Auxological Profile of Pre-School Children of Punjab

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ABSTRACT

Physical growth parameters (height, weight, upper arm circumference, head circumference, abdominal circumference and waist circumference) were assessed in a sample of 702 Jat Sikh children (males and females) residing in Punjab according to technique given by Lohman et al. The aim of the study was to evaluate the growth pattern of 1 to 5 year old children. There was a gain of 34.97 cm and 32.37 cm in height in females and males respectively. Weight increased from 7.04 kg to 15.08 kg in females and from 7.13 kg to 17.53 kg in males during pre school years. The head circumference, upper arm circumference, abdominal circumference and waist circumference showed a gain of 6.6 cm, 1.82 cm, 5.34 cm, 6.30 cm in females and 6.5 cm, 2.58 cm, 5.07 cm and 4.84 cm in males respectively.

Keywords: Pre-school, weight, height, upper arm circumference, head circumference.

INTRODUCTION

Health and nutritional status are two crucial and interlinked aspects of human development, which in turn interact with demographic variables in important ways. Parthamna (1984) stated that children during pre-school period undergo considerable changes in growth and development. Physical growth of various dimensions of the body is a very regular process. A child will grow because of a strong impulse to grow which is inherent in the organism. Although the impulse to grow is strong through innate force and the patterns are fairly definite for all children, still they may differ in the pattern of growth (Breckenridge and Vincent, 1960). Growth is a function of productivity or species' ability to achieve food intake and nutrient availability above the maintenance demands of body. According to Eckstein (1969) these potentialities related to

growth and development are major parameters in evaluation of health status of children. Growth and development in children are governed through certain laws. Postnatal period of growth and development comprises of newborn, infancy, toddler, preschool, school age and adolescence. The infancy and toddler years are the years when many types of changes precede biological, behavioral, social, physical and physiological changes. In the light of above developments, the present study was undertaken to evaluate the growth pattern of children of 1 to 5 years of age in terms of their anthropometric status.

MATERIAL AND METHODS

The present cross sectional study was carried out on a sample of 702 Jat Sikh children (both sexes included) ranging in age from 1 to 5 years. The data has been collected from various crèches, immunization clinics and preparatory schools located in the districts of Ludhiana and Patiala (Punjab) during the year 2011. Age of each child was calculated to three decimal places by using the decimal age calendar (Tanner, 1969). All the subjects were grouped into 9 age groups with a class interval of 6 months. Six anthropometric measurements (weight, height, upper arm circumference, head circumference, abdominal circumference and waist circumference) were taken according to the technique given by Lohman *et al.* (1988).

RESULTS

Table 1 Height and weight of 1 to 5 year old females and males

Age (yrs)	Females					Males				
	No.	Height (cm)		Weight (kg)		No.	Height (cm)		Weight (kg)	
		Mean	SD	Mean	SD		Mean	SD	Mean	SD
1	82	65.83	2.12	7.04	1.12	99	68.62	2.77	7.13	0.89
1.5	48	72.57	1.13	8.28	0.54	48	74.61	2.16	9.65	0.76
2	19	75.10	1.47	9.25	0.50	23	77.97	1.63	10.03	0.70
2.5	16	76.20	1.07	9.90	0.34	25	81.21	1.69	11.05	0.68
3	42	81.26	1.63	11.05	0.67	29	84.32	2.80	11.68	0.73
3.5	42	89.43	3.66	13.13	0.75	39	93.95	3.67	14.30	1.20
4	43	96.94	2.06	14.16	0.60	42	96.45	3.06	15.89	1.12
4.5	31	98.76	2.41	14.67	1.09	32	99.98	3.32	15.91	0.96
5	21	99.90	3.98	15.08	1.67	21	100.99	2.98	17.53	1.64

Height of females and males increased from 65.83 to 99.9 cm and 68.62 to 100.99 cm from 1 to 5 years of life (Table 1). There was a gain of 34.07 cm and 32.37 cm in females and males, respectively during early childhood years. The females had greater gain in height as compared to males. Weight showed a trend of increase from 7.04 to 15.08 kg in females and 7.13 to 17.53 kg in males. There was a gain of 8.04 kg and 10.40 kg in females and males respectively. The males had greater values for height and weight than females at 1 year but gained less in case of height and more in weight during the succeeding years.

