Physical Growth of Punjabi Girls in Government and Public Schools in Punjab

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Abstract

The present study has been conducted with the objective of finding out the growth differential between the girls studying in government and public schools so as to highlight the biological disparity resulting from a diverse socio-economic scenario obtaining in the state of Punjab. Data on 790 school girls ranging in age from 11-15 years and inhabiting the cities of Kotkapura and Mohali, Punjab, were collected separately from Government and Private/Public Schools during the month of January, 2006. It must be mentioned here that the Government Schools provide practically free education as the fee structure is very nominal. Every child was measured for height, body weight, upper arm circumference, biacromial and bicristal diameter and biceps and triceps skinfold employing the techniques of *Lohman et al. (1988).*The girls studying in government schools have significantly smaller values of height, weight, mid arm circumference, diameters and skinfolds than their peer studying in public schools. The average annualized deficit in the growth of height and weight of public and government school girls is around 5.9cm and 6.9 kg, respectively. To transform this backlog in years, it would amount to around one and a half year in height and 2.4 years in weight. Not only are the public school girls significantly taller and heavier than the government school girls but they have also significantly larger values of BMI. The larger values of Body Mass index in public school girls indicates that they are relatively greater in body weight than the government schools when the height is kept constant. The finding of the present study indicates the role of social diversity on the biological outcome of the children.

Key Words: Public School, Government School, Punjabi, Weight, Height, Growth

Introduction

It is a widely known fact that the unfavorable environments of the third world hamper the growth and development of children. The developmental strategies bring in improvements in the living standards of the people along with an overall improvement in nutrition and these situations are helpful in the optimal physical growth of children throughout the globe. Malnutrition is a double-edged sword having one side of under nutrition resulting in stunted growth and the other the over nutrition leading to obesity and overweight *(Singh 2002). Alderman et al. (2006)* found from his studies that malnutrition emerges from poverty and it shows strong associations with an inadequate diet, poor health and sanitation services and inadequate care for young children. Thus in order to play down the effect of malnutrition, two pronged strategy of income growth and nutrition interventions is required. The regional variations in physical growth of children arise not only due to the geographical characteristics but also due to the marginal resource availability in many areas of the world *(Eveleth and Tanner 1990)*.

Eiben and Mascie-Taylor (2004) reported the effect of family size on physical growth of children from the Hungarian National Growth Study on 39,035 children and youth aged 3–18 years and found that children where the family members are numerous are shorter, have lower body mass with smaller

skinfold thicknesses. The paternal age, mother's profession and birth order did not elicit any associations with body measurements in both sexes. Major historical calamities also seem to play a significant role on the growth of children as these wipe away the resources to levels not able to sustain the proper growth of children, even the survival seems to be at stake sometimes. Annual regional time series analysis of height in Japan worked out by *Bassino (2006)* shows the emergence of provincial and group similarity in heights of its populace before the First World War. That is a reflection of convergence of biological welfare. But after the war, heights started showing divergence indicating biological inequality. This is a clear indication of the dark side of the war widening the gap between haves and have-nots. The children living in the outskirts of Ankara (Turkey) have recorded lower growth performance than those of the mid-town *(Gultekin et al. 2006).* The main reason for this growth differential between these two groups of children has been cited as the poor socio-economic status and lower standard of the people living in the outskirts of Ankara. The bodily growth differences amongst 22 groups of small-scale societies (cross-sectional height and weight velocity) have been reported by *Walker et al. (2006).* Substantial differences are reported among hunter-gatherers vis-à-vis groups thriving more on horticulture. The societies living under more favorable conditions exhibit better growth with advanced puberty. But, this faster maturation in females is associated with higher and earlier mortality. According to *Walker et al. (2006)* the higher mortality might be putting selective pressures for faster growth and earlier maturation in these societies so that the reproductive process and lineage may not be affected.

Singh et al. (1987) conducted a study on government and public schoolchildren in Patiala and came to a conclusion that the government school children were retarded in physical growth than their public school peer. Weight-for-age, height-for-age, weight-for-height, mid arm circumference and triceps skinfold have been used as indicators for judging the level of malnutrition in various populations of Punjab by many authors showing variations in the frequency of malnourished children obtained by them *(Singh et al. 2003, 2005, Kaur 2005).* According to all these studies, the general population has some proportion of children who are stunted or wasted. Another study by *Singh et al. (2001)* based on 6653 children brings about differences in physical growth of urban and rural children besides commenting on other factors and providing growth standards.

On the other hand, modernization is bringing in rapid changes in the living style of the people and the children are becoming obese and overweight. The adolescent girls of Tonga have been found to be obese to the tune of around 20% of the total sample (Fukuyama et al. 2005). The BMI in case of girls in Tonga showed a positive correlation with fat mass indicating that the higher BMI is actually due to the higher fat mass. Contrary to the girls, the boys did not show any correlation of their BMI with fat mass which showed that their higher BMI may not be due to excessive fat mass. Thus the girls in this study are more prone to adolescent obesity than the boys. In Punjab also, the affluent schoolchildren are becoming overweight and obese. *Sidhu et al. (2006)* found that 12.24% of

boys and 14.31% of girls were overweight, whereas 5.92% boys and 6.27% girls were designated as obese. This situation of overweight and obesity in Punjab is alarming and seems to be as high or higher as in some of the developed countries.

