A study of prevalence of overweight and underweight among girls from different socioeconomic status in Ludhiana (Punjab)

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Abstract: The present study was conducted to assess the prevalence of overweight and underweight amongst girls of age group 10 to16 years studying in private (high income group) and government(low income group) schools of Ludhiana (Punjab) during mid 2007. A total sample of 1,049 children (514 from private schools and 535 from government schools) were covered in the present study. These children were anthropometrically assessed and statistically analyzed for body measurements. Overweight and underweight were assessed with Body Mass Index (BMI) utilizing age and sex specific cut off points. According to NCHS criteria the overall prevalence of underweight, overweight and obesity was found as 7.58%, 26.84% and 9.33% in private school girls and 24.85%, 5.42% and 1.68% in government school students respectively. According to WHO criteria the percentage of underweight, overweight and obesity was found as 6.42%, 28.59% and 7.78% in private school girls and 23.17%, 5.42 %and 0.93% in government school girls. A positive correlation of parental BMI was found on BMI of children suggesting that overweight parents are likely to have overweight children. This study finds that there is a double burden of underweight and overweight in this population.

INTRODUCTION:

Heredity and environment have a combined influence on physical growth. In general, children living under better socio-economic conditions have consistently exceeded in growth and maturation than their counterparts living under worse conditions. Actually the genetic endowment can better manifest themselves under better environmental circumstances (Eiben and Masie-Taylor,2004;Eveleth and Tanner,1990). A compilation of studies around the world has unquestionably demonstrated the effect of social stratification on child growth where the children of higher social class out perform the children of lower classes in physical growth. A comparative

study on variation of height among boys aged 7.5 yrs. from different populations of 12 countries of low and high socioeconomic background found a larger variation according to difference in socioeconomic status within the population (Eveleth and Tanner, 1990). Studies based on growth performance and malnutrition of government school children and preschool children in India also support the positive effect of socioeconomic background on the growth of children (Singh et al.,1987; Singh, 2002; Kaur and Singh, 2003; Singh et al., 2003 and Kaur et al., 2005, Kaur et al. 2009). The economic transition has changed the lifestyle and resulted in double burden of obesity and under nutrition in developing countries (Bovet et al., 2006). The WHO in 1998 designated obesity as a global epidemic. India is also facing the epidemic of obesity and its associated diseases especially in children and adolescents (Fall and Barker, 1997). NFHS (National Family Health Survey) data reveals that problem of obesity is substantial in the adult population residing in urban areas with high standard of living, where 25% were found to have a BMI > 25 and 6-7% had BMI > 30 (NFHS-2000). Results from the 2003-2004 National Health and Nutrition Examination Survey (NHANES), indicate that an estimated 17 percent of children and adolescents aged 2-19 years are overweight. According to two studies conducted by Ogden et al. (2008), obesity prevalence among children and adolescents showed no significant changes between 2003—2004 and 2005—2006. Based on the study, in the combined years of 2003—2006, 16.3% of children and adolescents aged 2–19 years were obese, at or above the 95th percentile of the 2000 BMI-for-age growth charts. In most developed countries the prevalence of obesity has increased in children among minorities and low socioeconomic groups. A study by Wang (2001) on prevalence of obesity across nations concluded that relationship between obesity and socioeconomic status varies across countries. Higher socioeconomic status subjects were more likely to be obese in China and Russia, but in the U.S.A , low socioeconomic groups were at higher risk. In our country also, children hailing from higher socioeconomic strata are likely to be heavier, and possess larger skinfold thickness along with higher BMI (Kaur et al. 2008; Kaur et al., 2009a, 2009b).

