

## Patterns of Growth in Children in Sri Lanka

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Nearly one fourth of the babies born in Sri Lanka fail to reach the minimum of 2,500 grams at birth. On the other hand a study of the social (and nutritional) elites of this country have revealed, in this group, rates of growth comparable to those of the United States; but only up to 11 years of age. Within the country itself it has been found that the growth retardation prevalent in rural children between the age of 4 to 6 years was 16 times higher than that seen in children from private Montessori and Nursery schools in Colombo. These are some of the stark findings that come out in this concise and revealing survey of the patterns of growth in Sri Lanka's children, by Dr. Beatrice V. de Mel of the Department of Nutrition of the Medical Research Institute and Dr. Kamilaka Abeyratne of Colombo's Lady Ridgeway Hospital for children. They emphasise that growth failure in our children is the result of a large number of interlinked factors and what is necessary is a long-term solution through an integrated programme, comprising reduction in family size, provision of better environmental conditions, immunization against preventable disease, nutrition education, continuous surveillance and supplementation where necessary.

Growth is the process in the human by which a single cell reaches full adult stature. This process requires not only "the building materials" but also energy for fuelling the various intricate chemical processes involved. These substances are the nutrients in the human diet. There are other factors involved in the rate of growth and the final stature reached, heredity being one of them; although the importance of this factor has been somewhat reduced by studies on immigrant populations, particularly the so called "small races" the Japanese and the Chinese resident in developed countries where in a generation or two the same stature as the Caucasian races is reached. Growth is not a uniform process throughout. There are periods when growth is very rapid and there are periods when it may be very slow or even quiescent. Growth is also not continuous throughout all parts of the body. At certain stages, certain organs and systems may grow faster than others and this gives rise to the characteristic change in form, illustrated in Fig. 1.

The most rapid period of growth, of course, is the intra-uterine, when the child grows in the mother's womb and starting as a single cell weighing 1-2 micrograms will reach a weight of 2,730 grams (average), an increase in size of two million times. Nearly one fourth of the babies born

in Sri Lanka fail to reach the minimum of 2,500 grams. Failure of growth in this period may be due to a large number of factors. In some cases the baby is born before full term. In others, one cannot be certain because mothers are not sure of their dates. In some cases this failure of intra-uterine growth may be due to disease in the mother or to disease in the placenta which connects the circulation of the mother to that of the growing embryo or to disease in the baby. Unfortunately the largest proportion of underweight babies at birth in this country are due to failure of nutrition of the mother which means that she does not receive sufficient nutrients in her diet to meet both her needs and the needs of the child developing within her. This can be a cumulative effect affecting subsequent children more than the first one and even being passed on from one generation of malnourished and stunted mothers to the next.

It is clear that such babies who have suffered failure of growth during gestation, start life with a handicap which, in most instances, they are able to catch up on.

The next phase of growth occurs during the first year of life. Though this period is clearly a period of very rapid bodily growth it is also the period when the brain reaches its greatest rate of growth and it is, therefore, a period in which dramatic

advances are made in physical and mental performance. Failure of growth during this period is likely to affect permanently the capacity of the brain. In addition, if this failure of growth is associated with malnutrition, resulting from overcrowding, large families, neglect and parental deprivation, there is likely to be permanent damage to the child's psychological responses to his environment.

The key to this phase of growth is breastmilk. Breastmilk is nature's food for the child. It provides all the nutrients in the correct proportions throughout, in addition to providing certain substances which are essential in the protection of the child from infections. Further, the physical contact that is an essential part of breast-feeding, undoubtedly leads to secure, confident, and well-rounded personalities ensuring a normal psychological development as the child grows. Except in the case of illness or grave inconvenience to the mother, there is no excuse for the use of poor artificial substitutes during this phase of growth, which, in effect denies the child of its birthright. Perhaps the best compromise that can be reached today is breast-feeding *alone* for 5-6 months, supplemented and later substituted by artificial feeding concurrent with a programme of weaning onto solids.