The region of Punjab is fast undergoing change in its landscape, occupation and industrialization. The overall standard of living of its population has improved a lot. It is important to put on record the changes occurring in physical growth of these children over a period of time and repeat them. The present study has been conducted with the objective of finding out the growth differential between the girls studying in government and public schools so as to highlight the biological disparity resulting from a diverse socio-economic scenario obtaining in the state of Punjab.

Materials and Methods

Data on 790 school girls ranging in age from 11-15 years and inhabiting the cities of Kotkapura and Mohali, Punjab, were collected separately from government and private/public schools during the month of January, 2006. It must be mentioned here that the government schools provide practically free education as the fee structure is very nominal. Moreover, it is also alleged that the level of education in these schools is very dismal. Therefore it is by compulsion of economic factors that the parents send their wards to government schools. On the other hand, public schools charge very heavy fees as compared to government schools and thus cater to the needs of upper and upper middle strata of the society. Thus the type of school attended by the child is a good way of making a distinction between the different social strata. Every child was measured for height, body weight, upper arm circumference, biacromial and bicristal diameter and biceps and triceps skinfold employing the techniques of *Lohman et al. (1988).*

Results

Table 1. Height (cm) of Government and public school girls of Punjab

Age (yr)	Private School			Government School			D	t
	Mean	SD	SEM	Mean	SD	SEM		
11	143.26	7.96	0.93	136.87	8.07	1.24	6.39	4.12*
12	147.43	7.12	0.62	142.41	8.75	1.15	5.02	3.86*
13	150.24	6.89	0.63	145.26	7.06	1.02	4.98	4.15*
14	154.19	5.49	0.50	149.03	5.28	0.75	5.16	5.74*
15	159.19	4.89	0.49	151.22	4.63	0.69	7.96	4.67*

*$p < 0.05$

Table 2. Body weight (kg) of Government and public school girls of Punjab

Age (yr)	Private School			Government School			D	t
	Mean	SD	SEM	Mean	SD	SEM		
11	35.13	7.29	0.85	28.71	6.27	0.97	6.42	4.98*
12	39.57	9.21	0.79	31.26	5.78	0.76	8.31	7.58*
13	40.80	9.70	0.88	34.43	7.00	1.01	6.37	4.75*
14	44.68	9.68	0.87	38.52	6.94	0.98	6.16	4.70*
15	45.19	8.38	0.84	38.03	5.48	0.83	7.16	6.06*

*$p < 0.05$

The height of girls studying in private/public schools is significantly greater than those of government schools from age 11 to 15 years. Body weight of the government school girls is also significantly lower than that of the public school girls from 11 to 15 years (Table 2). In the case of upper arm circumference and skinfold at biceps the public school girls have shown significantly greater thickness than those of the government school girls (Tables 3, 4, 5).The biacromial and bicristal diameters are also significantly bigger in the case of public school girls as compared to the government school girls (Tables 6, 7).

Table 3. Upper arm circumference (cm) of government and public school girls of Punjab

Age	Private School			Government School				t-
(yr)	Mean	SD	SEM	Mean	SD	SEM	D	value
11	20.00	2.82	0.33	17.82	2.40	0.37	2.18	4.40*
12	20.78	3.32	0.29	18.20	1.86	0.24	2.58	6.86*
13	21.04	3.13	0.29	19.26	2.75	0.39	1.78	3.66*
14	22.19	3.02	0.27	20.21	2.50	0.35	1.98	4.50*
15	22.46	2.88	0.28	19.98	1.79	0.26	2.48	6.49*

*p<0.05

Table 4. Biceps skinfold (mm) of Government and public school girls of Punjab

Age	Private School			Government School				t -
(yr)	Mean	SD	SEM	Mean	SD	SEM	D	value
11	8.88	2.79	0.33	6.85	1.91	0.29	2.03	4.62*
12	9.82	3.19	0.28	7.55	2.54	0.33	2.27	5.26*
13	9.53	3.21	0.25	7.64	2.65	0.38	1.89	4.15*
14	10.32	3.00	0.28	8.16	2.85	0.40	2.16	4.43*
15	10.14	2.85	0.29	7.61	2.34	0.35	2.53	5.56*

*p<0.05

Table 5. Triceps skinfold (mm) of Government and public school girls of Punjab

Age	Private School			Government School				t -
(yr)	Mean	SD	SEM	Mean	SD	SEM	D	value
11	14.93	4.58	0.54	13.56	3.56	0.55	1.37	1.78
12	17.13	5.31	0.46	15.52	4.23	0.56	1.61	2.22*
13	16.22	5.20	0.47	15.56	3.92	0.57	0.66	0.89
14	16.40	4.53	0.41	17.54	5.18	0.73	1.14	1.36
15	15.95	4.58	0.46	16.53	4.19	0.63	0.58	0.74

