 J. Hum. Ecol., 15(3): 179-182 (2004)

Childhood Obesity Among Punjabi Children in Relation to Physical Activity and Their Blood Profile

Amandeep Kaur Pandher, Jasvinder Sangha and Paramjit Chawla

INTRODUCTION

The prevalence of childhood obesity has been increasing during the last three decades and child obesity accounts for nearly 30 per cent of all adult obesity (Golan et al., 1998). Obesity occurs when a positive balance develops between the energy intake and expenditure. Obese children spend less time in physical activity, more time in sedentary activities and rest (Maffeis et al.,1996). Higher amounts of physical activity have the potential to protect against obesity through the maintenance of energy balance and thus prevention of accumulation of excess adipose tissue (Warden and Warden, 1997). Obesity is greater among children and adolescents who frequently watched television, not only because little energy was expended while viewing TV but also because of concurrent consumption of high calorie snacks. (Obarzanek et al.,1994; Popkin et al., 2001). There is a strong relation of obesity to higher BP and fasting insulin and lipid concen-trations in children and young adults (Chu et al.,1998; Gunnel et al.,1998). Childhood obesity has emerged only recently in India, unlike in the West where it existed since long. Obesity in children us young as two years onwards have been reported from the Indian population (Sharma, 2002). Since there is increase in the trend of childhood obesity the present study was undertaken to assess childhood obesity among Punjabi children in relation to physical activity and their blood profile.

MATERIALS AND METHODS

30 males and 30 females were purposely selected from II, III and IV class studying in three public schools in Ludhiana city based on the criteria of 20 per cent above the normal weight for age. A diary of the physical activity of each sub-ject was recorded. Parents or primary caretakers were asked to classify the usual level of child's physical activity as "sleep hours", "light activity" such as watching TV and playing computer or video games, studying and playing inside etc., "moderate activity" such as walking and playing outside etc. None of the subjects performed "vigorous activity".

Basal metabolic rate (BMR) of the subjects was calculated from the body weight of the subjects. Equation predicting BMR was

for males (22.7 x weight) + 495
for females (22.5 x weight) + 499
(NRC 1989)

According to ICMR expert group for Indians 5 per cent was lowered from the each above equation to predict BMR for the subjects. The total energy expenditure (TEE) of the subjects was calculated to determine the daily requirement (Krause, 1996). By calculating the ratio of TEE to BMR the physical activity level (PAL) of the subjects was determined.

Blood samples of one-third of the subjects were collected after consulting the willingness of the parents of the subjects. Biochemical analysis like serum glucose (Trinder, 1969), total cholesterol and triglycerides (Allian et al., 1974; Eggstien and Kuhimann, 1974), HDL-C (Lopes - Virella 1977), LDC-C and VLDL-C (Friedwald et al., 1972) were performed.

RESULTS AND DISCUSSION

Physical activity was assessed in terms of sleep, light activity and moderate activity (Table 1). The average sleep hours of the male and female subjects were 9.07±0.96 and 9.03±0.84, respectively. The average hours spent in light activity by the male and female subjects were 13.67±1.22 and 13.87±1.02, respectively. This light activity includes TV viewing, playing video or computer games and studying or any other indoor activity etc. The male subjects spent maximum hours (4.31±0.92 h) in TV viewing and playing video or computer games than the female subjects who spent 3.46±0.76h in the above said activity. A significant difference ($P<0.01$) was found in TV viewing and playing video or computer games in the male and female subjects. It was also found that female subjects were more interested in studying or any other indoor activities than the male subjects. A significant difference ($P<0.01$) was observed in

Table 1: Physical activity characteristics of the subjects (mean ± SD)