The next phase of growth carries the child from the end of the first year to the end of five years—known as the preschool period—this is undoubtedly the most appealing phase of a child's growth. The child is learning to explore his environment, learning to walk and talk and is developing as a personality. Unfortunately this group in our country provides the highest number of severe cases of growth failure and the rate of sickness and death in our children is highest in the period of up to 3 years of age (see table). Growth failure in this age group may arise from several factors. The most important is the fact that in a large number of families children are expected to join the adults for their meals, taking what is for them unsuitable food in inadequate quantities in two or three instalments for

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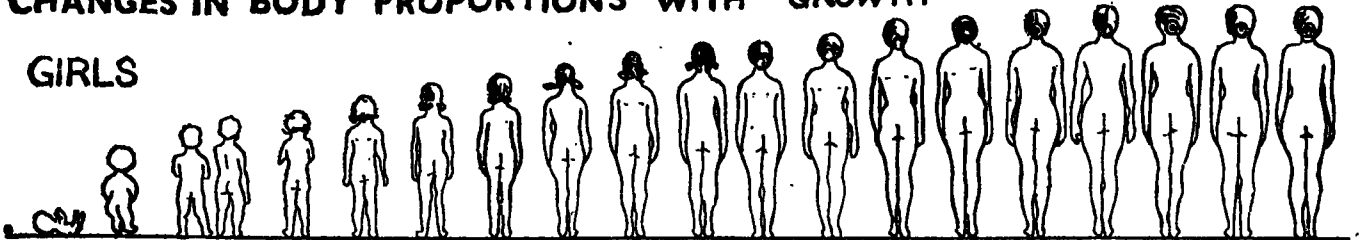
The most rapid period of growth, of course, is the intra-uterine, when the child grows in the mother's womb. The next phase occurs during the first year of life. The following phase of growth carries the child from the end of the first year to the end of five years — known as the preschool period — this is undoubtedly the most appealing phase of a child's growth. Unfortunately this group in our country provides the highest number of severe cases of growth failure and the rate of sickness and death in our children is highest in the period of up to 3 years of age.

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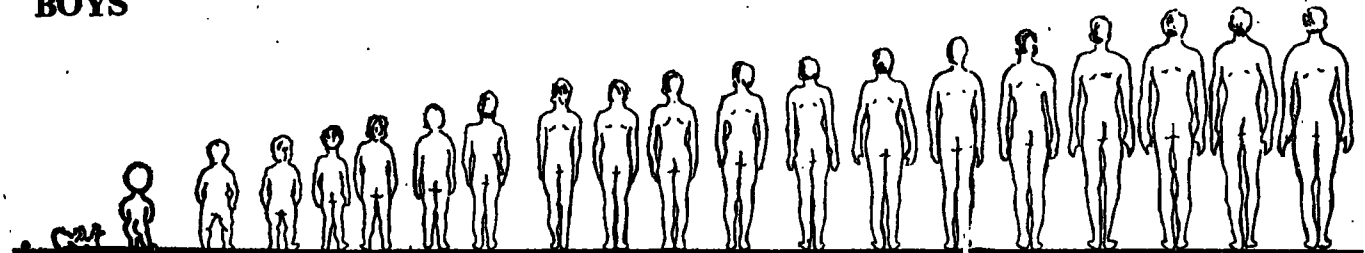
## CHANGES IN BODY PROPORTIONS WITH GROWTH

