A Comparative Study of Physical Growth in Urban and Rural School Children from 5 to 13 Years of Age

Sunil M Kolekar[1*], Sunita U Sawant[2]

{[1]Associate Professor of Physiology, [2]Associate Professor of Anatomy} ASRAM Medical College

Eluru, West Godavari Dist., Andhra Pradesh, INDIA.

[*]Corresponding Address:

kolekarsunil@yahoo.co.in

Research Article

Abstract: A cross-sectional study was conducted to compare the physical growth amongst healthy school children from the urban and rural areas of Sangli district, Maharashtra, India. A total of 2300 school children were taken for study, out of which 1390 were urban school children and 910 were rural school children. The anthropometric measurements like height and weight were taken. Height and weight of urban school children were statistically ($p<0.05$) higher than those of rural school children. This was due to differences in nutritional and socio-economic environment in urban and rural areas. This was also due to better understanding of nutritional requirements, availability of different foods, and prevention and treatment of recurrent diseases, state of hygiene and parental literacy in urban areas as compared to rural areas.

Key words: Physical growth, Height, Weight, School children, Socio-economic status.

Introduction

Studies on growth and physical development of infants and children are important as they provide determinants of a nation's health. Measurements of height and weight are still the simplest and one of the reliable means by which the progress of a normal child is evaluated and gross abnormalities detected even when no other clinical sign of illness is detected [(1)].

Growth is determined by biological determinants including sex, birth weight and genetic constitution. Socioeconomic and environmental factors seem to produce their effect by the presence of nutritional deficiencies, parasitic infections and psychosocial illnesses. The anthropometric measurements are important measures and selected body measurement can give valuable information regarding nutritional status. It is difficult to derive norms of Indian children due to wide variation in socioeconomic status, nutrition conditions, and ethnical and regional differences in India [(2)] . Primary school children are important child population segment, as they form the first institutionalized group that can be approached for health, nutritional and educational interventions with ease. The rate of growth of children varies with the environment in which they live. The better nutritional environment of children in the high socioeconomic community accelerates growth and poor socioeconomic group retards it[(3)]. Anthropometric assessment is a simple tool to study the nutritional status of the community at large. It serves as the most useful screening test especially in developing countries of the world, where malnutrition is widely prevalent and the resources are limited[(4)]. ICMR[(1)] in 1972 and Phadake M.V.[(5)] in 1968, and other various workers like Sahoo K, Hunshal S And Itagi S.[(6)] in 2010 showed that physical parameters in urban children were at higher level than in rural children. With this in mind, a study was undertaken to carry out a comparative study of physical growth in school children (5 to 13 Years) in urban and rural areas of Sangli district, Maharashtra.

Materials

A cross-sectional study was conducted in healthy school children from the urban and rural areas of Sangli district. This study included the children in the age group between 5 to 13 years. A total of 2300 school children from urban and rural areas of Sangli district were taken for study. Out of 2300 children, 1390 were urban school children (868 boys and 522 girls) and 910 were rural school children (500 boys and 410 girls). A special proforma was prepared to register name, age, sex and socioeconomic status of children. Urban school children studied were from high fee private schools and rural school children were from free government schools. Detailed physical examination was carried out and only healthy children were selected for study. Appropriate ethical permission for human studies was obtained from the concerned authority before commencement of this study.

Method

The study was conducted in school premises itself in a room provided by school authorities. Age was recorded by noting the date of birth in the school register. The measurements such as height and weight were taken by standard methods as reported by Jelliffe D.B.[(7)].

Height:

Standing height was recorded with student standing on the flat surface up to nearest 0.1 cm. The child was

asked to stand against scale without shoes but heels together and with the shoulders, buttocks and heels touching the vertical surface. The child was asked to look straight so that the line drawn from the external auditory meatus to the inferior orbital margin was in the plane parallel with the floor (Frankfurt plane). The arm should be hanging at the sides in a natural manner. The head piece was gently lowered, crushing the hair and making contact with the top of the head. The same scale was used for the whole study.

Weight:

Weight was recorded on portable weighing machine up to nearest 0.5 kg. The children were weighed with minimal clothing. Weighing machine was pretested for accuracy. The same weight machine was used throughout the study period. Data was analyzed into one year interval. In each age group, mean, standard deviation (S.D.), 'Z' test and 'p' value were calculated. Differences were considered statistically significant when 'p' value was less than 0.05.