Particulars	*Male (n=30)*	*Female (n=30)*	*t-value*	*Overall (n=60)*
Sleep Hours	9.07 ± 0.96	9.03 ± 0.84	0.172	9.05 ± 0.90
Light activity	13.67 ± 1.22	13.87 ± 1.02	0.689	13.77 ± 1.13
T.V. viewing , playing video or computer games	4.31 ± 0.92	3.46 ± 0.76	3.091***	3.88 ± 0.83
Studying or any other indoor activity etc.	9.36 ± 1.56	10.41 ± 1.63	2.549***	9.89 ± 1.59
Moderate activity (walking or any other outdoor activity etc.)	1.26 ± 0.51	1.10 ± 0.43	1.149	1.18 ± 0.48

*** Significant at 1% level

Table 2: Total energy expenditure (TEE), basal metabolic rate (BMR), and predicted physical activity level (PAL) of the subjects (mean ± SD)

Parameters	*Male (n=30)*	*Range*	*Female (n=30)*	*Range*	*Overall (n=60)*	*t-value*
TEE (KCal/day)	1512.66±288.19	1122.88-2245.76	1440.82±246.63	1028.72-1910.48	1476.74±270.61	1.04
BMR (KCal/day)	1313.44±147.98	1095.63-1699.45	1312.31±143.49	1072.55-1585.55	1312.68±145.36	0.03
PAL (TEE/BMR)	1.15±0.13	0.95-1.47	1.09±0.10	0.87-1.29	1.12±0.12	2.00**

** Significant at 5% level

studying or any other indoor activities in the male and female subjects. In the present study television viewing and playing video or computer games was associated with obesity in the subjects. The reason was that little energy was expended while viewing TV and playing video or computer games; and a con-current consumption of high calorie snacks was found which lead to obesity in the subjects. The findings of present study are in agreement with the reported literature studies (Obarzanek et al., 1994; Popkin et al., 2001).

The average hours spent in moderate activity like walking or any other outdoor activity by the male and female subjects was 1.26±0.51 and 1.10±0.43 h, respectively. Male subjects spent more hours in moderate activity than the female subjects. Similar finding had been reported by Tanasescu et al., (2000) in their 7-10 y old obese subjects. The average TEE of the male and female subjects was 1512.66 ± 288.19 and 1440.82±246.63, respectively (Table 2). The observed TEE was higher than that reported by Rueda - Maza et al. (1996) in their 8-9 y old obese male subjects (5548±225 kJ/d) and was lower than that reported by DeLany (1998) in their 10-11 years old obese subjects (9.58±1.48 MJ/d). In the present study the inactivity of the female subjects was low as compared to the male subject due to the low intake of iron by the subjects. The average BMR of the male and female subjects was 1313.44 ± 147.98 and 1312.31±143.49 Kcal, respectively. No significant difference was observed in BMR of male and female subjects.

The average PAL of the male and female subjects was 1.15±0.13 and 1.09±0.10, respectively. A significant difference ($P<0.05$) was found in PAL of male and female subjects. In the present study the low activity of female subject as compare to the male subjects might be due to low intake of iron by the female subjects.

The mean SBP of the male and female subject was 99.67±9.12 and 99.00±10.44 mmHg, respectively which is higher than the control subjects that reported by Tanasescu et al. (2000). The mean DBP of the male and female subjects was 70.06±1.26 and 69.67±1.80 mmHg, respectively which is higher than control subjects that reported by Tanasescu et al. (2000) (Table 3).

The average blood glucose of the male and female subjects was 91.73 ±11.68 and 91.33±9.97 mg/dL, respectively (Table 4). In the present study the mean blood glucose of the female subjects was higher than the non obese subjects that reported by Chu et al. (1998), but it

Table 3: Clinical parameters of the subjects (mean ± SD).

Parameters	*Male (n=30)*	*Female (n=30)*	*t-values*
Systolic blood pressure (mmHg)	99.67±9.12	99.00±10.44	0.265
Diastolic blood pressure (mmHg)	70.06±1.26	69.67±1.80	0.972

was lower in case of male subjects. The average total chole-sterol in the male and female subjects was 163.70 ± 21.16 and 149.67 ± 21.29 mg/dL, respectively. The total cholesterol of male subjects was higher than the female subjects. On the contrary Chu et al. (1998) reported that the average total cholesterol of female subjects (4.19 ± 0.68 mmol) was higher than male subjects (4.05±0.75) mmol). In the present study a significant difference (P <0.05) was found in the average total cholesterol in the male and female subjects.