### GIRLS



	Birth	1	1½	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Height	50.0	74.0*	80.9	86.4	95.0	103.2	109.1	114.5	122.1	125.8	132.1	136.5	141.3	146.0	152.4	155.0	159.5	156.6	156.8	158.8
(Sri Lanka)							109.2*	115.6	119.4	124.5	129.5	134.6	141.6	148.0	153.	153.7	159.6	157.9	159.1	156.9
(India)	72.4		79.9	87.1	84.5	101.3	107.3	113.0	117.9	122.5	128.1	133.4	138.3	144.5	148.1	150.0	157.9	152.1	152.1	151.6
(America)	50.2	74.2*	80.9	86.6	95.7	103.2	109.1	115.9	122.3	128.0	132.9	138.6	144.7	151.9	157.1	159.6	161.1	162.2	162.5	162.5
Weight	3.2	8.8*	10.8	11.9	13.8	16.0	18.2	20.3	24.0	25.5	27.1	28.9	32.7	36.7	39.1	44.0*	46.1	45.4	48.1	49.9
(Sri Lanka)							18.4*	21.4	24.8	26.1	29.7	33.5	36.5	42.6	44.4	46.7	48.2	49.8	49.9	50.1
(India)	7.7*		9.4	11.2	12.8	14.3	15.8	17.3	19.2	21.0	23.2	25.7	29.3	33.0	37.0	39.1	41.0	42.0	42.3	42.3
(America)	3.4	9.8*	11.1	12.3	14.4	16.4	18.4	22.2	23.7	26.4	28.9	31.9	35.7	39.7	45.0	49.2	51.5	53.1	54.0	54.4

### BOYS



	Birth	1	1½	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Height	50.6	74.5*	81.6	87.0	96.4	103.0	109.0	114.5	124.0	127.7	135.2	136.2	143.8	145.1	154.9	161.0	165.9	169.5	169.9	171.8
(Sri Lanka)							109.2*	115.1	121.3	125.1	130.8	134.0	137.8	143.5	151.1	156.2	161.9	167.0	170.1	169.5
(India)	73.5*		81.9	88.6	95.9	102.2	108.4	114.0	119.8	123.0	128.9	133.3	138.1	144.0	150.3	156.6	160.3	162.4	163.5	163.5
(America)	50.6	75.2*	81.8	87.5	96.2	103.4	108.7	117.5	124.1	130.0	136.5	140.3	144.2	149.6	155.0	162.7	167.8	171.6	173.7	174.5
Weight	3.3	9.1*	10.6	12.2	14.5	16.1	18.4	20.8	24.1	26.0	29.4	30.8	33.2	35.0	42.9	47.3	52.2	55.3	56.7	59.0
(Sri Lanka)							17.5*	18.9	21.0	22.6	24.5	26.6	28.3	32.3	35.7	41.3	45.3	49.2	53.8	52.4
(India)	8.3*		10.0	11.8	13.4	15.2	16.7	18.4	18.6	21.2	22.9	25.4	27.9	31.3	35.2	39.9	43.6	45.6	47.4	47.4
(America)	3.4	10.7*	11.4	12.6	14.6	16.5	18.4	21.9	24.5	27.3	29.9	32.6	35.2	38.3	42.2	48.8	54.5	58.8	61.8	63.1

\* DATA ARE THOSE OF THE 50TH PERCENTILE OF WEIGHT FOR AGE FOR ALL AND HEIGHT FOR AGE OF REPRESENTATIVE CHILDREN OF SRI LANKA INCLUDING THE MALNOURISHED - INDIAN THE SAME SAMPLING. (PERCENTILES PROVIDE A MEANS OF QUANTIFYING THE VARIATIONS WITHIN A GROUP - IN THIS CASE THE HEIGHT AND THE WEIGHT FOR EACH AGE GROUP. ALL THE SAMPLES WITHIN ONE AGE GROUP ARE PLACED IN A 100 SEGMENTS IN ASCENDING ORDER. THE 5TH PERCENTILE WILL THEREFORE REPRESENT THE 5TH SEGMENT OUT OF 100; THE 50TH WILL REPRESENT THE 50TH SEGMENT AND ALSO THE MEDIAN).

the day. The other problem is that in the exploration of the environment children pick up a large number of uninvited and unwelcome guests in the form of worms and other intestinal parasites who, living in the child's gut, consume the child's food. In cases where the nutrient intake is marginal, the presence of large numbers of intestinal parasites may tip the scales towards severe growth failure.

Chronic or recurrent infections, such as those of the bowel, causing diarrhoea, or those of the throat and lungs may debilitate a child to the point when its nutrient intake is not sufficient to meet the increased demands of fighting repeated infections. For example, in a child on a marginal nutrient intake, an apparently simple disease like measles can prove to be fatal or lead to a severe form of malnutrition known as Kwashiorkor. School-going children starting from 8 years may be considered in two groups, primary school ending at 12 years, and secondary school thereafter.

