BODY MASS STATUS OF SCHOOL CHILDREN OF DERA ISMAIL KHAN, PAKISTAN

Muhammad Ramzan, Irshad Ali, Abdus Salam Khan[*]

Department of Chemistry, Gomal University, Dera Ismail Khan, *Women Medical College, Abbottabad, Pakistan.

Background: Childhood obesity is a global epidemic involving both developed and developing countries. It is a stare of over-nutrition with long term complications such as dyslipidemia, hypertension, and coronary artery disease and type-2 diabetes. Underweight is the result of under nutrition leading to reduction in growth and development of every body organ especially the Central Nervous System. Long term under-nutrition causes failure in linear growth (height) of the child. Growth is further retarded by the repeated attacks of respiratory infections, diarrhea and anemia as a result of reduced immunity. **Methods**: This study was carried out eight primary schools of Dera Ismail Khan (Private, semi government organizations, and welfare foundations) having mixed population with some of the wards belonging to high socioeconomic group. Thorough clinical examination excluded those suffering from chronic heath problems. Height and weight of each one was taken body mass index of determined according to 'Quatelet's' index. Body mass index number was plotted on the CDC S age and gender specific growth charts 2–20 years for BMI-for age percentile and body mass status (underweight, normal weight, overweight/at the risk of overweight and obese/overweight. **Results**: Total 1338 school going children (6–11years) were examined with 865 (67.75%) boys and 471 (35.25%) as girls. 13.39%, 72.15%, 8.83% and 5.61% as underweight, normal weight, overweight and obese respectively. Percentage of underweight was higher in girls (25%) than boys (13.22). Percentage of obesity was higher (5.17%) in boys than girls (1.39%). **Conclusion:** Awareness about balanced diet, improvement in the level of education and socioeconomic conditions, easy access to health facilities and prevention of the gender discrimination, are the remedial measures to be taken to redress the situation.

Keywords: Children, Height, Weight, Body mass index.

INTRODUCTION

School going children are the important segment of our society. Their growth, development and body weight is of utmost significance and presents general health status of a community and nation as a whole.[1] Body weight depends on energy balance; intake depends not only on food availability but also on a number of complex interrelationships that include stimulus of good food, the role of hunger, metabolic changes, hypoglycemia, pleasure and habit of eating.[2] Energy out put comprises: (i) the basal metabolic rate (ii) the thermal effect of food (digestion and absorption) and (iii) activity.[3] Of these variables activity is most susceptible to change. A gain or loss of energy would respectively increase or decrease body weight. An excess of 50–100 calories per day will lead to 5–10 pounds weight gain over one year. A small imbalance between energy input and output leads to significant weight gain overtime. In fact, most obese children demonstrate a slow but constant weight gain over several years.[4]

According to National Center for Health Statistics (NCHS) and Centers for Disease Control and Prevention (CDC) gender specific growth chart 2–20 years, if the BMI for age percentile is less than 5th percentile, the child is said to have underweight. Underweight is commonly associated with low dietary intake, excessive energy expenditure, and frequent attacks of respiratory and gastrointestinal infections, iron deficiency anemia as well as slow recovery from illness, school children have low attendance and poor school performance. Healthy/Normal weight is associated with minimum morbidity and mortality. Children have sound energy balance when BMI-for-Age-Percentile is between 5th and 85th percentile. Overweight refers to excess body weight including all the tissues; obesity refers only to excess body fat.[5,6]

