.35 ±3.02	3.39**	17.04**	142.65 ±3.71	17.20**	23.59**
18+	156.00	163.70	156.65 ±2.22	0.65^{NS}	18.85**	147.05 ±2.69	18.02**	10.38**	153.50 ±2.78	17.10**	11.24**	145.05 ±3.37	16.60**	25.50**

***P< 0.05 **P< 0.01 R1 - ICMR, 1972 R2 - NCHS, 1983**

The worst affected group are girls from rural scheduled castes and the next affected are the girls from urban slum. The RFC group is somewhat better than these two worst affected ones. Hence at all age levels, even during peak growing periods the RSC and USL girls are most affected than the RFC girls. It is to be noted that urban elite group with higher level of family backgrounds were nearer to ICMR standards and at 18 years age (after puberty) they have attained similar heights as that of ICMR.

This is the note worthy finding to discuss the trend of results observed in the study on the mean heights indicate the differences in height by the four groups of girls during fast growing periods of age, i.e. 10 to 18 years. The 10 to 18 years is a very crucial period of growth for girls during which period menarche attainment takes place along with other physiological changes of reproduction. There is a sign of physiological maturation of reproductive organs. It is here the girls require a very balanced and adequate good nutrition in order to achieve full growth potentials. Under nutrition may alter the growth rate and make suffer or postpone the attainment of menarche at proper time and thus girls suffer from shorter stature and poor body composition, short stature create more gynecological, obstetric problems and reproduction. This is a risk factor to be considered and to reduce the reproductive problems of the adolescent girls, better food and environment need to be given and created.

The observation of the study is an important indication that the retarded and slow growth is seen at all the nine age groups of girls irrespective of communities they belong. At the ages of 15 to 17 years, RFC girls are able to crossover RSC, USL girls and reach to the levels of UE and ICMR. This trend is may be due to hormonal changes after puberty and better food intakes by forward caste girls who belong to middle income families.

Mean heights of all the girls increased progressively with age. The very low income group, RSC girls always registered lower mean height profiles at every age level followed by USL and RFC groups. The RSC and USL girls are worst affected compared to UE and RFC girls. This trend of results observed with all the age groups. The differences between UE Vs USL, RFC and RSC are highly significant ($p<0.001$) at one percent level. The mean height values of three groups RFC, RSC and USL at all age levels are significantly below in their heights, in comparison to UE, the control group.

Table 3: Mean Weights of adolescent girls from different deprived communities over a period of 8 growing years: A Comparison with reference standards (ICMR & NCHS) and calculated 't' values for the differences.

Age (Yrs)	ICMR R_1 (Kg)	NCHS R_2 (Kg)	Mean Weights (in Kg) of adolescent girls from four different communities and related 't' values against R_1 and R_2											
			UE Mean (n=25)	't' value UE Vs R_1	't' value UE Vs R_2	USL Mean (n=30)	't' value USL Vs R_1	't' value USL Vs R_2	RFC Mean (n=30)	't' value RFC Vs R_1	't' value RFC Vs R_2	RSC Mean (n=30)	't' value RSC Vs R_1	't' value RSC Vs R_2
10+	33.58	34.55	30.18 ±5.04	13.77**	12.56**	23.50 ±6.04	15.07**	19.41**	25.50 ±3.66	17.40**	15.50**	21.32 ±2.24	14.56**	19.71**
11+	37.17	39.04	32.52 ±4.78	19.66**	11.59**	24.25 ±7.78	12.82**	11.91**	26.72 ±1.96	19.51**	10.15**	22.41 ±3.21	16.81**	13.18**
12±	42.97	43.64	39.14 ±4.24	15.06**	17.70**	25.23 ±5.83	16.15**	19.23**	28.05 ±3.83	14.84**	19.24**	23.75 ±4.13	9.46**	9.80**
13±	44.54	48.07	41.02 ±3.07	11.12**	17.78**	27.63 ±3.52	17.19**	11.01**	32.67 ±2.07	16.99**	15.49**	27.43 ±5.94	10.87**	15.09**

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14±	46.70	51.91	41.80 ±2.90	12.72**	11.62**	32.80 ±4.64	16.99**	10.04**	36.30 ±1.94	10.39**	10.64**	29.46 ±4.50	14.43**	14.35**
15±	48.75	54.81	42.80 ±3.16	16.83**	12.93**	36.10 ±3.30	14.03**	11.74**	37.35 ±2.81	13.65**	18.66**	32.66 ±3.56	19.01**	12.20**
16±	49.75	56.35	44.20 ±4.51	18.33**	10.13**	36.60 ±2.72	19.02**	13.59**	39.45 ±4.61	15.87**	10.47**	33.33 ±2.99	15.87**	10.47**
17±	49.75	56.35	45.30 ±5.23	9.97**	14.76**	37.43 ±3.54	10.41**	16.71**	40.91 ±3.15	11.99**	13.34**	33.80 ±4.14	13.16**	15.16**
18±	49.75	56.60	46.00 ±2.62	11.57**	12.71**	37.90 ±4.53	18.38**	17.41**	41.55 ±3.99	12.23**	10.30**	35.50 ±5.64	10.22**	10.74**

***P< 0.05 **P< 0.01 R1 - ICMR, 1972 R2 - NCHS, 1983**

Naturally the better income group (UE) of girls seem to be better in their stature with all their access to good food, education, environment and better family profiles. The control group really acted as control in the experimental study, where all other three groups of girls are significantly shorter in their heights. The UE as a control group is not only better in their heights than the other three groups of girls but also nearer to ICMR standard heights. This finding indicate that the 'girls' belonging to better family status, better income, better education proved to be better in their nutritional status indicating that "the Indian girls from affluent families can meet to the requirements of National level of standards and genetic potentials" provided with adequate quality and quantity of food, with stimulating environment. Thus, keeping UE as the study control group proved to be a good local standard for the locality of the study. All the three groups of deprived community girls are significantly below in their heights than the UE.