Though more studies are needed to understand the precise prevalence of overweight in India, school based data demonstrates an increasing trend of obesity range. According to a large survey on middle to high income school children in Delhi (Kapil et al., 2002) about 30% of adolescents were found to be over weight (adult BMI analogue of 25) as per the International obesity task force criteria. A study on affluent school children in Amritsar, Punjab concluded that

overweight in affluent children was higher or as high as in some developed countries (Sidhu et al., 2006). Another study conducted on affluent adolescent girls of Bengal (9-18 years) found 13.1 % and 4.3% girls overweight and obese respectively (Sood et al. 2007) .The nutritional status of adolescent girls, the future mothers, contributes significantly to the nutritional status of the community. Health and nutritional status as a child influence the future life of these adolescent girls.

Two large longitudinal studies from England (Power and Moynihan,1998 & Wang, 2001) on childhood obesity predicted the development of obesity in adult life. There is a very limited data from this region of India regarding this malady; hence the present study was carried out in the city of Ludhiana in Punjab. Ludhiana is one of the fastest growing cities of north India. Rapid growth of industry and trade has increased the per capita income of the citizens translating into higher levels of disposable income in the hands of high and middle income groups where as the lower income group is still struggling hard for better nutrition. Also known as the 'Manchester of India', this industrial city has seen a paradigm shift in the lifestyle and eating habits of its populace especially children and youth in the last decade or so. This change has unfolded an era of easy availability and affordability of high calorie junk food and ever decreasing physical activity. Though rich materially, there is a mental block in the minds of people regarding preference of children as evidenced by decreasing ratio of girls as compared to boys in this region.

Therefore present study was planned to study prevalence of underweight, overweight and obesity among 10-16 year old girls studying in private and government schools of Ludhiana and to analyze correlation of parental BMI and children's BMI.

MATERIAL AND METHODS:

The present cross sectional study was conducted on 1049 girl students, aged 10-16 years from private and government schools of Ludhiana city in Punjab state of India during mid 2007 and divided into seven groups. A total data of 514 girls were collected from two prestigious public schools of Ludhiana with higher fee structure. Rest of the data (535 girl students) was collected from government schools of the same city. Each child's assessment for height and weight measurements was conducted to calculate BMI using the formula weight (kg)/height (metre)^2. All the measurements were recorded utilizing the standard equipments and methodology (Weiner and Lourie, 1969). The mean values of the variables of both the groups were compared and significance of the differences was determined. The prevalence of underweight, overweight and

obesity was determined by using NCHS and WHO criteria. Correlation between BMI of parents and their children was also established.

RESULTS AND DISCUSSION:

Table 1 shows the mean, standard deviation, standard error of mean, actual difference between the body weight of two groups and 't' value of weight of each age group. The weight of private school girls is significantly higher at all ages where maximum difference is found at 13 years of age.

Table 1 Comparison of weight (Kg) of girls studying in private and government schools

	WEIGHT (kg)									
Age Group (Years)	PRIVATE				GOVERNMENT				D	t-value
	N	Mean	SD	SEM	N	Mean	SD	SEM		
10	91	34.08	7.60	0.80	65	24.14	4.68	0.58	9.94	9.35*
11	66	38.55	8.62	1.06	75	29.19	8.81	1.02	9.35	6.36*
12	66	45.33	8.19	1.01	82	32.54	6.87	0.76	12.79	10.33*
13	72	50.88	11.05	1.30	100	37.47	8.15	0.82	13.41	9.16*
14	65	49.81	10.68	1.32	74	41.27	10.17	1.18	8.54	4.83*
15	70	54.01	11.20	1.34	74	42.80	7.53	0.88	11.21	7.09*
16	71	51.68	11.14	1.32	65	44.99	7.06	0.88	6.69	4.14*

* p< 0.001   D actual difference

This could be because the girls of private girls are expected to be from affluent family background and hence experience the adolescent growth spurt earlier than their counterparts from less privileged family background. These results are in accordance with many studies conducted in India (Kaur et al., 2008; Chhatwal et al., 2004; Ji and Sun, 2006; Ramachandran et al.,2002).This difference reflects the effect of greater access of comforts and rich food on the body measurements of children of higher socioeconomic status.

