IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 14, Issue 11 Ver.X (Nov. 2015), PP 73-78
www.iosrjournals.org

Nutritional status of Girls through Anthropometric and Dietary Assessment

Dr.G.Sireesha* and Dr.N.Rajani**
**Assistant professor, Department of Home Science, Sri Padmavati Mahila Visvavidyalayam, Tirupati.*
***Assistant professor, Department of Home Science, Sri Padmavati Mahila Visvavidyalayam, Tirupati.*

Abstract: *One of the greatest problems for India is undernutrition among children. The country is still struggling with this problem. The objective of the investigation was to examine the nutritional status of school going girls of 8 to 10 years age. A total of 434 school going girls were selected from 9 Municipal Upper Primary Schools of Tirupati urban region. All the girls belonged to low income households. Data on dietary intake was collected by using combination of 3 day dietary recall and weighment method. Height, weight and MUAC were measured. Consumption of all the nutrients by a majority of girls was less than the recommended dietary allowances. Data on anthropometry revealed that the mean height, weight and MUAC of girls of all the age groups was significantly (P<0.00%) less than the standards of National Center for Health Statistics.*
Key Words: *Girls, Nutritional Status, Anthropometry, Dietary nutrient intakes, Stunted and Wasted*

I. Introduction:

School age is the active growing phase of childhood. Primary school age is a dynamic period of physical growth as well as of mental development of the child. Historically, the science of nutrition developed in part from the study of disease entities brought about by inadequate diet. Nutritional status is the condition of health of an individual as influenced by nutrient intake and utilization in the body. In developing countries like India various forms of malnutrition affect a large segment of population and both macro and micronutrient deficiencies are of major concerns. The most recent estimates (1996-2005), in developing world, approximately 146 million children are underweight, out of these 57 million children live in India [1] and Over 90% Indian women, adolescent girls and children are anemic [2]. Thatcher [3] and Amirthaveni and Barikor [4] suggested that the health of children is dependent upon food intake that provides sufficient energy and nutrients to promote optimal physical, social, cognitive growth and development. Inadequate energy and nutrients have a variety of poor outcomes including growth retardation, iron deficiency anemia, poor academic performance and development of psychosocial difficulties.

One way to break the intergenerational cycle of malnutrition is to improve the nutrition of adolescent girls prior to conception. The vicious cycle of malnutrition, if not broken, will goes on resulting in more and more severe consequences. Nutritional deficiencies have far reaching consequences, especially in adolescent girls. If their nutritional needs are not met, they are likely to give birth to under nourished children, thus transmitting under nutrition to future generations [5].

Adolescence is a unique intervention point in the life-cycle for a number of reasons [6]. Early adolescence after the first year of life is the second critical period of rapid physical growth and changes in body composition, physiology, and endocrine. Rapid growth and changes heighten their nutritional requirements and risks of undernutrition. Parents simply need to provide more nutrients and emotional support. Adolescence offers the last opportunity to intervene and recover growth faltered in childhood and also support growth spurt and skeletal development to break the vicious cycle of inter-generational undernutrition [7,8].

In children, protein/calorie deficient diet results in underweight, wasting and lowered resistance to infection, stunted growth and impaired cognitive development and learning. Whereas, iron deficiency in school age children, is associated with retardation of growth, decreased immunity, poor cognitive development resulting in lower Intelligence Quotient (IQ) and behavioral abnormalities [9].Therefore, it becomes very important to know the nutritional status of school going children, the building blocks of state and country and hence the present study was carried out in Tirupati with following objectives:

- To assess the nutritional status of 8-10 year old school going girls through anthropometry.
- To study the adequacy of food and nutrient intake in their diets.

II. Materials and methods:

Nine Municipal Upper Primary Schools are located in Tirupati. All the Girls (443) aged 8-10 years presented in Upper Primary schools were selected as sample for the present study.

