

Anthropometric Profile of Rural Preschool Children Belonging to Different Agroclimatic Regions of Punjab

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KEYWORDS Agro-Climatic Regions. Anthropometric Measurements. Preschool Children

ABSTRACT The anthropometric measurements of 150 rural preschool children (1-3 years) belonging to different agro-climatic regions of Punjab i.e. sub-mountain (RI), central plains (RII) and southern western (RIII) were analyzed. The inter-regional analysis showed that boys and girls of RII in the age group of 1.0-1.5 years were significantly ($p \leq 0.01$) shorter and lighter than their counterparts of RI and RII. The mean height of rural preschool children belonging to different regions of Punjab were comparable with international ($\geq 95\%$ of NCHS) and national ($\geq 98\%$ of ICMR) standards. The analysis depicted that the weight of boys belonging to all regions in the age groups from 1.5-3.0 years were lower than those of NCHS standards whereas the weight of girls of only RIII were lower in all the age groups. On the whole, the weight of boys and girls of Punjab state, only in the age group of 1.0-1.5 years were comparable with those of NCHS standards. The comparison of mean body weight of boys and girls with ICMR standards showed that in RI and RII, all age groups (excluding boys of 1.5-2.0 years) and in RIII boys of 2.0-3.0 years and girls of 1.0-2.5 years had either higher or comparable weight. On the whole weight of boys and girls of Punjab state in all the age groups were comparable with those of ICMR standards except of boys in the age group of 1.5-2.0 years. The analysis further revealed that height and weight of rural preschool children belonging to different regions of Punjab were more than 100 per cent of average Indian and Punjabi children.

INTRODUCTION

The prevalence of protein energy malnutrition (PEM) among preschool children is high in most of the developing countries including India. This may lead to retardation in both physical growth and intellectual development in latter years. It is generally believed that nutritional status of the under-five children of any community is a direct reflection of the stage of development of that community. The most common measure of "malnutrition" is the anthropometric status of under five year old children. Anthropometry is widely recognised as one of the useful techniques to assess the growth and nutritional status of individual or population (Gorstein et al. 1994). A child's weight, height and age permit determination of degree of underweight, stunting or wasting and such measures are usually considered as proxies of protein energy malnutrition. The regular monitoring of child growth is now one of the major concerns for the public health policy makers and planners of our state or country. The Punjab state is considered as one of most prosperous states of India with one of

highest per capita income. The production of food in proportion to area is far better in Punjab than India. Rural poverty is lowest among all the states of India and the agricultural labour productivity is highest. The agricultural resource base of Punjab also varies widely from one corner to the other (Anonymous 2001). Keeping in view all these factors, an attempt has been made to analyse the physical growth (anthropometric measurements) of rural preschool children belonging to different agro-climatic regions of Punjab.

MATERIAL AND METHODS

Based on agro-climatic parameters (ARPU 1998), the state of Punjab has been sub-divided into three regions viz. sub-mountain (RI), the central plain (RIII) and south-western (RIII). Two districts from each region were selected purposively, keeping in view, the functioning of Krishi Vigyan Kendra's of Punjab Agricultural University, Ludhiana. The selected districts were Hoshiarpur and Nawanshahr representing RI, Kapurthala and Patiala from RII and Bathinda and Faridkot

representing RIII. The multistage random sampling technique was adopted to select sample respondents. In the first stage, two blocks from each districts were chosen randomly. In the second stage, two villages were randomly selected from each selected block. The final stage involved the selection of 50 preschool children of 1-3 years of age from the selected villages in each region. Thus, a sample of 150 preschool children spreading over 24 villages, 12 blocks, 6 districts and 3 agro-climatic regions were selected.