Results

The present study was a cross-sectional study of physical growth in urban and rural school children of Sangli district in age group of 5 to 13 years. Table 1 shows the distribution of boys and girls of urban and rural schools. Table 2 and Figure 1 show the comparative values of mean height for children of both urban and rural school. Boys of urban school are taller in height than rural school boys throughout all ages. Similarly, Girls of urban school are taller than their rural school counterparts in all age groups. The statistically significant difference is seen in all age groups in both boys and girls of urban school as well as of rural school. The height in boys as well as girls of both urban and rural school shows a continued upward trend with increasing age.

In the present study, height of boys is seen to be more than that of girls up to the age group 9-10 years. After the age of 10 years, girls are ahead of boys up to 13 years of age. This is same for children of both urban and rural school. The earlier lead of girls at 11 years is due to pubertal spurt that starts around the age of 10 years. However, statistical significant difference is seen in the age group 11-12 years in urban school children only.

Table 3 and Figure 2 indicate the comparative values of mean weight in children of both urban and rural school. Boys and girls of urban school are heavier than that of rural school counterparts in all age groups. The difference is statistically significant in all age groups. The weight in boys of urban and rural school increases as the age advances. Girls in urban and rural school show similar findings. The girls are lagging behind the boys in urban school up to the age of 8 to 9 years. After that girls are slightly heavier than that of boys. But the difference is statistically significant in age group 6-7 years only. Similarly, boys in rural school are heavier than that of girls in urban school up to the age of 10 to 11 years. After that girls are slightly heavier than that of boys but the difference is statistically not significant. This indicates that pubertal growth spurt occurs early in girls.

Table 1: Distribution of Boys and Girls of Urban and Rural School according to age

Age in years	Urban School			Rural School		
	Boys	Girls	Total	Boys	Girls	Total
5+	99	68	167	47	41	88
6+	125	78	203	50	49	99
7+	123	50	173	61	46	107
8+	124	57	181	60	67	127
9+	96	71	167	72	56	128
10+	133	74	207	82	60	142
11+	76	47	123	73	54	127
12+	92	77	169	55	37	92
TOTAL	868	522	1390	500	410	910

Table 2: Comparative account of Mean Height in cm in children of Urban and Rural Schools.

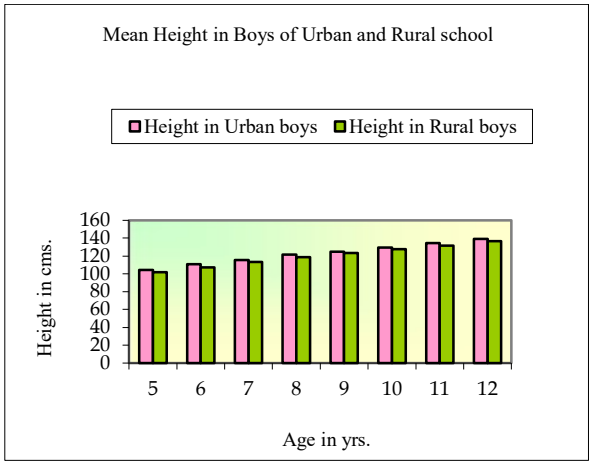
Boys

Age in years	Urban Boys		Rural Boys				
	Mean	S.D.	Mean	S.D.	Z value	p value	Remark
5+	104.4	5.03	101.6	2.76	4.4	<0.001	HS
6+	110.9	3.79	107.2	2.74	7.19	<0.001	HS
7+	115.3	4.35	113.1	3.41	3.75	<0.001	HS
8+	121.5	4.17	118.6	3.29	5.12	<0.001	HS
9+	124.6	3.32	123.1	3.14	2.99	<0.01	S
10+	129.2	2.95	127.5	4.2	3.21	<0.001	HS
11+	134.5	3.49	131.6	4.67	4.28	<0.001	HS
12+	139	4.42	136.6	4.34	3.22	<0.001	HS

Girls

Age in years	Urban Girls		Rural Girls				
	Mean	S.D.	Mean	S.D.	Z value	p value	Remark
5+	103.4	4.13	100.4	3.14	4.28	<0.001	HS
6+	110.1	4.23	107	2.92	4.88	<0.001	HS
7+	114.1	4.08	111.9	3.6	2.81	<0.01	S
8+	121	3.91	117.5	3.39	5.28	<0.001	HS
9+	124.5	3.03	122.5	3.19	3.59	<0.001	HS
10+	129.2	3.53	127.6	4.15	2.37	<0.05	S
11+	135.6	2.52	131.8	4.61	5.23	<0.001	HS
12+	140	4.09	137	3.66	3.94	<0.001	HS