Table 2: Prevalence of overweight and obesity in private and government school girls according to NCHS (BMI for age Z- scores) reference standards

AGE IN YEARS	TYPE OF SCHOOL	TOTAL NO.	OVERWEIGHT		OBESITY	
			N	%	N	%
10	PRIVATE	91	24	26.37	10	10.98
	GOVT	65	1	1.53	0	0
11	PRIVATE	79	16	20.25	5	6.32
	GOVT	75	4	5.33	3	4
12	PRIVATE	66	24	36.36	5	7.57
	GOVT	82	2	2.43	1	1.21
13	PRIVATE	72	21	29.16	12	16.66
	GOVT	100	7	7	0	0
14	PRIVATE	65	18	27.69	7	10.76
	GOVT	74	9	12.16	4	5.04
15	PRIVATE	70	22	31.42	2	4.28
	GOVT	74	5	6.75	1	1.35
16	PRIVATE	71	13	18.3	7	9.85
	GOVT	65	1	1.53	0	0
TOTAL	PRIVATE	514	138	26.84	48	9.33
	GOVT	535	29	5.42	9	1.68

Table 2 shows the prevalence of overweight and obesity in girls of private and government schools. The girls of private schools are significantly heavier than those of government schools at all the age groups studied. According to NCHS criteria the overall prevalence of overweight and obesity was found to be 26.84% and 9.33% in private school girls and 5.42% and 1.68% in government school students respectively. According to WHO criteria the %age of overweight and obesity was found as 28.59 % and 7.78% in private school girls and 5.42 % and 0.93% in government school girls.
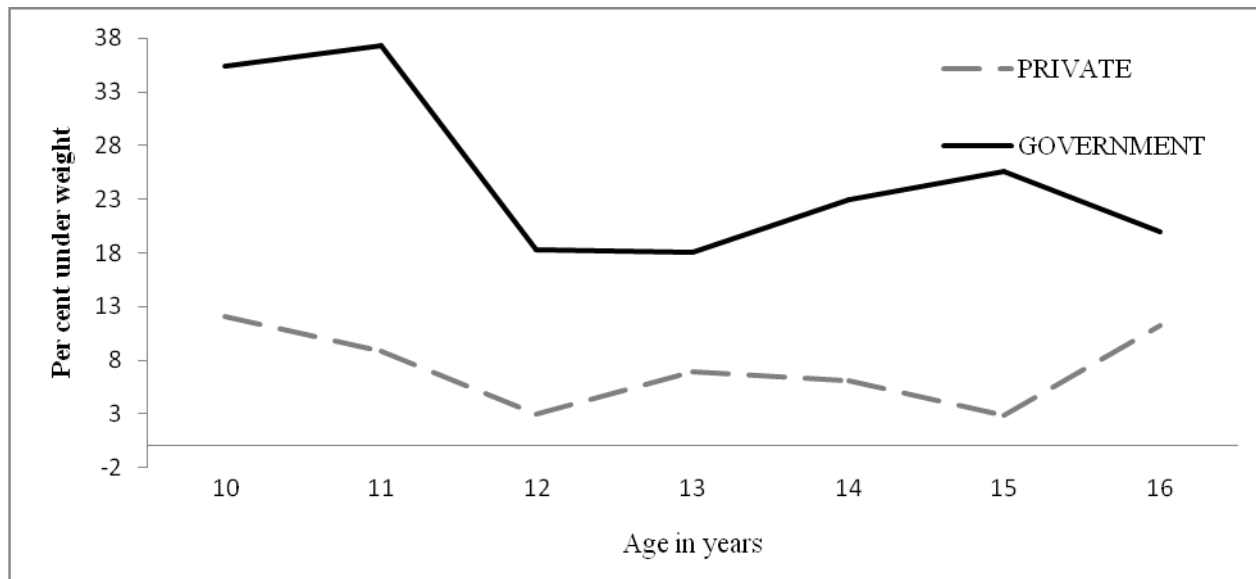
Figure 1 Prevalence of underweight in private and government school girls according to NCHS reference standards