The anthropometric measurements i.e. height and weight of each subject were taken according to the procedures described by Jelliffe (1966). The height and weight of the preschool children were compared with international (NCHS) as well as national (ICMR) standards (Gopaldas and Sheshadri 1987). These anthropometric measurements were also compared with the average values for Indians and Punjabi children given by ICMR (1989). The student 't-test' was applied to test the significance of mean difference of different regions.

RESULTS AND DISCUSSION

General Profile: Age-wise distribution revealed that in all the regions majority of preschool children were male and in the age group of 1-2 years. The region wise analysis on socio-economic characteristics of selected children brought out that 50 per cent of rural

preschool children belonged to higher caste in RIII as against 32 and 34 per cent in RI and RII. The maximum percentage of children in RI (36%) and RIII (38%) belonged to medium income group whereas in RII (30%) belonged to low-income group.

Anthropometric Profile

Height: The mean height of 1-3 years rural preschool children and its comparison with international (NCHS) and National (ICMR) standards as well as with average values for Indian and Punjabi children (ICMR 1989) has been summarized in Tables 1 to 3.

Table 1 showed that inter-regional differences with regard to height were non-significant in all groups except 1.0-1.5 yrs. The rural preschool children of RIII in the age group of 1.0-1.5 yrs were significantly shorter than their counterparts in RI and RII. The mean height of rural preschool children (boys and girls) belonging to different regions and Punjab state as a whole (Table 2) were comparable with international ($\geq 95\%$ of NCHS) and national ($\geq 98\%$ of ICMR) standards. However, heights of rural preschool children were found to be slightly higher when compared with average values for Indian and Punjabi children (Table 3). The boys of all age groups except 1.5-2.0 years tended to be taller than girls. Nanda (2000) stated that height or total body length is influenced by heredity apart from nutritional and other environmental

Table 1: Mean height (cm) of selected rural preschool children in different regions of Punjab.

Age (years)	Region			Punjab	t-value		
	RI	RII	RIII		I vs II	I vs III	II vs III
Boys							
1.0 - 1.5	80.56±7.43	78.77±8.21	71.14±4.88	76.25±8.03	0.53 ^{NS}	3.36***	2.91***
1.5 - 2.0	80.30±2.62	77.00±4.87	78.43±4.84	78.11±4.71	1.45 ^{NS}	0.80 ^{NS}	0.57 ^{NS}
2.0 - 2.5	86.14±4.02	86.67±2.56	88.33±1.25	86.75±3.23	0.29 ^{NS}	1.30 ^{NS}	1.31 ^{NS}
2.5 - 3.0	90.38±7.51	91.00±5.66	90.50±1.50	90.59±6.62	0.21 ^{NS}	0.05 ^{NS}	0.21 ^{NS}
Girls							
1.0 - 1.5	75.86±3.80	76.83±6.47	70.29±3.01	74.20±5.40	0.32 ^{NS}	3.04***	2.27**
1.5 - 2.0	81.25±5.26	85.00±1.00	77.67±6.60	80.08±6.21	1.38 ^{NS}	0.96 ^{NS}	2.63**
2.0 - 2.5	84.00±3.39	88.00±0.00	84.50±6.48	84.90±5.19	NA	0.15 ^{NS}	NA
2.5 - 3.0	88.00±3.56	87.00±8.19	85.33±4.42	86.56±6.33	0.27 ^{NS}	0.98 ^{NS}	0.47 ^{NS}

Values represent mean $\pm$ S.E.

No. of subjects: Boys (RI - 9, 3, 7, 13 ; RII - 13, 8, 6, 7; RIII - 14, 7, 3, 2; Punjab - 36, 18, 16, 22)

Girls (RI - 7, 4, 4, 3; RII - 6, 2, 1, 7; RIII - 7, 6, 5, 6; Punjab - 20, 12, 10, 16)

*** - significant at 1%, ** significant at 5%, NS - non significant

Table 2: Percentage of height (cm) of selected rural preschool children in comparison to standards in different regions of Punjab.