HS- Highly significant, S-Significant



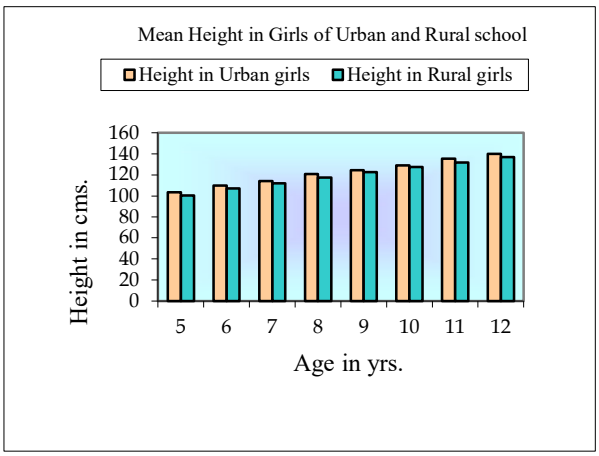


Figure 1: *Comparative account of Mean Height in children of Urban and Rural school*

Table 3: Comparative account of Mean Weight in kg in children of Urban and Rural Schools

Boys

Age in years	Urban Boys		Rural Boys				
	Mean	S.D.	Mean	S.D.	Z value	p value	Remark
5+	15.8	1.79	14.3	1.14	6.12	<0.001	HS
6+	18.1	2.16	15.9	1.09	8.90	<0.001	HS
7+	20.1	2.29	17.5	1.42	9.45	<0.001	HS
8+	21.7	2.46	19.5	1.41	7.69	<0.001	HS
9+	22.5	3.22	21.4	1.91	2.76	<0.01	S
10+	24.4	2.47	23.1	2.25	3.96	<0.001	HS
11+	26.5	2.78	25	2.62	3.39	<0.001	HS
12+	29.5	3.09	27.1	3.54	4.17	<0.001	HS

Girls

Age in years	Urban Girls		Rural Girls		Statistical Testing		
	Mean	S.D.	Mean	S.D.	Z value	p value	Remark
5+	15.3	1.95	14.2	1.2	3.65	<0.001	HS
6+	17.3	2.1	15.4	1.43	6.06	<0.001	HS
7+	19.5	1.65	17.1	1.67	7.07	<0.001	HS
8+	21.5	2.82	19.1	1.58	5.71	<0.001	HS
9+	22.6	2.97	21.1	1.5	3.70	<0.001	HS
10+	24.8	2.8	23	2.11	4.24	<0.001	HS
11+	27.1	2.62	25.2	3.11	3.33	<0.001	HS
12+	30.7	3.58	27.4	3.18	4.98	<0.001	HS

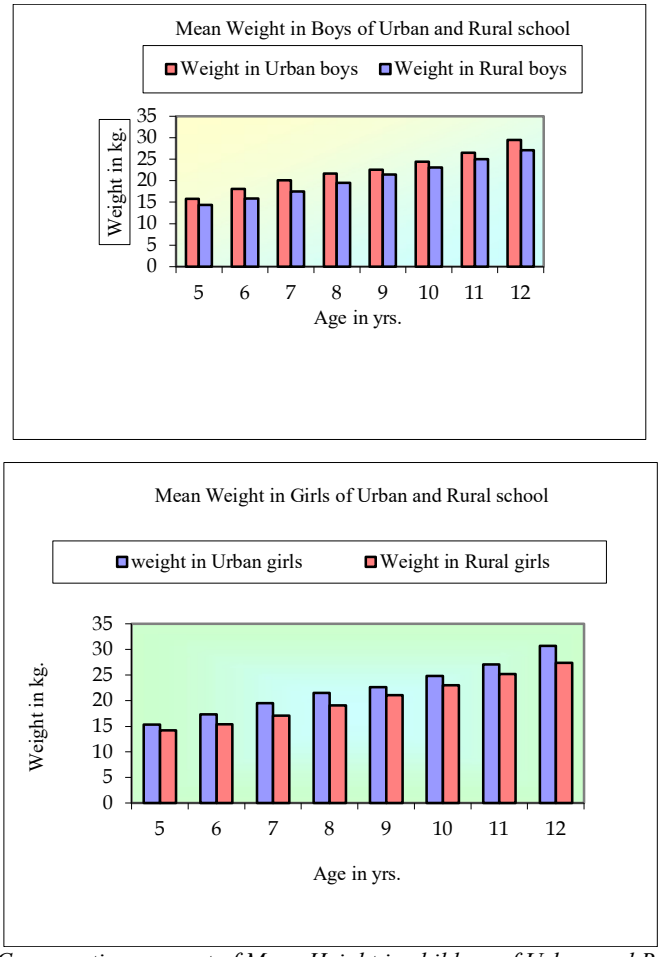


Figure 2: *Comparative account of Mean Height in children of Urban and Rural school*