In the private schools, maximum over weight were found in 12 year old girls and obesity was found to be highest in 13 year old girls. In the group of government school girls, maximum overweight and obesity was found in 14 year old girls according to both NCHS and WHO standards. Many studies conducted in developing countries have shown similar results. In a recent study Kaur et al. (2008) studied 5-18 years children of different socioeconomic groups in Delhi and found 13.1% children overweight and 9.3% obese from higher socioeconomic status suggesting the possible role of change in the dietary pattern and physical activities with increase in income level. Similar results were found by Chhatwal et al.(2004), Sharma et al.(2007) and Ramachandran et al.(2002). Hence, the comparative data clearly delineates that obesity is an increasing malady of affluent populations.

Parental obesity is considered an important risk factor for obesity in children which imposes a combined effect of genes and numerous environmental factors operative in the families deciding the living style, eating habits, food preferences and attitudes (Fisher and Birch, 1995). In this study a significant positive relation was found between the BMI of parents and children (Table 3). Similar studies have found that children with two obese parents are more prone to be obese when compared with those with one obese parent who in turn were more

obesity prone than children with non obese parents (Maffeis et al., 1994; Lake et al., 1997) and have predicted future obesity in children (Whitaker et al., 1997). These results are in uniformity with many studies conducted in our country and around the world (Mo-Suwan et al., 2000; Maffeis et al., 2000; Bhandari et al., 2002; Bralic et al., 2005; Sangha et al., 2006; Kosti et al., 2008; Patel et al., 2011).

Table 3: Correlation between parental BMI and child's BMI

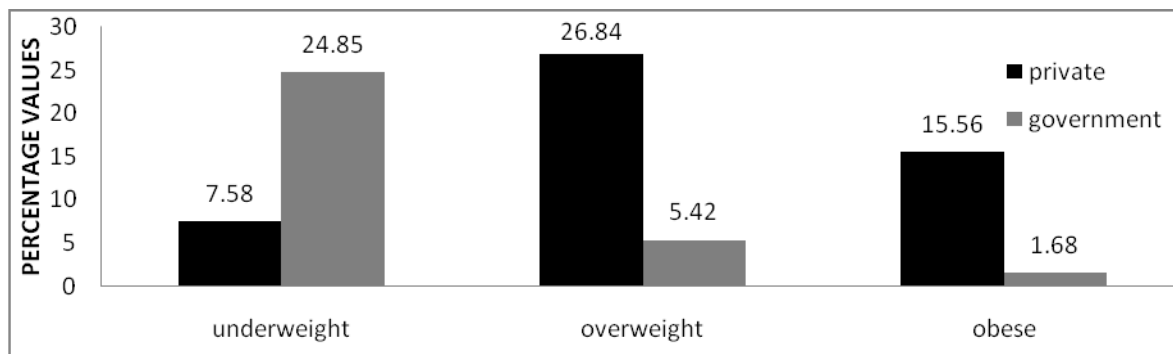| Age Group (Years)	Government school girls with parents	Private school girls with parents
10	--	0.52*
11	--	0.28*
12	--	-0.03
13	0.42*	0.29*
14	0.42*	0.23*
15	0.81*	0.41*
16	0.34*	0.34*

* $p < 0.05$

Figure 2: Prevalence of underweight, overweight and obesity in private and government school girls (NCHS criteria).

Hence, the present study has highlighted that overweight and obesity is an emerging health problem in adolescent children belonging to affluent families in Ludhiana.

CONCLUSIONS AND RECOMMENDATIONS:

The present study has highlighted the prevalence of both, underweight and obesity in adolescent children from different socioeconomic backgrounds in Ludhiana. The prevalence of overweight and obesity in the private school girls appears to be the result of over nutrition and incorrect life style of these girls. The need of the hour is urgent educative measures to spread awareness at community level and effective policy measures at government level to rid the children of this region from the ill effects of under nutrition on one hand and over nutrition on the other.

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