Table 2(a) Circumferences (head and upper arm) of 1 to 5 year old children

Age (yrs)	Females				Males			
	HC(cm)		UAC(cm)		HC(cm)		UAC(cm)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	42.89	1.02	12.77	0.47	43.80	2.49	12.92	0.73
1.5	43.64	1.17	13.17	0.40	46.15	2.57	13.18	0.63
2	45.49	0.61	13.18	0.35	47.16	2.98	13.49	0.49
2.5	45.65	0.67	13.4	0.36	49.22	2.04	13.61	0.41
3	46.88	1.66	13.87	0.33	49.23	2.04	13.81	0.54
3.5	48.91	2.18	13.58	0.71	49.41	1.63	13.95	0.29
4	49.10	1.54	13.83	0.31	49.84	1.45	14.08	0.49
4.5	49.36	1.85	14.38	0.51	50.27	1.15	14.63	0.68
5	49.49	2.07	14.59	0.77	50.32	0.99	15.50	1.24

(HC- Head circumference; UAC- Upper arm circumference)

The head circumference increased from 42.89 cm to 49.49 cm in females and from 43.80 to 50.32 cm in males (Table 2a). The two sexes showed similar gain (6.6 cm and 6.52 cm respectively) during the early childhood years. Head circumference increased rapidly till 3.5 years and remained constant beyond these years. Upper arm circumference showed a greater increase (2.58 cm) in males as compared to females (1.82 cm) from 1 to 5 years. It increased from 12.77 to 14.59 cm in females and from 12.92 to 15.50 cm in males.

Table 2(b) Circumferences (abdominal and waist) of 1 to 5 year old children

Age (yrs)	Females				Males			
	AC(cm)		WC(cm)		AC(cm)		WC(cm)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	42.87	1.17	41.58	1.20	44.79	2.46	44.08	2.64
1.5	43.25	1.16	42.23	1.09	46.84	2.21	45.91	2.29
2	44.45	0.88	43.96	0.93	47.92	3.17	46.93	3.03
2.5	45.03	1.37	43.94	1.14	49.20	1.68	48.55	1.88
3	46.85	1.98	45.06	1.65	49.65	1.88	49.09	1.89
3.5	48.94	2.04	47.40	1.83	49.86	1.40	48.12	1.53
4	47.88	2.19	47.94	1.77	49.45	1.75	48.95	1.80
4.5	49.11	2.59	47.42	2.24	49.87	1.45	49.37	1.33
5	48.21	1.86	47.88	2.05	49.86	1.73	48.92	1.60

(AC-Abdominal circumference; WC- Waist circumference)

The abdominal circumference increased from 42.87 cm to 48.21 cm and from 44.79 cm to 49.86 cm in females and males respectively during the pre-school years (Table 2b). There was a gain of 5.34 cm in the female children and 5.07cm in the male children. Waist circumference showed an increase of 6.30 cm in females and 4.84 cm in males from 1 to 5 years of age. The females gained more girth around the waist as compared to their male counterparts during the pre-school years.

DISCUSSION

The males of the present study had greater height and weight as compared to the study conducted by Rao *et al.* (2012) on the children of rural Maharashtra (Table 3). Comparison with slum children (Sharma, 2011) and male children of Punjab (Kaur and Singh, 2003) shows that the mean values for height of males of the present study were lesser than the males of slum children and other areas of Punjab up till 3 years where after the males of the present study exhibited greater values. They also showed greater values for weight than slum male children except for 1 and 2 years. But the values were much lesser than that of their counterparts in the results given by ICMR (1990) as national standards. This well predicted that the subjects of present paper were shorter and had less weight than the ones studied earlier during early years of pre-school period.