The mean HDL of the male and female subjects was 60.27±8.51 and 77.20±11.32 mg/dL, respectively. This value was higher in females compared to male subjects. The mean HDL of the male and female subjects was higher than that reported by Chu et al. (1998) in their obese male and female subjects (1.18±0.33 and 1.31±0.28 mmol/L, respectively). In the present study a significant difference (P < 0.01) was found in the HDL of male and female subjects. The average LDL of the male and female subjects was 85.90±15.69 and 106.77±10.59 mg/dL, respectively. The average LDL of the male and female subjects was lower than that reported by Chu et al. (1998) in their obese male and female subjects (2.37±0.69 and 2.43±0.59 mmol/L, respectively). In the present study a significant difference (P<0.01) was observed in the LDL of male and female subjects (Table 3).

Table 4: Blood glucose and lipid profile of the subjects (mean ± SD).

Parameters	*Male (n=10)*	*Female (n=10)*	*t-values*
Blood glucose (mg/dL)	91.73±11.68	91.33±9.97	0.143
Total cholesterol (mg/dL)	163.70±21.16	149.67±21.29	2.560**
HDL-C (mg/dL)	60.27±8.51	77.20±11.32	6.548***
LDL-C (mg/dL)	85.90±15.69	106.77±10.59	6.039***
VLDL-C (mg/dL)	25.63±8.72	29.80±10.89	1.637
TG-C (mg/dL)	126.23±45.19	146.83±55.53	1.576

*** Significant at 1% level ** Significant at 5% level

The average VLDL of the male and female subjects was 25.63±8.72 and 29.80±10.89 mg/dL, respectively. No significant difference was found in VLDL of both the sexes. The average TG of the male and female subjects was 126.23 ± 45.19 and 146.83 ± 55.53 mg/dL, respectively. The average TG of the male and female subjects was higher than that reported by Chu et al. (1998) in their obese male and female subjects (1.09±0.55 and 0.99±0.50 mmol/L, respectively) (Table 3).

CONCLUSION

From the present study it has been concluded that the subjects spent less time in physical activity, more in sedentary activities and rest which positively affect the energy balance and leads to accumulation of excess adipose tissue. Moreover excessive television viewing influenced obesity not only through less physical activity but also due to increased opportunity for snacking. The mean HDL-C and TG of the subjects was not comparable to their western obese counter parts but was higher than the normal children.

KEYWORDS Blood Pressure. Children. Lipid Profile. Obesity. Physical Activity.

ABSTRACT The study included 60 subjects comprising equal number of male and female of 7-9 years of age from three public schools in Ludhiana city. The subjects who were 20% above the normal weight for age were selected. A diary of the physical activity of each subject was recorded. A signification difference (P < 0.01) was observed in light activity in male and female subjects. The results indicated that low physical activity level (PAL) leads to overweight or obesity in the subjects. A significant difference (P < 0.05) was found in PAL of male and female subjects. TV viewing was positively and significantly correlated (P < 0.05) with sweets and snacks intakes among male and female subjects. While a positive and negative significant correlation (P < 0.01) was found in soft drink / juice intake and moderate physical activity, respectively of the subjects of both the sexes. Biochemical analysis like glucose and lipid profile were performed by standard methods. Blood pressure of each subject was on higher side. A significant difference was found in total cholesterol (P < 0.05), HDL-C and LDL-C (P < 0.01) of the male and female subjects.

REFERENCES

Allian, C. C., Roon, L. S., Chan, C. S., Richmond, W. and Fu, P. C.: Enzymatic determination of total serum cholesterol. *Clin. Chem.*, **20**: 470 (1974).