Age (years)	NCHS*		Region			Punjab	ICMR**		Region			Punjab
			RI	RII	RIII				RI	RII	RIIII	
Boys												
1.0 - 1.5	76.1	105.86	103.51	93.48	100.20	72.0	111.89	109.40	98.81	105.90		
1.5 - 2.0	82.4	97.49	93.45	95.18	94.79	79.5	101.04	96.86	98.65	98.25		
2.0 - 2.5	85.6	100.63	101.25	103.19	101.34	85.0	101.34	101.96	103.92	102.06		
2.5 - 3.0	90.4	99.98	100.66	100.11	100.21	90.0	100.42	101.11	100.56	100.66		
Girls												
1.0 - 1.5	74.3	102.10	103.41	94.60	99.87	72.8	104.20	105.54	96.55	101.92		
1.5 - 2.0	80.9	100.43	105.07	96.01	98.99	78.5	103.50	108.28	98.94	102.01		
2.0 - 2.5	84.5	99.41	104.14	100.00	100.47	83.8	100.24	105.01	100.84	101.31		
2.5 - 3.0	89.5	98.32	97.21	95.34	96.72	88.5	99.44	98.31	96.42	97.81		

*Gopaldas and Shesdhadri (1987)

** ICMR (1989)

Table 3: Per cent height (cm) of selected preschool children in comparison to the average values for Indian and Punjabi children in different regions of Punjab.

Age (years)		Region			Punjab
		RI	RII	RIII	
Boys					
1-2 (n = 12, 21, 21, 54)	Mean±S.E.	80.08±6.80	78.76±7.93	73.57±5.96	77.16±7.52
	% Indian value	108.36	106.57	99.55	104.23
	% Punjabi value	107.05	105.29	98.35	102.98
2 - 3 (n = 20, 13, 5, 38)	Mean±S.E.	89.15±6.33	87.92±5.30	89.20±1.72	88.73±5.60
	% Indian value	109.25	106.86	109.31	108.74
	% Punjabi value	108.19	106.69	108.25	107.68
Girls					
1-2 (n = 12, 21, 21, 54)	Mean±S.E.	79.18±6.71	78.81±6.64	73.61±5.98	76.81±6.84
	% Indian value	109.21	108.78	101.53	105.72
	% Punjabi value	109.51	109.08	101.81	106.01
2 - 3 (n = 20, 13, 5, 38)	Mean±S.E.	83.14±3.72	87.12±7.67	85.27±5.56	85.26±6.10
	% Indian value	103.79	108.76	106.45	106.44
	% Punjabi value	103.27	108.22	105.92	105.91

n = number of children in region I, II, III and Punjab respectively.

ICMR (1989) Average Indian values - Boys (1+ = 73.9; 2+ = 81.6) Girls (1+ = 72.5; 2+ = 80.1)

Average Punjabi values- Boys (1+ = 74.8; 2+ = 82.4) Girls (1+ = 72.3; 2+ = 80.5)

factors. The findings of the present study are in accordance with those of Banik (1982) who has reported that Indian preschoolers are as tall as American children at the same age group. On the contrary, Goyal (1990) and Punraj (1992) found that height of Punjabi preschool children compared well with ICMR standards but they were shorter than the Harvard standards. Similarly, Hanumantha Rao et al. (1994) reported that tribal preschool children belonging to

three ecological zones of Madhya Pradesh were shorter to NCHS children but were comparable to rural Madhya Pradesh children. Dolla *et al* (2005) observed that the mean height increased significantly with increase in age. The preschool girls were found taller about 2-3 cm than those Kodaku and other Madhya Pradesh Tribal boys. However, the Kodaku boys and girls were shorter than the American counterpart (NCHS).

Table 4: Mean weight (kg) of selected rural preschool children in different regions of Punjab.

