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PHYSICAL GROWTH AND PEAK EXPIRATORY FLOW RATES IN RURAL CHILDREN

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ABSTRACT

The study has been carried out on 459 rural school children within 5-15 years age range in Varanasi district (U.P.). The peak Expiratory Flow Rate (PEFR) was measured and correlated with various anthropometric parameters of children. It was found to have high positive correlations with age, height, weight and body surface are (BSA) in children of both sexes. However, the boys were having higher PEFR (about 15-20% more) values, better physical growths and superior respiratory development than girls at all ages. This study further indicated a "male superiority" growth pattern including the lung function abilities in these children.

Key words : *Children, age, height*

Studies relating to lung functions have gained extensive use in health and diseases of human beings. The PEFR including forced vital capacity and forced expiratory volumes are in common use (American Thoraxic Society, 1987) for assessing various lunch function disorders in subjects of various age groups. The factors like age, sex, height, usual habitat, ethnic and racial variations, locality and environment have been shown (Tanner, 1962 and Primhak, 1984) to influence the PEFR and other lung functions indices widely. The present investigation was therefore undertaken to record data on PEFR of children and adolescents (5-15 year) hailing from a low socio-economic background in a particular locality. It was also further aimed at studying the influence of a rapid and rising growth stage (5-15 years) with all expected irregularities and fluctuations on the PEFR of those children.

MATERIALS AND METHODS

The study has been conducted on 459 rural school children (318 boys and 141 girls) within 5-15 years age range in Varanasi district (UP) (Table-1). All the children were hailing from a low socio-economic background and the school medical record showed no chronic health ailments or any airway disorders with any of the children. The PEFR of children were measured with the help of a Wrights Peak Flow Meter – an instrument widely accepted for its easy handling and simple operations in assessing the capacities of lung functions.

Before the test was carried out, the purpose and techniques of measurements were explained and demonstrated to the children and they were asked to take deep breath and then exhale through the mouth piece. The children were also encouraged to develop a spirit of contest to breathe through the mouth piece. The process was repeated for three times and the highest of the three recordings was accepted as the test reading.

Then the weights and heights of the children were taken carefully to secure maximum accuracy in measurements. The body surface area (BSA) was calculated using the nomogram based on Du Bois formula and statistical analysis was made to see the correlation of age, weight, height, BSA etc. with the PEFR of children.

RESULTS AND DISCUSSION

The results are given in Tables-1 and 2. The overall PEFR in children were significantly increasing with age ($P < 0.001$) and the boys were having 15-20% higher values of PEFR than girls at all ages. There was a high correlations of PEFR with the standing (boys 0.99 and girls 0.97) and sitting height (boys 0.96 and girls 0.97) of children at different ages (Table 1). The PEFR values are positively influenced by higher muscle and bone growth and adversely affected by fat growth in the body (Primhak. 1984). On the other hand, the muscle and the bone growths are superior in boys and the fat growth in girls at different ages. The present study showing the

Table-1 : General physical characteristics and correlation with PEFR of children.

Sl. No.	Total No. Female (F) Male (M)		Age (Years)	Weight mean	(kgs) ± S.D.	Height mean	(Cm) ± S.D.	Sitting (SH) mean	Height (Cms) ± S.D.	BSA (m^2) mean	± S.D.	Overall PEFR (1/min) mean	± S.D.
1	F	19	(5-6)	15.35	2.57	103.25	8.13	53.56	3.48	0.66	0.02	80.00	25.27
	M	29		15.35	2.00	105.37	6.16	54.55	2.36	0.68	0.02	91.43	37.02
2	F	14	(6-7)	15.29	2.77	106.38	7.37	55.07	3.45	0.68	0.03	99.09	26.61
	M	26		14.82	2.17	103.52	6.85	54.63	2.72	0.60	0.01	91.25	31.30
3	F	16	(7-8)	17.95	1.65	115.00	3.48	59.09	2.17	0.78	0.03	119.09	26.25
	M	32		16.32	2.52	110.50	7.79	57.07	3.59	0.72	0.04	143.33	21.87
4	F	17	(8-9)	19.00	3.10	116.14	8.67	59.85	3.37	0.78	0.02	152.50	21.44
	M	30		17.60	5.58	115.65	13.49	58.76	4.35	0.76	0.01	167.20	24.72
5	F	10	(9-10)	20.80	2.74	118.60	9.74	59.10	4.81	0.84	0.01	126.00	33.02
	M	39		19.42	3.05	114.52	9.22	57.50	4.51	4.51	0.78	180.28	45.50
6	F	13	(10-11)	19.82	2.24	120.21	7.29	59.92	2.96	0.82	0.04	172.31	45.15
	M	35		20.98	2.67	120.73	7.04	60.09	3.17	0.84	0.01	207.14	46.80
7	F	13	(11-12)	21.26	2.88	125.71	7.89	61.35	3.66	0.88	0.03	199.23	42.91
	M	27		22.73	2.87	126.21	8.02	61.64	3.79	0.90	0.01	220.24	49.04
8	F	18	(12-13	23.78	3.39	126.14	7.86	61.80	3.28	0.92	0.03	177.78	53.51
	M	29		25.89	3.29	131.47	7.24	64.29	3.22	0.98	0.01	245.52	36.72
9	F	13	(13-14)	24.66	3.00	130.56	5.93	63.13	2.71	0.96	0.05	225.38	49.60
	M	32		25.34	3.43	132.93	6.80	64.19	3.34	1.00	1.01	275.63	48.19
10	F	9	(14-15)	29.50	4.03	138.20	4.85	64.80	2.60	1.08	0.05	257.78	41.16
	M	38		29.53	4.09	139.25	7.07	66.82	3.60	1.08	0.04	317.37	59.57
Total (F+M) = 543 (141+318)													
Correlation value(r)			F	0.95	0.96	0.97	0.97	0.60					
			M	0.99	0.97	0.99	0.97	0.98					