Anthropometric Survey:

Height was measured using portable anthropometric rod and weight by plotform weighing balance with minimum clothing. The height and weight were measured nearest to 0.1 cm and 0.5 kg respectively [10]. Mid Upper Arm Circumference (MUAC) was recorded with the help of flexible non – stretchable steel measuring tape to the nearest 0.1 cm. [11]. The measurements were compared with NCHS standards.

Diet Survey:

A dietary survey was conducted as described by Swaminathan [12]. The daily dietary recall for three consecutive days was taken and was averaged out for one day. The average daily nutrient intake was calculated with the help of the food composition tables [13]. The calculated daily nutrient intakes were compared against RDA for Indians [14].

Interpretation of anthropometric Data

The ht and wt measurements were compared with NCHS standards and MUAC [10]. Using the percent weight-for-age and weight-for-height (table.1) the children were classified into different degrees of malnutrition based on Waterlow's classification [15].

Table: 1. Waterlow's classification

Indicator*		Type / degree of malnutrition
%Weight / Age	% Weight / Height	
>90	>80	Normal
>90	<80	Wasted Short duration malnutrition
<90	>80	Stunted Long duration Malnutrition (nutritional dwarf)
<90	<80	Stunted & Wasted Current and long duration Malnutrition

*Cut-Off level as % of NCHS Median

III. Results and Discussion:

Anthropometric status of the children :

Nutritional anthropometry is the measurement of human body at various ages and levels of nutritional status. It is based on the concept that an appropriate measurement should reflect any morphological variation occurring due to a significant functional physiological change.

The select anthropometric measurements viz., height, weight and mid upper arm circumference (MUAC) were recorded and compared with NCHS standards. The profile of anthropometry of children belonging to 8, 9, 10 yrs is presented in tables.2.

Table :2 Mean height, weight and MUAC of school going girls as compared against the standards

Age in yrs	Height (cm) [1]			Weight (kg) [1]			MUAC (cm) [1]		
	Mean ±SD	NCHS 50^{th} percentile values	t-value	Mean ±SD	NCHS 50^{th} percentile values	t-value	Mean ±SD	NCHS 50^{th} percentile values	t-value
8	117.6±7.5	126	13.235**	17.9±4.0	24.8	19.567**	13.8±1.4.	18.3	36.534**
9	122.0±7.2	132	18.067**	19.8±4.3	28.5	26.018**	15.2±1.3	19.5	44.016**
10	126.4±6.2	138	22.642**	22.6±5.5	32.5	21.451**	16.6±1.2	21.1	43.773**

[1] Difference between age groups significant at $p<0.01$

Height : Ht is a genetically controlled characteristic though not sensitive to the nutritional deprivation as body wt. It reflects the long term influence of prolonged nutritional status on linear growth. Mean ht in all the age groups of girls was significantly lower ($P<0.01$) than the NCHS standards. The mean ht girls in the age group of 8 yrs were 117.6cm. Mean ht of girls in the age groups of 9 and 10 yrs recorded ht values of 122.0 and 126.4 cm respectively.

Weight : Wt is the best index of present nutritional status. The mean wt in all the age groups was significantly lower ($p<0.01$) than the NCHS standards. The difference in wt was significant between the age groups (8, 9, 10 yrs).

MUAC:

Measurement of arm circumference is considered to be a more sensitive index of tissue dystrophy than low body weight. The mean MUAC of girls in all the age groups was significantly ($p<0.01$) lesser than the NCHS standards. The difference in MUAC was significant between the age groups (8, 9, 10 yrs).

In the present study group of school going girls the anthropometric measurements recorded were significantly lower than the NCHS reference values for all the three age groups (8,9,10 yrs). These deficits in growth may primarily be attributed to the low quality and quantity of food intakes observed.

Several researchers [16,17,18,19,20] have shown that dietary and environmental constraints are the major determinants of growth disparities between children of developing and developed countries.