*p<0.05

Table 6. Biacromial diameter (cm) of Government and public school girls of Punjab

Age	Private School			Government School				t -
(yr)	Mean	SD	SEM	Mean	SD	SEM	D	value
11	30.06	2.12	0.25	28.16	2.05	0.32	1.90	4.68*
12	30.98	2.25	0.19	28.86	1.90	0.25	2.12	6.75*
13	31.33	2.18	0.19	29.44	1.92	0.28	1.89	5.59*
14	31.98	2.08	0.18	31.09	1.97	0.28	0.89	2.68*
15	32.13	1.94	0.19	31.15	1.99	0.29	0.98	2.88*

*p<0.05

Not only are the public school girls significantly taller and heavier than the government school girls but they have also significantly larger values of BMI (Table 8). The larger values of Body Mass index in public school girls indicates that they are relatively greater in body weight than the government school girls when the height is kept constant.

Table 7. Bicristal diameter (cm) of Government and public school girls of Punjab

Age (yr)	Private School			Government School			D	t - value
	Mean	SD	SEM	Mean	SD	SEM		
11	26.02	2.39	0.28	25.40	1.79	0.28	0.62	1.57
12	26.99	2.24	0.19	25.95	1.77	0.23	1.04	3.47*
13	27.50	2.35	0.22	26.17	1.50	0.21	1.33	4.37*
14	28.43	1.98	0.18	27.64	1.72	0.24	0.79	2.63*
15	28.77	1.84	0.18	27.68	1.53	0.23	1.09	3.89*

*p<0.05

Table 8. Body Mass Index (BMI) of Government and public school girls of Punjab

Age	Private school			Government School			D	t -
(yr)	Mean	SD	SEM	Mean	SD	SEM		value
11	17.05	2.84	0.33	15.25	2.66	0.46	1.80	3.18*
12	18.06	3.33	0.29	15.35	2.13	0.28	2.71	6.72*
13	17.98	3.67	0.33	16.26	2.88	0.42	1.72	3.22*
14	18.73	3.66	0.33	17.29	2.68	0.38	1.44	2.86*
15	18.76	3.31	0.33	16.6	2.05	0.31	2.16	4.78*

*p<0.05

Discussion

The children of the present investigation studying in government schools have significantly smaller values of height, weight, mid arm circumference, diameters and skinfolds than their peer studying in public schools. The average annualized growth rate in height of girls of the present study in public schools is around 4 cm/yr during 11 to 15 years. The average annualized deficit in the growth of height between public and government school girls is around 5.9cm/yr. To transform this backlog in years, it would amount to around one and a half year. It means that the 15 year old girls studying in government schools are roughly comparable in height to 13.5 year old girls of public schools. The average deficit in the growth of weight between the government and the public school girls of

11 to 15 years is around 6.9 kg. Considering an annual increment in body weight of 2.5 kg per year of public school girls during this period, the government school girls seem to be lagging behind by as much as 2.4 years. Transforming this growth lag it may be projected that the 15 year old government school girls are comparable in body weight to 12.6 year old public school girls. In other words, the children whose parents are unable to afford them better and costly education suffer from growth retardation. Actually the type of school attended by the child in Punjab also is a reflection of the socio-economic status of the parents because of the very high range of fee charged by them. Hence these differentials in physical growth of children can be kept at par with those emanating from socio-economic differences. Compared to these differences in the Indian settings which are very large, the results on the effect of social class from Britain indicate that the seven-year old boys from the managerial classes and the unskilled workers were different only by a margin of 3.3 cm *(Goldstein 1971).*

A comparison of difference in height between the government school and the public school girls of the present study and those investigated during 1973 by *Singh et al. (1987)* reveals that the difference was 10.7 cm during the year 1973 whereas it is 5.9 cm in the present study. These figures point towards the secular changes taking place in this region over a period of three decades. The lower social class people at present who are sending their wards to government schools may also be enjoying better health care, sanitation and quality of life which were not available some three decades back to the similarly placed people. While there seems to be greater stresses on the growth of children then, the situation seems to have eased out a little now. However, still the existence of difference in height between the higher and lower strata reveals that the backlog in growth exists but only the magnitude of it has become a little smaller.

Almost all over the world over, the higher social class children perform much better than their lower class peer *(Goldstein 1971, Hauspie et al. 1980, Rona 1981, Bogin 1988, Macintyre 1988, Walker et al. 1988, Eveleth and Tanner 1990, Kuh et al. 1991, Gulliford et al. 1991, Ulijaszek et al. 1998).* Studies on north Indian children by *Sharma and Kaul (1970)* and *Singh et al. (1987)* also found that the growth lag in lower social class children is very substantial which may run into a year's growth or longer. The finding of the present study indicates the role of social diversity on the biological variation in the growth of the children.

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