Table 3 Comparison of height and weight of 1 to 5 year old male children

Age (yrs)	Height(cm)					Weight (kg)				
	Present study	Rao *et al.* 2012	Sharma 2011	Kaur and Singh 2003	ICMR 1990	Present study	Rao *et al.* 2012	Sharma 2011	Kaur and Singh 2003	ICMR 1990
1	68.62	68.4	71.13	75.66	76.10	7.13	7.27	8.27	9.37	10.20
1.5	74.61		76.68	80.61		9.65		8.83	9.90	
2	77.97	76.9	81.89	87.36	85.60	10.03	9.26	10.28	11.52	12.30
2.5	81.21		84.02	92.51		11.05		10.95	12.37	
3	84.32	85.7	87.89	95.74	94.90	11.68	11.18	11.33	13.30	14.60
3.5	93.95		90.24	98.53		14.30		11.66	14.16	
4	96.45	92.6	94.93	101.68	102.90	15.89	13.30	12.93	15.12	16.70
4.5	99.98		96.31	103.63		15.91		12.83	15.68	
5	100.99	99.6	100.39	105.14	109.90	17.53	15.03	14.67	16.02	18.70

The results show that the female children of the present study had lesser height as compared to females studied by Rao *et al.* (2012) and Sharma (2011) at all ages except from 4 to 5 years. They had lesser height in comparison to their counterparts studied by earlier investigators (Kaur

and Singh, 2003 and ICMR, 1990) (Table 4). The values were lesser at earlier age groups but they reached almost similar values by the time the females were 5 years old (Present study; Rao et al, 2012; Sharma, 2011) for height. The weight was lesser than the national values at all ages (ICMR, 1990); lesser till 3 years and greater beyond that than their peers (Kaur and Singh, 2003) and greater than the rural children of Maharashtra except at 1 year (Rao *et al.*, 2012).

Table 4 Comparison of height and weight of 1 to 5 year old female children

Age (yrs)	Height(cm)					Weight (kg)				
	Present Study	Rao *et al.* 2012	Sharma 2011	Kaur and Singh 2003	ICMR 1990	Present Study	Rao *et al.* 2012	Sharma 2011	Kaur and Singh 2003	ICMR 1990
1	65.83	66.8	68.86	75.20	75.00	7.04	6.76	7.50	8.89	9.50
1.5	72.57		73.95	81.60		8.28		8.19	9.90	
2	75.10	76.0	81.06	87.88	84.50	9.25	8.66	9.78	11.49	11.80
2.5	76.20		83.51	88.23		9.90		10.45	12.39	
3	81.26	83.8	86.70	89.04	93.90	11.05	10.76	11.07	13.02	14.10
3.5	89.43		91.37	97.79		13.13		11.91	13.75	
4	96.94	90.3	96.14	100.43	101.60	14.16	12.51	13.31	14.65	16.00
4.5	98.76		95.94	102.69		14.67		13.33	15.11	
5	99.90	96.9	99.57	104.08	108.40	15.08	13.93	14.05	15.52	17.70

Head circumference was lesser in the children (both sexes) of the present study in comparison to their peers evaluated by Samai *et al.* (2009) and de Onis *et al.* (2004). The females had lesser values than their male counterparts in the present analysis (Table 5). The head circumference increased till the age of 3.5 years and remained constant in the succeeding years in all the populations studied by different investigators. This proved that the growth in head circumference occurred till early years of childhood and after this, only negligible increase took place.

Table 5 Comparison of head circumference of 1 to 5 year old children

Age (yrs)	Females (cm)			Males (cm)		
	Present Study	Samai *et al.* 2009	de Onis *et al.* 2004	Present Study	Samai *et al.* 2009	de Onis *et al.* 2004
1	42.89	44.61	44.9	43.80	44.94	46.1
1.5	43.64		46.2	46.15		47.4
2	45.49		47.2	47.16		48.3
2.5	45.65		47.9	49.22		48.9
3	46.88		48.5	49.23		49.5
3.5	48.91	46.08	49.0	49.41	46.06	49.9
4	49.10		49.3	49.84		50.2
4.5	49.36		49.6	50.27		50.5
5	49.49		49.9	50.32		50.7

Upper arm circumference is measure of body fat on upper limbs of the body. It is a good indicator to determine the nutritional status and health of children below 5 years of age. Upper arm circumference was greater in the subjects (both sexes) of the present study than their counterparts studied by Samai *et al.* (2009) and Kaur and Singh (2003) (Table 6). But its values were much lesser than the subjects studied by de Onis *et al.* (2004) in the WHO sample.