Different anthropometric measures correspond to different biological status. Deficit in the weight-for-age measure corresponds to the biological state of being underweight. According to Svedberg and Peter, (2000) – "Children with a low weight-for-age thus comprise both those who are chronically and those who are acutely deprived in terms of nutrition and / or healthcare". Deficit in the height-for-age measure corresponds to linear growth retardation i.e. the inability to reach the genetic potential in terms of height. This is supposed to be a longe-term measure of deprivation than weight-for-age which is more sensitive to short-term or seasonal variations in food availability. Height, and by extension height-for-age, is also said to have a strong relationship with mental function and mortality [21].

As age increased the deficits in ht also increased for girls. With the increasing age the nutrition requirements increase to meet the growth and development needs of children. The mean nutrient intakes though recorded an increase with increasing age they are not adequate; as with age the activities of children also increase where a major chunk of calories may be channelized to meet the increased energy expenditure. This leads to deficits in wt and a chronic situation influences the linear growth of children.

A case control study identifying the risk factors of short stature among Chilean children entering school, reports several risk factors associated with short stature (and poverty) independent of parents heights, suggesting that genetic factors have limited impact on height at this age. The authors conclude that in countries similar to Chile, inorder to decrease the prevalence of growth deficits, reducing poverty and its consequences is critical [22].

Degree of malnutrition of children and respective nutritional characteristics :

The prevalence of malnutrition in terms of duration and type is assessed using anthropometry. An attempt is made in the present context to focus on the nutritional status parameters of girls in relation to the type and duration of malnutrition. Nutritional status of the girls was assessed through Waterlow's classification which is based on wt-for-age and wt-for-ht data. The children were categorized into different degrees/types of malnutrition as normal (N), wasted (W), stunted (S), stunted&wasted (SW). The select nutritional characteristics viz., anthropometric measurement, dietary intakes, serum level of select micronutrients are presented in relation to the N, S, SW status of the children.

The type and duration of malnutrition prevalent among school girls of 8-10 yrs:

Table.3. shows that out of the total of 434 girls screened only 24 percent were found to be normal and the remaining 76 percent belonged to stunted (41.0 percent) and stunted & wasted (35.0 percent) types of malnutrition.

Table: 3. Prevalence of undernutrition among school going girls as assessed from Waterlow's classification

Nutritional Grades	Girls			
	8 yrs %(n)	9 yrs %(n)	10 yrs %(n)	Total %(n)
Normal	22.5 29	24.4 40	24.8 35	24.0 104
Wasted	-	-	-	-
Stunted	41.8 54	37.2 61	44.7 63	41.0 178
Stunted&Wasted	35.7 46	38.4 63	30.5 43	35.0 152

In the present study, the overall age shows prevalence of N, W, S and SW were 24.0, 0.0, 41.0 and 35.0 per cent respectively. While wasting reflects a failure of attainment of wt-for-age only; Stunting reflects a failure to reach linear growth potential due to sub optimal health and / or nutritional conditions; SW reveals low body mass relative to chronological age which is influenced by both, a child's ht and wt [23].

Further, ht-for-age reflects achieved linear growth, and its deficits (stunting) indicate long-term cumulative inadequacies of health and nutrition. Stunting of older children is a legacy of nutritional deprivation during early childhood. Present level of prevalence of stunting among school children also points to the high prevalence of nutritional insults during early childhood. In India, prevalence of stunting, underweight was almost 60 percent among rural preschool children and prevalence of wasting was also high [24]. The present group of school going children who hail from low income families might have been exposed to gross undernutrition during early childhood years, which further is being continued into the school ages, as is evidenced in the present context.

IV. Nutrient Intake:

The daily intake of calories, protein, fat, calcium, iron, retinol, zinc and vit-C was calculated using the food composition tables [25]. The three day mean intake of nutrients is presented in table.4 and depicted in fig.1.