The problems of the school child are mainly those of increased demands of energy to meet the greater physical effort of attending school. In addition, some children living far away from their schools may be affected by the long single session, and its late termination leading to their having their first meal for the day at 2 or 3 in the afternoon. School-going children are available for programs aimed at detecting growth failure due to lack of nutrients and also can be reached by programs aimed to supplement the nutrition intake. The problem, therefore, is not as severe as in the preschool group (see table).

One of the features of growth failure and a lack of nutrients in school-going children is that they are listless and unable to concentrate and therefore unable to make use of the excellent free educational systems provided by the State. This is a comment that has been often made by teachers of remote rural schools. This may be a hitherto undetected cause of the poor academic performance of this part of the country.

The next period of adolescence marks a very important event in growth and development, the passing of puberty, after which the acquisition of the ability to reproduce

marks the final ascent to adult status. Boys start off by being heavier and taller than girls at 5 years and are caught up by the 10th year and passed in both height and weight by girls but only till the 13th year. In any case the pre-pubertal growth spurt is very dramatic. Studies in Caucasians have shown that early growth spurts indicate early puberty. The picture in Sri Lanka is not as clear but in females the menarche is reached 2-3 years earlier in girls with an urban (well-to-do) background than their shorter and lighter rural counterparts.

Growth failure leading to an inability to achieve full physical and mental stature can be a socio-economic handicap to the individual and a financial liability to the State, not only from reduced productivity, but also from the need to spend on medical care for the undernourished and social services to those who have been disabled thereby. It is therefore necessary to have the means of detecting growth failure early enough to do something about it. These are based on bodily measurements (anthropometry) such as height, weight and circumference of head, chest and left arm. When these individual measurements are compared against a norm, cases of retarded growth can be detected. There is a great deal of controversy in which measurements should be used and which norms should be applied. It is absolutely essential that whatever measurements are made and whatever norms are applied must be capable of being made accurately and interpreted with the simplest of equipment by paramedical field personnel, and they should be intelligible to the general public. The norm currently available in this country is based on weight in relation to age and forms the basis of growth cards currently used in the CARE-sponsored Triposha Program which includes nutritional food made exclusively from indigenous foodstuffs fortified with a vitamin/mineral additive being supplied to the vulnerable groups of infant children, pregnant and lactating mothers, pre-school and primary school children.

In 1936 Lucius Nicholls commented that there was such a difference in stature between the urban rich and rural poor of this country as

though they were of two different races. More specifically, in the Sri Lanka Nutrition Status Survey in 1975/76 an official of the Department of Health Education and Welfare, United States commented that the prevalence of growth retardation in rural children between the ages of 4 to 6 years was 16 times higher than that seen in children from private Montessori and Nursery schools in Colombo. A study on the social (and nutritional) elites of this country have revealed rates of growth comparative to those of the United States (Harvard and NAS) but only upto 11 years of age. There is a fall off in growth in our children after this age leading to the difference in adult statures. This may be due to a genetic factor as this observation has been made in India.

The State, in all Third World countries, has a special function in the prevention of severe forms of growth failure in its population. Various programs of food subsidies have been a feature of life in this country since the war.

Subsidies have been mainly in the energy-giving foods rice, flour and sugar and to a lesser extent in the "building materials", i.e. milk, pulses and dried fish. These subsidies were aimed more at the working adult and the needs of children were served by special programmes aimed at identified groups, communities and areas at risk and providing them with free supplements to their diet ranging from the buns and skimmed milk of the past to Triposha and biscuits. Food subsidies are being replaced by a similar supplementary programme of food stamps for all members of deprived households.

On the whole, growth failure is a result of a large number of inter-linked factors. Overcrowding, over-large families, underemployment and poor sanitation and housing leading to intestinal parasitosis and recurrent infections, all of which together tend to diminish the value of the marginally adequate food available to such groups. The only long-term solution is an integrated program comprising reduction in family size, provision of better environmental conditions, immunization against preventable disease, nutrition education, continuous surveillance and supplementation where necessary.