Discussion

Children belong to 5-12 years age group are vulnerable because of their rapid growth rate. They need more attention and care for the physical and mental development. Physical growth, development and well-being are directly related to the nutritional status. Chronic under-nutrition is considered to be the primary cause of ill health and premature mortality among children in developing countries[8]. The present study showed that urban school children have higher values for all measurements when compared to rural school children. This is due to better socioeconomic status in urban children as compared to lower socioeconomic status in rural children. Indian workers (Udani[12], Banik et al[3] and Vijaya Raghavan et al[13]) observed that children belonging to well-to-do group were taller and heavier than those from the low-income group and these studies also revealed the direct impact of socioeconomic status on nutritional anthropometry as also observed in the present study. The under-privileged children are constantly exposed to severe nutritional, social and environmental strains as compared to children of well-to-do group. ICMR[1], Phadake M.V.[5] and Sahoo K, Hunshal S And Itagi S.[6] showed that physical parameters in urban children were at higher level than in

rural children. Similar findings were reported by Indirabai K. et al.[9], Bhandari et al.[10], and Mukerjee B. and Kaul K.K.[11]. The results of the present study is also in conformity with the findings of studies conducted by Eiben et al.[14] and Mouzan et al.[15] who found that urban girls usually had higher means (both height and weight) than rural counterpart.

Conclusion

The physical parameters in urban school children are found to higher as compared to rural school children in all age groups. This is due to differences in nutritional and socio-economic environment in urban and rural areas. Thus the growth of an individual, besides genetic factors, is affected by different environmental, cultural, nutritional, economic factors, and all factors act together on growth of an individual. The present study also suggests that there is a need to create awareness among rural school children and their parents about physical growth and physical health which can be improved by providing proper care and nutrition right from early childhood period.

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References

1. I.C.M.R. Growth and physical development of Indian infant and children, Technical report series No.18, 1972.
2. Banik Datta N.D. Semi-longitudinal growth evaluation of children from birth to 14 years in different socioeconomic groups. Indian pediatrics 1982; 19, 353-59.
3. Banik Datta ND, Sushila Nayar, Krishna, Bakshi and Taskar A.D. Growth pattern of Indian school children in relation to nutrition and adolescence. Indian Journal of pediatrics 1973; 40, 173.
4. Shrivastav D.K., Thavrani U.P. and Kumar Gupta. Health examination of primary school children at Gwalior-part III: Anthropometric assessment. Indian pediatrics 1978; 15, 8, 672.
5. Phadake M.V. Growth norms in Indian children. Indian Journal of Medical Research 1968; 56, 851.
6. Sahoo K, Hunshal S And Itagi S. Physical growth of school girls from Dharwad and Khurda districts. Karnataka Journal Agricultural Science 2011; 24, 2, 221-226.
7. Jelliffe D.B. The assessment of nutritional status of community. WHO Monogram Series 53, Geneva, 1966.
8. Nandy S, Irving M, Gordon D, Subramanian SV and Smith GD. Poverty, child undernutrition and morbidity: New evidence from India. Bull World Organ 2005; 83, 210-216.
9. Indirabai K., Raghavaprasad S.V., Ravi Kumar and Reddy C.O. Nutritional and anthropometric profile of primary school children in Rural Andhra Pradesh. Indian pediatrics 1979;16, 12, 1085.
10. Bhandari B, Jain A.M., Padma Karna, Asha Mathur and SharmaV.K. Nutritional anthropometry of rural school children of Udaipur district. Indian Journal of pediatrics 1972;39, 1-11.
11. Mukerjee B. and Kaul K. K. Anthropometric observations- urban school children. Indian Journal of Medical Research 1970;58, 1257.
12. Udani P.M. Physical growth of children in different socioeconomic groups in Bombay. Indian Journal of child Health 1963;12, 593-611.
13. Vijaya Raghavan, Darshan Singh and Swaminathan M.C. Heights and weights of well nourished Indian school children. Indian Journal of Medical Research 1971; 59, 648-54.
14. Eiben O. G., Barabas A. and Nemeth A. Comparison of growth, maturation and physical fitness of Hungarian urban and rural boys and girls. Journal of Human Ecology 2005;17, 2, 93-100.
15. Mouzan M. E., Foster P., Herbish A. A., Salloum A. A., Omer A.A., Alqurashi M. and Kecojevic, T. Regional variations in the growth of Saudi children and adolescents. Annals of Saudi Medicine 2009;29, 5, 348-356.

Address for correspondence:
Dr. Sunil M Kolekar
Associate professor of Physiology
ASRAM Medical College, ELURU-534005
West Godavari Dist., Andhra Pradesh, India
Email: kolekarsunil@yahoo.co.in