It is observed from the data presented in table.2, That the intake of calories, proteins, fat, calcium, iron, retinol, vit-C and zinc increased with the increasing age of the children. When compared with RDA at all ages the intakes were lower than recommended allowances. The diet survey clearly brought out the fact that the food and nutrient intakes are inadequate with respect to both macro and micronutrients. Similar trends in intakes are observed with all the three age groups of children in both genders as well. Very small percent of the children had intakes closer to RDA.

Cereal carbohydrate being the primary contributor to the calorie intake the low cereal intake was also reflected in the low calorie intake. The energy intake of girls in 8 to 10 yrs were

Table: 4. Mean daily nutrient intake of school going girls as compared against RDA

Nutrients	8 Years [1]		9 Years [1]		10 Years [1]	
	RDA	Mean±SD	RDA	Mean±SD	RDA	Mean±SD
Energy (k.cal)	1950	1202.9±66.6**	1950	1313.3±57.3**	1970	1656.9±31.0**
Protein (g)	41	27.2±3.9**	41	29.5±4.9**	57	39.4±2.8**
Fat(g)	25	17.9±1.9**	25	18.1±2.1**	22	18.6±1.9**
Calcium (mg)	400	217.9±35.6**	400	215.0±55.2**	600	303.1±50.4**
Iron(mg)	26	12.2±1.4**	26	12.5±1.4**	19	15.5±3.4**
Zinc(mg)	10	3.6±0.9**	10	3.7±0.9**	10	5.0±0.7**
Retinol(µg)	600	137.4±19.2**	600	175.5±37.5**	600	230.2±18.0**
Vit-C(mg)	40	15.6±2.0**	40	17.5±1.9**	40	20.5±1.7**

** Significant at p<0.01

[1] Difference between age groups significant at p<0.01

▪ ICMR (2007)

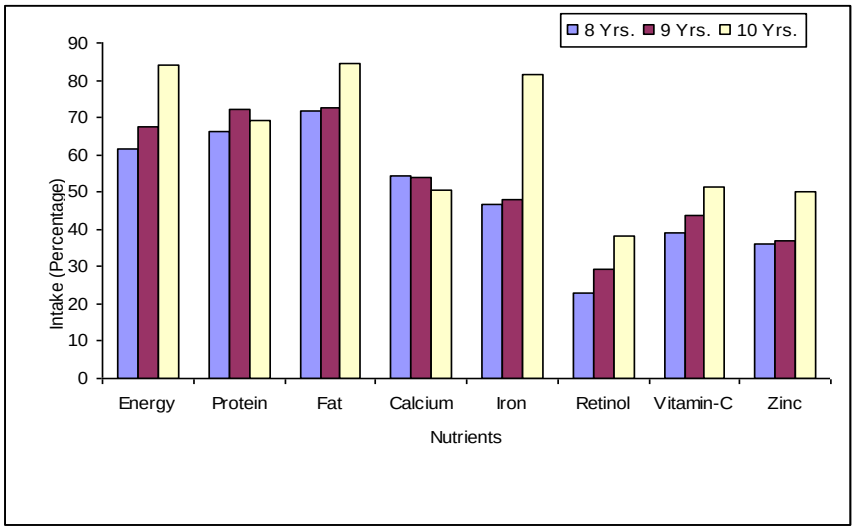

Fig: 1. Comparison of nutrient intakes of 8 - 10 yrs girls

Significantly less than the RDA. The mean fat intake of all groups was lower than the RDA values. About 20 percent of the calories in a day's diet should be supplied by fat. Irrespective of age it was observed that the fat contribute only 15 percent of total calories (when both visible and invisible fat of the diet was combined).

Deficit in protein intakes were in the order of 20-30 percent in the present group of children which may be directly attributed to the low intake of protein rich foods and lesser frequency of consumption. Several research studies [26,27,28] have focused that the frequency of consumption of pulses along with all other animal sources of foods and protective foods such as milk, fruits and vegetables is low for a majority of children studied.