Table-2 : PEFR value (1/min) per unit of the anthropometric parameters.

Sl. No.	Total No. Female (F) Male (M)		Age (Years)	PEFR body mean	Per kg weight ± S.D.	PEFR of height mean	Per cm height ± S.D.	PEFR of SH mean	Per cm ± S.D.	PEFR of BSA mean	Per m^2 ± S.D.
1	F	19	(5-6)	5.21	0.53	0.77	0.05	1.49	0.12	121.21	23.46
	M	29		5.96	0.30	0.87	0.06	4.68	0.18	1.4.46	27.35
2	F	14	(6-7)	6.48	0.48	0.93	0.05	1.79	0.16	145.72	26.66
	M	26		6.16	0.32	0.88	0.06	1.67	0.14	152.08	30.02
3	F	16	(7-8)	6.63	0.55	1.04	0.05	2.02	0.15	152.68	31.44
	M	32		8.78	0.32	1.29	0.06	2.51	0.17	199.07	41.19
4	F	17	(8-9)	8.08	0.37	1.31	0.08	2.55	0.14	195.51	40.36
	M	30		9.50	0.36	1.45	0.07	2.85	0.16	220.00	46.38
5	F	10	(9-10)	6.06	0.47	1.06	0.08	2.13	0.17	150.00	23.64
	M	39		9.28	0.33	1.57	0.06	3.14	0.18	231.13	48.79
6	F	13	(10-11)	8.69	0.44	1.43	0.07	2.89	0.13	210.13	49.04
	M	35		9.87	0.22	1.72	0.08	3.45	0.18	246.59	36.96
7	F	13	(11-12)	9.37	0.26	1.58	0.06	3.25	0.18	266.39	45.60
	M	27		9.71	0.27	1.75	0.07	3.58	0.17	245.27	36.60
8	F	18	(12-13	7.48	0.27	1.41	0.05	2.88	0.16	193.24	39.57
	M	29		9.48	0.26	1.87	0.06	3.82	0.17	250.33	41.78
9	F	13	(13-14)	9.13	0.28	1.73	0.06	3.57	1.05	234.77	44.19
	M	32		10.88	0.29	2.07	0.08	4.26	0.19	275.63	52.25
10	F	9	(14-15)	8.74	0.31	1.87	0.06	3.98	0.19	238.69	36.60
	M	38		10.73	0.35	2.28	0.09	4.75	0.19	293.86	43.94
Total = 459 (M : 318 F : 141)											

higher PEFR-values in boys was indicative of the male-superiority growth pattern including the bone and muscle growth in comparison to the girls. Then the PEFR values per unit of standing and sitting height when considered (Table 2) showed higher values for the sitting height which might be possible due to superior growth in trunk length leading to better lung functions. Report arc also available (Tanner. 1962) describing the increase in height of children and adolescents because of the increase in trunk length.

The PEFR values of children were compared with the age and sex matched samples of other places (Malik and Jindal. 1985). Our children were found to have lower PEFR-values including general physical growth and body composition. Their lower socio-economic background having low level of nutrition, physical activities and poor respiratory developments might be crucial factors affecting the PEFR values of present children in comparison to those in other places. Again, the socio-cultural factors restricting the physical activities of girls in such a social set up reflected the further lower values of PEFR in girls in comparison to the boys in different ages.

In conclusion, better physical growth and increased respiratory fitness, were largely reflected through systematic physical activities in the form of various games and sports, exercise and balanced nutrition in children and adolescents. Hence these components should be emphasized for improving the overall PEFR of our children. Besides, measurements of PEFR at regular intervals arc also suggested to assess the improvements of respiratory fitness in growing children and adolescents.

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