Overweight and obesity adversely affects psychological development particularly low self esteem, poor body image, peer interaction of young people in their formative years and these effects should not be under estimated.[7] Obesity is most common cause of abnormal growth acceleration in childhood. Obesity in females is associated with an early onset of puberty and early menarche. Puberty is now occurring earlier in females than in the past and this is probably related either directly or indirectly to increase in body weight of the population. The effect of obesity on male pubertal maturation is more variable and obesity can lead to both early and delayed puberty. Pubertal gynecomastia is a common problem in obese male. Breast development in females is currently at the age of 10.9 years. Adiposity for male and female children is predominantly subcutaneous. The extent of visceral fat in obese children is lacking, this is due to the absence of methods available to assess the visceral fat other than radiology. Family history can be extremely useful. There is strong

hereditary component to visceral deposition as well as Non Insulin Dependent Diabetes Mellitus (NIDDM), hypertension and ischemic heart disease. These often can be traced through the family tree in obese family members.[8] Short term complications of obesity relates to the effect on growing bone, endocrine, cardiovascular, respiratory and gastrointestinal systems and some malignancies like carcinoma of colon.[9] Since excess body weight and obesity seems to be a risk factor in a number of clinico-pathological conditions. This study was undertaken particularly in children to asses the frequency of these risk factors at early age.

MAIERIALS AND METHODS

The present study was conducted in eight different primary schools of Dera Ismail Khan City (NWFP) Pakistan to assess the body weight status of school children 6–11 years. These schools had mixed population while some of the schools had wards of high socioeconomic group. A total of 1336 school children were included in this study with 865 boys and 471 as girls. All the children were subjected to thorough clinical examination to exclude those suffering from chronic health problems (tuberculosis, asthma, diabetes etc). All the measurements were taken on each school child wearing minimum possible clothing (summer) without footwears.[1]

Two measurements of each child including height and body weight were taken. Body Mass Index (BMI) for each child was calculated according to 'Quatelets' Index which is a statistical correlation of the relationship between the height and weight of an individual arrived at by dividing body weight (kg) and height in m[2]. For children BMI for age percentile is used, as amount of body fat changes with age and amount of body fat is different between girls and boys. In children; BMI number is plotted on the CDCs' gender specific growth charts 2–20 years to obtain percentile ranking. The growth charts show the weight status categories used with children and teens under weight, normal weight, overweight, and obese.

The values of BMI-for-age used were based on the reference data of the World Health Organization (WHO) report. A child was considered underweight or having low BMI-for-age when his BMI-for-age was <5th percentile, normal weight when his BMI-for-age was between 5th to <85th, overweight when his BMI-for-age was between 85th to <95th and obese when his BMI-for-age was ≥95th percentile.[6]

RESULTS

A total of 1336 students including 865 (64.75%) boys and 471 (35.25%) girls were included in this study. Regarding different age groups, 23.58% students belonged to the 10 year while 20.13% were of 8 year. Likewise, the percentage of students representing age

groups of 6,7, 9 and 11 years were 7.93%, 12.57%, 17.37% and 18.41% respectively, are listed in Table-1.

Table-1: Sample size distribution by age and gender

Age (Yr)	Number of Students Examined		
	Male (%)	Female (%)	Total (%)
6	74 (68.81)	32 (30.19)	106 (7.93)
7	97 (57.74)	71 (42.26)	168 (12.57)
8	164 (60.97)	105 (39.03)	269 (20.13)
9	149 (64.22)	83 (35.78)	232 (17.37)
10	207 (65.71)	108 (34.29)	315 (23.58)
11	174 (70.73)	72 (29.27)	246 (18.41)
Total	865 (64.75)	471 (35.25)	1336

Table-2: Age wise distribution of BMI and Percentiles in school children (6-11 years) Boys

Age (Yr)	Weight (Kg) Mean±SD	Stature (meters) Mean±SD	BMI (kg/m^2) Mean±SD	Percentiles Mean±SD
6	22.878±3.875	1.198±0.263	16.512±5.533	58.554±30.385
7	22.644±3.875	1.205±0.081	15.428±1.065	39.371±30.381
8	28.927±16.629	1.278±1.40	15.142±4.338	40.171±30.550
9	28.094±6.498	1.345±0.105	15.653±3.734	37.163±31.971
10	31.481±6.772	1.381±0.071	16.207±1.168	36.860±31.283
11	33.543±8.261	1.424±0.110	16.556±2.743	35.029±31.375