According to [29] surveys carried out in different parts of India, both rural and urban areas indicate that the diets were deficient in several nutrients and deficiencies of these nutrients therefore occur frequently and to a greater degree among children. Inadequate intake of nutrients compounded by poverty was pointed out as the main cause for the high prevalence of undernutrition and severe degree of nutritional deficiencies. Similar were the findings of [30,31] and that of the present study, which projects the fact that since past few decades there is little or no change in the nutrition situation of children.

Diets of poor income groups were deficient in several nutrients, namely energy, vit-A, calcium, riboflavin, iron. Dietary deficiency of these nutrients occurs more frequently and to a greater degree among children whose requirements of nutrients are higher than others. General deficiency of these nutrients in their diet is reflected in widespread prevalence of deficiency diseases like anemia, PEM, Vit-A and B-complex deficiency (predominantly riboflavin) and goitre (in endemic areas). Although dietary deficiencies of nutrients are the primary cause of these deficiencies, they are aggravated by environmental and personal hygiene. These diets of the poor are predominantly based on cereals which provide 80 per cent of energy and some amount of other nutrients except vit-A and C. Such foods are consumed only in some quantities, that too infrequently by the poor and hence their diets are inadequate with respect to many nutrients, particularly that of vit-A, iron, riboflavin. Only diets of high income and middle income groups in urban areas can be said to be satisfactory [32].

V. Conclusion:

The most important period of human life, the adolescent period is spread almost over a decade. It is characterized by rapid increase in ht and wt and hormonal changes, sexual maturation etc. Since each stage of adolescence is typically characterized by different growth patterns the nutrient requirements also vary and eating too little can lead to deleterious health conditions. And an adequate diet with all nutrients is needed.

The health and nutritional status of school going girls of the study was, on the whole very poor. The gourmet should take effective steps to improve the nutritional status of school children by monitoring and improving the existing supplementary feeding programmes. Efforts are needed to use the school system favorably and proper strategies have to be adopted for improving the nutritional status of girls. Which intern reflects as upliftment of whole community.

References:

[1]. UNICEF., 1997. Nutritional anemia is South Asia. Malnutrition in South Asia- A regional profile. Rosa Publications, pp: 75-83.
[2]. Chandrika, S., 2006. Childhood and adolescent anemia in India. The Hindu Times Newspaper, Sunday March, 5.
[3]. Thatcher, R.W., 1998. Maturation of the human frontal lobes. Physiological evidence for staging. Dev Neuropsychol., 7: 397-419.
[4]. Amerithaveni, M. and C.W. Barikor, 2002. Nutritional status of Meghalayan pre-school children. The Ind. J. of Nutr. and Dietetics, 32: 262.
[5]. Brabin L, Brabin BJ 1992. The cost of successful adolescent growth and development in girls in relation to in relation to iron and vitamin A status. Am J ClinNutr 55:955-958.
[6]. Golden MH. Is complete catch-up possible for stunted malnourished children? Eur J Clin Nutr. 1994;48:S58–71. (Suppl 1) [PubMed]
[7]. Martorell R, Khan LK, Schroeder DG. Reversibility of stunting: epidemiological findings in children from developing countries. Eur J Clin Nutr. 1994;48:S45–57. (Suppl1) [PubMed]
[8]. Public health at a glance—adolescent nutrition 2003. (http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTHEALTHNUTRITIONANDPOPULATION, accessed on 22 June 2008).
[9]. Gowri, A.R. and H.J. Sangunam, 2005. Assessment of mental and motor abilities of school going children with anemia. Ind. J. Nutr. Dietet, 42: 99-105.
[10]. Jelliffe, D.B. An Assessment of the Nutritional Status of the Community. Monograph series, 53, World Health Organization, Geneva (1966).
[11]. Swaminathan, M., 2002 Essentials of food and Nutrition 2nd Edn., Bappco Publication, 2: 337-338.
[12]. Gopalan, C., B.V. Ramasastri and S.C. Balasubramanian, 2002. Nutritive value of Indian foods. NIN (ICMR) Hyderabad, 94.
[13]. Indian Council of Medical Research, 2000. Nutrient Requirement and Recommended Dietary Allowances for Indians. NIN, Hyderabad, PP: 67-89.
[14]. Bamji MS., Rao NP. and Reddy V. (2007). Text book of human Nutrition, Anthropometric Assessment of Nutritional status oxford and IBH publishing co Pvt. Ltd. New Delhi, p.157.
[15]. ICMR. (2007). Indian council of medical research nutrient requirement and recommended dietary allowances for Indians, NIN, Hyderabad pp.67-89.
[16]. Mei Z., Yip R. and Trowbridge F. (1988). improving trend of growth of Asian refugee children in the USA: evidence to support the importance of environmental factors on growth. Asia Pac J clin Nutr; 7:111-116.
[17]. Serenius F. (1988). Attained growth of privileged Saudi Children during the first three years of life. Acta pediatr scand 1988; 1346 (suppl); 80-92.