Chu, N. F., Rimm, E. B., Wang, D. J., Liou, H. S. and Sheeh, S. M.: Clustering of cardiovascular disease and risk factors among obese school children. *Am. J. Clin. Nutr.*, **67**: 1141-46 (1998).

DeLany, J. P.: Role of energy expenditure in the development of pediatric obesity. *Am. J. Clin. Nutr.*, **68 (Supple)**: 950-5 (2001).

Dietz, W. H. and Gortmaker, S. L.: Do we fatten our children at the television set ? Obesity and television viewing in children and adolescents. *Pediat.*, **75**: 807-12 (1985).

Eggstein, M. and Kuhimann, E.: Enzymatic calorimetric method for estimation of serum/plasma triglycerides (Original not

seen. In: *Methods of Enzymatic Analysis*. H.N. Bergmeyer (Ed.). Academic Press, New York (1974).

Friedwald, W. T., Levy, R. T. and Fredrickson, D. S.: Estimation of the concentration of low density lipoprotein cholesterol in plasma without use of the preprative centrifuge. *Clin. Chem.*, **18**: 499-502 (1972).

Golan, M., Weizman, A., Apter, A. and Fainaru, M.: Parents as the exclusive agents of change in the treatment of childhood obesity. *Am. J. Clin. Nutr.*, **67**: 1130-5 (1998).

Gunnel, D. J., Frankel, S. J., Nanchahal, K., Peters, T. J. and Smith, G. D.: Childhood obesity and adult cardiovascular mortality: a 57-y follow-up study based on the Boyd Orr Cohort. *Am. J. Clin. Nutr.*, **67**: 111-8 (1998).

Krause: *Food Nutrition and Diet.* WB Saunders Company, USA pp 17-30 (1996).

Lopes-Virella, M. F., Stone, P., Ellis, S. and Colwell, J. A.: Cholesterol determination in high density lipoprotein separated by three different methods. *Clin. Chem.*, **23**: 882-84 (1998).

Maffeis, C., Zaffanello, M., Pinelli, L. and Schutz, Y.: Total energy expenditure and patterns of activity in 8-10 year old obese and non obese children. *J. Pediatr. Gastroenterol. Nutr.*, **23**: 256-61 (1996).

N.R.C. (National Research Council): *Food and Nutrition Board, National Academy of Sciences., Recommended Dietary Allowances.* 10th (Ed.) National Academy Press, (1989).

Obarzanek, E., Schreiber, G. B. and Crawford, P. B.: Energy intake and physical activity in relation to indexes of body fat: The National Heart, Lung and Blood Institute Growth and Health Study. *Am. J. Clin. Nutr.*, **60**: 15-22 (1994).

Popkin, B. M., Horton, S., Kim, S., Mahal, A. and Shuigao, J.: Tends in diet, nutrition status, and Diet-related Non communicable Diseases in China and India: The Economic Costs of the Nutrition Transition. *Nut. Rev.*, **59**: 379-90 (2001).

Rueda-Maza, C. M., Maffeis, C., Zaffanello, M. and Schutz, Yves: Total and exogenous carbohydrate oxidation in obese prepubertal children. *Am. J. Clin. Nutr.*, **64**: 844-9 (1996).

Sharma, M. : Roly poly children make unfit adults. *The Tribune* (Spectrum) March 3 (2002).

Tanasescu, M., Ferris, A. M., Himmelgreen, D. A., Rodriguez, N. and Escamilla, R. P.: Biobehavioural factors are associated with obesity in Puerto Rican Children. *J. Nutr.*, **130**: 1734-42 (2000).

Trinder: Enzymatic method of serum plasma glucose estimation. *Clin. Bio. Chem.*, **6**: 24 (1969).

Warden, S. N. and Warden, C. H.: Pediatric obesity, an overview of etiology and treatment. *Pediatr. Clin. North Am.*, **44**: 339-61 (1997).

Authors' Address: **Amandeep Kaur Pandher, Jasvinder Sangha and Paramjit Chawla,** Department of Food and Nutrition, Punjab Agricultural University, Ludhiana, 141 004, Punjab, India