Table 6 Comparison of upper arm circumference of 1 to 5 year old children

Age (yrs)	Females (cm)				Males (cm)			
	Present Study	Samai *et al.* 2009	de Onis *et al.* 2004	Kaur and Singh 2003	Present Study	Samai *et al.* 2009	de Onis *et al.* 2004	Kaur and Singh 2003
1	12.77	11.83	14.2	12.52	12.92	11.66	14.6	12.59
1.5	13.17		14.5	12.89	13.18		14.8	13.01
2	13.18		14.9	13.48	13.49		15.2	13.57
2.5	13.40		15.3	13.73	13.69		15.5	13.81
3	13.87		15.6	13.86	13.81		15.7	13.89
3.5	13.58	12.61	16.0	14.19	13.95	12.80	15.9	14.30
4	13.83		16.2	14.44	14.08		16.1	14.57
4.5	14.38		16.6	14.55	14.63		16.3	14.61
5	14.59		16.9	14.63	15.50		16.5	14.68

CONCLUSION

It can be concluded that all the anthropometric variables (height, weight, upper arm circumference, abdominal circumference and waist circumference) increased at a constant rate throughout the pre-school years but the values for head circumference increased till the age of 3.5 years and remained almost same in the further age groups. On comparison with the studies conducted by other investigators, it can be elaborated that the subjects of the present population had lesser height, weight and circumferences than their peers.

REFERENCES

Breckenridge ME, Vincent EL, 1960. Child development: Physical and physiological growth although adolescence. Philadelphia, WB Saunders, 5th ed. P. 15.

de Onis M, Garza C, Victora CG, Onyango AW, Frongillo EA, Martines J, for the WHO Multicentre Growth Reference Study Group, 2004. The WHO Multicentre Growth Reference Study: Planning, study design and methodology. *Food Nutr Bull*; **25**(Suppl 1): S15-S26.

Eckstein EF, 1969. Food, people and nutrition. AVI Publishing Co.INC. West Port Connecticul: 435-461.

Indian Council of Medical Research, 1990. Nutrient Requirements and Recommended dietary allowances for Indians, A Report of the Expert Group of Indian Council of Medical Research.

Kaur G, Singh SP, 2003. Growth and malnutrition in 1-5 year old Punjabi Boys. Understanding people of India. Anthropological Insight : Proceedings of P. C Biswas Centenary National Seminar on *Peoples of India: An Anthropological Perspective.*

Lohman TG, Roche AF, Martorell R, 1988. Anthropometric standardization reference manual. Human Kinetic Books, Champaign: Illinois.

Parthamna C, 1984. Scheduled castes and tribes: A socio-economic survey: New Delhi. Ashish Publishing House.

Rao S, Kanade AN, Joshi SB, Sarode JS, 2012.Secular Trends in Growth of Preschool Children from Rural Maharashtra,India. *J Health Popul Nutr*; **30**(4): 420-430.

Samai M, Samai HH, Bash-Taqi DA, Gage GN, Taqi Ahmed M, 2009. The Relationship between Nutritional Status and Anthropometric Measurements of Preschool Children in a Sierra Leonean Clay Factory Displaced Camp. *Sierra Leone J Biomed Res*; **1** (1):21-27.

Sharma S, 2011. Evaluating the growth performance in 0-5 years slum children. *The Nursing Journal*; CII (**5**).

Tanner JM, 1969. Relation of body size, intelligence, test scores and social circumstances. *In*: Trends and issues in developmental Psychology, *ed*. P. Mussen, J. Langer and M. Covington, 182-201. New York: Holt, Rinehart and Winston.