T-values were calculated to see the community wise differences if any on heights of girls on physical development. It is clearly evident from the Table 2 that RFC, USL and RSC children differed significantly from UE (control) girls to a greater extent. So, the community wise differences across the height indicate that in the physical development the UE girls were found to be superior to girls from other three communities ($P<0.001$).

The distance curve of growth in height i.e. increases or changes in heights of girls observed over a period of 9 years is plotted as against ICMR and NCHS standards. Though the data is cross sectional (not follow up study) the plotting of mean heights by each year observed for different age groups is indicative of the growth pattern trends from 10 years onwards till they reach young adulthood (18 years). The mean data on heights over a period of 9 years groups of girls are given in Table 2. The girls belonged to rural and urban deprived communities and UE girls acted as internal study control. It is observed that the age of 15 to 16 years, UE girls able to reach to the levels of ICMR heights but not to the NCHS standards. RFC girls somehow are able to meet to the levels of heights of UE but still they are at low level of heights. However, RSC and USL girls having their own trend of growth at lower level of height at all ages, but still they experienced considerable amount of growth in height at a lowest velocity point.

These distance curve show a steep rise in height viz., from 10 to 12 years and then again from 14 to 15 years. Approximately 6 to 14cms increment is registered from 10 to 12 years and 2 to 6cms from 14 to 15 years. A minimal increment of around 1 to 3cms is observed as a plateau between 12 to 14 years. The two marked increments at 10 to 12 and 14 and 15 years are true to the four groups studied. Though all the groups of girls showed a distinct peak in mean height at 10 to 11, 11 to 12 years, whereas RSC and USL girls attained maximum height at 13-14 years period to compensate for growth loss than other counterparts to regain the expected height for age. But after 15 years, all the groups of girls increase in significant growth in height (1 to 4.5cm), the rate of growth decreased to half of the peak (1.5-2.58 cm) increase in height.

A distinct peak in mean height at 10 to 11, 11 to 12 years is observed in all the groups of girls. The peak height velocity (PHV) in USL and RSC girls were observed, the values being 4.52, 5.91cms, respectively. However there were considerable differences in the age at which PHV occurred in the four groups. There is a rapid deceleration falling to lowest velocity point by 12 years in UE girls where as 13-14 years in USL and RSC girls. After a distinct PHV, there is a dip observed in 12-13 years followed by a plateau at 13 to 14 years. Thereafter the adolescent growth spurt attains rapid peak height velocity (PHV) and deceleration with completion of growth. Another peak is evident in at 14 to 15 years in USL and RSC girls. At 15 to 16 years girls experienced considerable amount of growth in height.

Weight

Body weight is observed to be a sensitive indicator of growth failure and current nutritional status of the individual. The data on mean weights of four groups of rural and urban girls in comparison to ICMR and NCHS standards and calculated 't' values for the weight differences was presented in Table.3. In comparison to ICMR and NCHS standards, all the four experimental groups of girls recorded significantly low level of weights at all ages tested. It is also interesting to observe that rural scheduled caste girls (RSC) are far below in their weights than their counterparts (USL, RFC and UE) and worst affected group. Urban elite girls (control) seem to be better in their weights than their counterparts in all the age groups. However, as the age increased, there is an increase in their weights in each community group, though the rate of growth was poor and slow in deprived groups (RSC, USL). It is important note that even the urban elite (control) group are significantly lighter in their weights in relation to NCHS standards (mean difference 4 to 10kgs) whereas they were nearer to ICMR standards (mean difference 3 to 4kgs). Rural forward caste girls seem to be better in weights than USL and RSC girls at all ages tested.

Results indicate that increments in weights of girls from different communities were socioeconomic dependent. Increments were lowest among the poorest groups i.e. USL and RSC (14.40, 14.18 kg) and highest in the urban elite group (16.82kg). The RFC had better increments (16.05kg) compared to USL and RSC girls. It is to note that educational status and socio-cultural level of parents of UE girls strongly influence the nutritional status of adolescent girls. Gopalan and Suminder Kaur (1989) also observed that the pattern of weight gain is different between the groups. Girls from low socioeconomic group gain considerably less than do girls from high socioeconomic group (14.3 Vs 16.7kg) during the 10th and 15th years, but during the next three years they gain a little more (3.4kg Vs. 2.8kg) as is in the case with height increments.

CONCLUSION

A need has therefore been felt to address the special needs of this important target group whose health and well being will greatly improve the quality of life and enable the state to make impressive gains against all vital developmental indicators and

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