Age (years)	Region			Punjab	t-value		
	RI	RII	RIII		Ivs II	IvsIII	IIsIII
Boys							
1.0 - 1.5	10.61±1.43	9.54±1.38	8.43±1.15	9.38±1.57	1.75 ^{NS}	2.01 ^{**}	2.26 ^{**}
1.5 - 2.0	9.00±0.82	8.94±1.59	9.43±1.97	9.14±1.67	0.08 ^{NS}	0.49 ^{NS}	0.53 ^{NS}
2.0 - 2.5	10.57±0.94	10.17±1.07	11.00±1.25	10.58±1.88	0.71 ^{NS}	0.67 ^{NS}	0.93 ^{NS}
2.5 - 3.0	11.70±1.68	11.43±1.68	12.00±0.00	11.64±1.48	0.40 ^{NS}	0.64 ^{NS}	1.19 ^{NS}
Girls							
1.0 - 1.5	9.57±1.15	9.08±1.10	7.86±0.58	8.83±1.22	0.78 ^{NS}	3.51 ^{***}	2.44 ^{**}
1.5 - 2.0	9.50±1.12	10.50±0.50	9.33±1.46	9.58±1.30	1.51 ^{NS}	0.20 ^{NS}	1.69 ^{NS}
2.0 - 2.5	10.75±1.25	10.00±0.00	9.75±1.21	10.15±1.27	NA	1.21 ^{NS}	NA
2.5 - 3.0	10.67±1.89	10.29±1.03	9.67±0.75	10.13±1.22	0.33 ^{NS}	0.88 ^{NS}	1.25 ^{NS}

Values represent mean±S.E.

No. of subjects: Boys (RI - 9, 3, 7, 13; RII - 13, 8, 6, 7; RIII - 14, 7, 3, 2; Punjab - 36, 18, 16, 22)

Girls (RI - 7, 4, 4, 3; RII - 6, 2, 1, 7; RIII - 7, 6, 5, 6; Punjab - 20, 12, 10, 16)

*** significant at 1%, ** significant at 5%, NS - non significant

Table 5: Percentage of weight (kg) of selected rural preschool children in comparison to the standards in different regions of Punjab.

Age (years)	NCHS*		Region			Punjab	ICMR**	Region			Punjab
			RI	RII	RIII			RI	RII	RIII	
Boys											
1.0 - 1.5	10.2	104.02	93.53	82.65	91.96	9.5	111.68	100.42	88.74	98.74	
1.5 - 2.0	11.5	78.26	77.74	82.00	79.48	10.5	85.71	85.14	89.81	87.05	
2.0 - 2.5	12.3	85.93	82.68	89.48	86.01	11.2	94.38	90.80	98.24	96.18	
2.5 - 3.0	13.5	86.67	84.67	88.89	86.22	12.5	93.60	91.44	96.00	93.12	
Girls											
1.0 - 1.5	9.5	100.74	95.58	82.74	92.95	8.7	110.00	104.37	90.34	101.57	
1.5 - 2.0	10.8	87.96	97.22	86.39	88.70	9.8	96.94	107.14	95.20	99.76	
2.0 - 2.5	11.8	91.10	84.75	82.63	86.02	10.5	102.38	95.24	92.86	96.82	
2.5 - 3.0	13.0	82.08	79.15	74.38	77.92	11.3	94.42	91.06	85.58	90.35	

*Gopaldas and Shesdhari (1987)

** ICMR (1989)

Weight: The mean weight of 1-3 years old rural preschool children and its comparison with international (NCHS) and National (ICMR) standards as well as with average values for Indian and Punjab children has been summarized in Tables 4 to 6.