[18]. Dugdale AE., Muller M. and Alsop Shields L. (1994). Patterns of weight growth in Aboriginal children on queensland communities. J Pediatr child Health; 30:55-58.
[19]. Loka P., Nossar V. and Bauman AE. (1994). A comparative study of the growth of south east asian children in south –west Sydney born in Australia and overseas. J Pediatr Child Health; 30:436-438.
[20]. Quinn VJ, Chiligo-Mpoma MO, Simler K, Milner J. The growth of malwian preschool children from different socio economic groups. Eur J clin Nutr 1995;49:66-72.
[21]. Gopalan C. (1992). Undernutrition: Measurement and Implications in S.R.Osmani(ed.)
[22]. Amigo H., et al. (2001). Growth deficits in children school Children. Journal of Nutrition 131: 215-254.
[23]. Som S., Pal M., Bhattacharya B., Bharati S. and Bharati P. (2006). Socioeconomic differential in nutritional status of children in the states of West Bengal and Assam. J Biosoc Sci. 38 (5):625-642.
[24]. WHO. (1995). WHO Technical Report Physical status the use and interpretation of anthropometry, Report of a WHO Expert committee, Geneva, (WHO Technical Report Series, No.854).WHO. (1996). World Health Organization Indicators for Assessing vitamin-A Deficiency and their Applic ation in monitoring and Evaluating Intervention programs. WHO/ NUT / 96.10. Geneva.
[25]. Vijayaraghavan K. and Rao H. (1998). Diet Nutrition Situation in rural India. India. J.Med. Res; 108: 243 – 253.
[26]. Engle PL. and Nieves I. (1993). Intra household fooddistibution among Guatemalan families in a supplementary feeding programme: behavior and pattern. Soc Sci Med; 36(12):1605-12.
[27]. Vijayaraghavan K. and Rao H. (1998). Diet Nutrition Situation in rural India. India. J.Med. Res; 108: 243 – 253.
[28]. Tanvir Chowdhury T., Nahid R. and Nahid S. (2007). Dietary pattern and food intake habit of the underprivileged children Resi ding in the urban slums. Iran J ped; Vol-17 (No3); 227-234.
[29]. UNICEF. (1997). Nutritional anemia is South Asia. Malnutrition in South Asia – A regional profile. Rosa publications. Pp:75-88.
[30]. Singh, M., 2003. Nutrition, Brain and Environment: how to have smarter babies? Indian Pediatrics, 40: 213 – 220.
[31]. National Institute of Nutrition, 2003. Differences in attention – concentration, memory and school achievement of regular and irregular breakfast eaters and noneaters. Annual Report, 4: 27-30.
[32]. Shepherd R. (1999). Social determinants of food choice proceedings of the Nutrition Society 58:807-812.