Table-3: Age wise distribution of BMI and Percentiles in school children(6-11 years) Girls

Age (Yr)	Weight (Kgs) Mean±SD	Strature (meters) Mean±SD	BMI-kg/m^2 Mean±SD	Percentiles Mean±SD
6	19.828±3.086	1.201±0.109	14.134±1.597	26.560±26.199
7	23.028±5.281	1.240±0.116	15.285±1.522	37.465±31.971
8	24.524±4.090	1.286±0.110	15.058±2.787	34.504±27.985
9	27.660±5.599	1.323±0.562	15.661±1.560	38.398±31.277
10	30.907±6.952	1.365±0.084	16.450±3.178	38.435±28.186
11	33.319±7.208	1.437±0.071	16.139±3.197	31.625±28.573

Table-4: Percentage of Body Weight status according to Age and Gender.

Age (Yr)	Underweight (%)		Normal (%)		Overweight (%)		Obese (%)	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
6	2.70	37.50	59.46	56.25	22.98	3.125	14.86	3.125
7	12.37	19.72	72.16	67.61	12.37	4.23	3.10	8.44
8	6.71	15.24	79.26	71.43	7.32	8.57	6.71	4.76
9	10.07	18.07	77.85	67.47	7.38	8.43	4.70	6.03
10	13.57	12.04	72.46	75.93	9.66	5.55	4.35	6.48
11	13.22	25.00	72.41	68.05	9.20	5.56	5.17	1.39

There is a sizeable increase in the body weight (Boys 11 kegs, Girls 14 Kg) of both the sexes in this study (Table-2, 3). This can be compared with the children in India (Patna).[10] Where the increase in weight (Boys 9 Kg, Girls 11 Kg) was lower than their Pakistani counter parts. This may be due to the better nutritional conditions in ours study area.

Height in boys was lower than the normal gain (25 cm in girls, 30 cm in Boys) of stature during the early growth spurt (7–8 years in Girls, 9–10 years in Boys).[5] BMI as well as BMI-for-age percentile gradually declines in boys. This may be due to decline in the linear growth as a result of chronic undernutrition. Both showed consistent increase in the age of 11 years reflecting improved nutrition in girls (Table-2, 3). Percentage of

body mass status according to age and gender is given in Table 4. It reveals that among total population of both the sexes, 13.39% children were underweight, 72.15% normal weight, 8.83% overweight and 5.61% obese. Underweight was more prevalent in girls than in boys at all ages. It was highest (37.50%) at the age of 6 years 25% at the age of 11 years, 19.72% at the age of 7 years, 18.73% at the age of 9 years and lowest (15.24%) at the age of 11 years. Underweight in girls may be due to the gender discrimination prevalent in our society.

This can be compared with other Asian countries like Malaysia[11] where underweight is less prevalent (16.2% in boys, 13.3% in girls) in school children It reflects the better nutritional conditions in Malaysia than Pakistan. Also to be noted is the sizeable gender difference with less prevalence of underweight in girls showing no gender discrimination. Normal weight was high in boys than in girls at all the ages. It was maximum (17.26%) at the age of 8 years and lowest (59.46%) at the age of 6 years indicating the need to redress nutrition at this age to prevent the central nervous system under development (Table-4).

There is descending trend in the prevalence of underweight in girls as the age increases (Table-4). This can be compared with the inconsistent descending trend in girls as the age advances in Malaysia. However, there is ascending trend as for as underweight is concerned in boys of the study area. This may be due to deficient nutritional supply needed by the growth spurt at this age. Normal weight showed consistent increase (Boys, 72% Girls, 68%) as the age advances in both the sexes showing improved nutrition (Table-4). Similar studies in other countries like India showed normal weight as 82%[9] and 73.8% in Malaysia showing reflecting variability in nutrition.[11]

Overweight showed descending trend in both the sexes as the age advances with 22.23% at the age of 6 years in the study area (Table-4). Similar studies in Egypt revealed overweight as 10.8% in boys and 8.48s% in girls showing better nutrition.[12]