The data (Table 4) revealed that the inter-regional differences with regard to weight of boys and girls were non-significant in all the age groups except for 1.0-1.5 years. The rural preschool children of RIII in the age group of 1.0-1.5 years were lighter than their counterparts in RI and RII. Further, the Table 5 showed that the mean weight of boys of RI and RII in

the age group of 1.0-1.5 years were comparable to NCHS standards whereas, the weight of boys of RIII were lower. However, the weight of boys belonging to RI, RII and RIII in remaining age groups i.e. 1.5-2.0, 2.0-2.5 and 2.5-3.0 years were lower than those of NCHS standards. The mean weight of boys of RI and RII in all the age groups except 1.5-2.0 years, RIII in the age groups of 2.0-2.5 and 2.5-3.0 years were either comparable or higher with those of ICMR standards (Table 5). Similarly, the mean weight of girls belonging to RI, RII and RIII were either comparable or higher with those of ICMR standards except for the girls of RIII in the age

Table 6: Per cent weight (kg) of selected rural preschool children in comparison to the average values for Indian and Punjabi children in different regions of Punjab.

Age (years)	Region			Punjab	
	RI	RII	RIII		
Boys					
1-2 (n = 12, 21, 21, 54)	Mean±S.E.	10.25±1.42	9.40±1.59	8.76±1.55	9.34±1.64
	% Indian value	122.02	111.90	104.28	111.19
	% Punjabi value	120.58	110.59	103.05	109.88
2 - 3 (n = 20, 13, 5, 38)	Mean±S.E.	11.28±1.61	10.69±1.31	12.20±1.33	11.20±1.47
	% Indian value	111.68	105.84	120.79	110.89
	% Punjabi value	109.51	103.78	118.44	108.73
Girls					
1-2 (n = 12, 21, 21, 54)	Mean±S.E.	9.72±1.34	9.43±1.16	8.27±0.85	9.09±1.30
	% Indian value	124.61	120.89	106.02	116.15
	% Punjabi value	124.61	120.89	106.02	116.15
2 - 3 (n = 20, 13, 5, 38)	Mean±S.E.	10.50±1.49	10.25±0.97	10.00±1.11	10.21±1.20
	% Indian value	109.37	106.77	104.16	106.35
	% Punjabi value	109.37	106.77	104.16	106.35

n = number of children in region I, II, III and Punjab respectively.

ICMR (1989) Average Indian values - Boys (1+ = 8.4; 2+ = 10.1)

Average Punjabi values - Boys (1+ = 8.5; 2+ = 10.3)

Girls (1+ = 7.8; 2+ = 9.6)

Girls (1+ = 7.8; 2+ = 9.6)

group of 2.5-3.0 years. On the whole, the weight of boys and girls of Punjab state in all the age groups were comparable with those of ICMR standards except of boys in the age group of 1.5-2.0 years. Similarly, a number of studies in India viz. Punraj (1992), Hanumantha Rao et al (1994) and Bilasini et al (1997) have reported that weight of preschool children were comparable to Indian standards but were less than those of international standards (NCHS and Harvard). The data (Table 6) further showed that the weight of rural preschool children belonging to different regions of Punjab state as a whole were more than 100 per cent of average Indian and Punjabi children (ICMR 1989). In accordance with the present findings, Hanumantha Rao et al. (1994) found that mean weight of tribal preschool children belonging to three ecological zones of Madhya Pradesh was either comparable or higher than those of regional values. The nutritional status of rural preschool children by anthropometry in selected PHC's of Dharwad Taluka reported lower values of weight than suggested by NCHS. Though gender discrimination was found to be prevailing at all ages, no significant differences were noted in the mean weight of selected preschool children.

CONCLUSION

From the above results, it may be inferred that physical growth (height and weight) of rural preschool children in two regions i.e. sub-mountain and central plains was better than those in south western. On the whole height of rural preschool children of Punjab were comparable to international as well as national standards. The weight of these children were comparable to national standards and compared favourably with international standards during early years but was lower thereafter. Further, the anthropometric measurements of rural preschool children belonging to three agro-climatic regions of Punjab were higher than those of average Indian and Punjabi values. The study concluded the better physical growth (anthropometric profile) of rural preschool children of Punjab than India.

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