Obesity was more common in boys than girls and was highest (14.86%) at the age of 6 years. It was highest in girls at the age of 9 (6.03%) and 10 years showing the growth spurt at this age as well as accumulation of fat (Table-4). The increased prevalence of obesity in the developed,[13,14] and oil producing Middle Eastern countries,[15] is due to rapid economic and industrial development, overeating of energy dense food, poor food habits, physical in activity and sedentary lifestyle, playing of computer games and television viewing for longer duration. Increased rate of obesity in developing countries like Malaysia, Singapore and

Thailand is due to rapid economic and industrial development, improvement in the living standards with sedentary lifestyle and problems related to physical, behavioral and mental health, become common.[16]

CONCLUSION

The present study revealed that both under and overnutrition is present in schoolchildren. It is striking to note that underweight is more common (37.50 at the age of 6 years) in girls than boys. Underweight (undernutrition) at this age will retard the growth and development of various system of the body especially the Central Nervous System. It will also reduce the linear growth (increase in height) of the child. This may be attributed to the poor dietary intake, large family size, unawareness about the balanced diet, poor access to health facilities and gender discrimination. Appropriate steps need to be taken to address this problem to build up a strong and healthy nation in future.

REFERENCES

1. Vashisht RN, Krishan K, Devlal S.. Physical growth and nutritional status of Garhwali girls. Indian J Pediatric 2005;72:573–8.
2. Shay SD. Ministry of food New Delhi India. World Bank FAO corporate Document and assessment of food deprivation and under nutrition. Originated by economic and social department Part IV User's perspective on national level. 2005.
3. Kumar P, Clark M Clinical Medicine. 5th edition. London: WB Saunders, 2004; p 224.
4. Moran R. The evaluation and treatment of childhood obesity. Am Fam Physician 1999;59:861–8, 871–73.
5. Gordon MW. Contemporary nutrition. Issues and Insights. Higher Education 5th edition. New York: McGraw Hill, 2003;p. 369–504.
6. World Health Organization. Adolescents In: Physical status: the use and interpretation of anthropometry. Technical Report Series No.854. Report of a WHO Expert Committee, Geneva 1995;263–309.
7. Roche EF. Childhood obesity. Why should we be worried? Ir Med J 2003;96(4):100–2.
8. Slyper AH. Childhood Obesity, Adipose Tissue Distribution, and the Pediatric Practitioner. Pediatrics 1998;102(1):e4.
9. Mclennan J. Obesity in children. Tackling a growing problem. Australian Family Physician 2004;33(1-2):33–6.
10. Kumari K. Health and nutritional status of school children in Patna (India). Health Popul Perspect Issues 2005; 28(1):17–25.
11. Moy FM, Gan CY, Zaleha MK. Body mass status of school children and adolescent in Kuala Lumpur, Malaysia Asia Pac J Clin Nutr 2004;13:324–9.
12. Monir Z, Koura A, Erfan M, Abd El-Aziz A, Mansour M. Anthropometric parameters in Relation to Nutritional Status in School children. Egypt Med J NRC, 2004;5(7):15–39.
13. Freedman DS, Kettel Khan L, Serdula MK, Ogden CL, Dietz WH. Racial and ethnic differences in secular trends in chilhood BMI, weight and height. Obesity 2006;14:301–8.
14. Ogden CL, Caroll MD, Curtin RL, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesityin United States.1999-2004.JAMA 2006;295:1549–55.
15. Al-Isa AWN, Thalib L. Body mass index of Kuwaiti children aged 3-9 years: reference percentiles and curves. J R Soc Promot Health 2004;126(1):41–6.
16. Tee ES Obesity in Asia, prevalence and issues in assessment methodologies. Asia Pac J Clin Nutr 2002;11(Suppl 8):S694–S701.

Address for Correspondence:
Dr. Muhammad Ramzan, Gomal University, Dera Ismail Khan, Pakistan
Email: apnaramzan@yahoo.com