| Research Paper | Home Science |

A study on Food consumption pattern and nutrient adequacy of Indian children

Dr. Meena Mehta — Department of food Science & Nutrition, Dr. B.M. Nanavati College of Home Science, 338 R.A. Kidwai Marg, Matunga, Mumbai 400 019 INDIA

ABSTRACT Building a child health with various nutritional aspects is of prime importance in India. The country is diversified with respect to different regional states following different traditions, customs and eating habits. The choice of food is influenced by differences in environment, differences in availability of raw food and various other social factors. These differences affect the individuals' nutrient intake, which in turn is related to various anthropometric parameters particularly amongst the growing children. A project was designed to study these factors for the children of the age group 2-15 yrs. Large number of school going children were made target for the study and proper survey was conducted. The data on various nutritional aspects were summarized and a relationship between health status and activity of the child was developed amongst these terms.

KEYWORDS : Food pattern, Nutrient adequacy, Children

INTRODUCTION

Health and nutrition are the most important contributory factors for human resource development in India[1-4]. Diet is a vital determinant of health and nutritional status of people. The dietary habit of individual/families/communities varies according to socio-economic factors and regional as well as traditional customs. Precise information on food consumption pattern of population through application of appropriate methodology is often needed not only for assessing the nutritional status of children[5-9] and adults, but also for elucidating the relationship of nutrient intake with specific deficiency of certain nutrients. WHO constitution states that the

"Enjoyment of the highest attainable standards of the health is one of the fundamental rights of every human being without distinction of race, religion, political, economic and social conditions".

Good nutrition is the fundamental basic requirement of every child for maintenance of positive health. A well balanced diet is essential from early stages of life for proper growth, development and healthy active life. A child's nutrition begins from conception itself. It is documented that nutrition plays important role right from intrauterine life of the child.

Thus, it is important to study on quantification of variation in dietary pattern and adequacies in food consumption in developing country like India. Diet varies from state to state, region wise, community wise and individual-to-individual. In turn such variation affects the nutritional status of an individual. Indian children are the future of the country, and it is an important segment of the country population. Hence, it is worth investigating the dietary pattern of such young children to understand their healthy growth and activity. A research project was designed to study the goal with following objectives.

- To study the prevalence of dietary deficiency disorder among 2-15 yrs of age group.
- To study the activity pattern among 2-15 yrs. of age group.
- To correlate food consumption pattern with the anthropometric parameters.

MATERIALS AND METHODOLOGY

A cross sectional study was carried out in India among the large number of children of either sex. The sample size of the subject comprises of total 129655 boys and girls in the age group of 2-15 year from different zones of the Mumbai city. The choice is made based on mission statement **"Every child a healthy child"[10]**. A pre-planned and pre-tested questionnaire was designed to collect data of all the subjects. The questionnaire was supplied as a part of school education programmed. The salient features of the questionnaire consist of four major titles as below.

1. General information
2. Anthropometric measurements of boys and girls.
3. Dietary information by recall method using detail on quantity of oral food consumed by them per day.
4. Activity pattern of boys and girls at home and school.

For anthropometric measurements like weight, height, waist and hip circumference were recorded by standard method reported in the literature.

Nutrient intake was calculated from the quantity of food consumed and compared with the recommended dietary allowances described by ICMR (Indian Council of Medical Research) in "Nutritive values of Indian foods". The cooperative families and respondent were short-listed for the study and only those data are summarized in the study. Most of the families provided good support and cooperated while conducting the diet survey. The quantities of foods used in various preparations were estimated by using household measurement like cup, spoon and bowl.

The various nutrients like energy, protein, fat, calcium, iron, vitamin A, thiamine, riboflavin, niacin and vitamin C were calculated using food standard table. The nutrient analysis was done by computerized program. A data collected during detailed survey of each subject using this questionnaire is summarized in the form of Table. The statistical treatment was carried out for these data and outcome of the same is discussed below.

RESULTS AND DISCUSSION

The present study is a cross sectional study, which involves children from various communities in the age group of 2-15 yrs. These subjects were classified on the zonal basis of their residence area. This classification provides the broad food consumption practices amongst different region of Mumbai city. The classified data is tabulated in the Table 1. It can be seen that boys and girls from west zone is maximum comprises of 36643 boys and 20785 girls. It is expected that children from this zone will dominate the activity pattern investigated[11-12].

Anthropometric measurements of boys and girls.

A set of noninvasive, quantitative techniques for determining an individual's body fat composition by measuring, recording, and analyzing specific dimensions of the body, such as height and weight; skin-fold thickness; and bodily circumference at the waist, hip, and chest are known as anthropometric measurements.

The anthropometric measurements were conducted with the help of equipments recommended by the WHO. The body heights, weights and arm spans of the boys and girls are summarized in Table 2 and 3.

The data reveals that boys and girls show steady growth in terms of their weight and height in each subgroup. The ratio of weight height remains identical with boys and girls but overall height of the girls is less. The Tri Skin Fold (TSF) and Mid-Upper Arm Circumference (MUAC) is very much impressive and show healthy sign of the body

growth. A multivariable analysis of variance revealed significant differences in the body weights, arm spans and BMIs of the children and their respective controls. A comparison of the anthropometric measurements of the boys and girls was performed for each age group. The results indicate that the arm spans of the boys are comparable in each group while that differ in case of girls. The differences in the values of anthropometric results can be attributed to difference in their life style. The food habits are related to their religious, environment and daily life style of the family.

Although no definitive recommendation can be made regarding which anthropometric indices are the most appropriate for adolescents, some revisions may improve current practices. Weight-for-height could be used for pre-pubertal adolescents and body mass index could be used for post-pubertal adolescents. Because cut-off points are age-specific, age should be collected as accurately as possible for all adolescents measured during screening or survey activities. The WHO-recommended reference population of US adolescents is inappropriate in most populations of adolescents.

Similarly, a pre-planned questionnaire was used to collect the data on food consumption by these boys and girls. The pulled data was analyzed and calculated in terms of percentage distribution of various nutrients available from the food. All the results are summarized in Table 4-5.

The result revealed that only 18.45% of the boys and 21.62% of girls consume healthy nutritional food recommended by the ICMR. These children have 100% of energy intake from their food. The protein intake for 35.33% of the boys and 33.52% of girls had appropriate consumption as per the RDA mentioned for the Indian children. These children were healthy and show better physical and mental growth. Most of these boys and girls come from educated families and these families were aware of the nutritional supplements for their children. However, result also indicates that these children consume food containing more fat. Almost 65 to 69% of them consume food containing higher content of fat. The fat containing food may have adverse effect on their health at the latter stage of life. These children are more prone to cardiovascular diseases and likely to develop obesity-related disorder in their health.

Calcium from food is a very important nutrient particularly for the growing child. Any inadequacy will reflect in the healthy growth of the child. It is expected that every child must receive food containing higher percentage of calcium[13]. The result indicates that only 4% of boys and girls do not have sufficient calcium in their diet. This deficiency may result in the poor bone growth and general weakness. A proper diet design and awareness amongst the parent of these children is expected.

Iron from the daily diet is generally low due to faulty food consumption habits. The iron intake of these children was unexpectedly below the average RDA value. Only 1.94% of boys and 6.05% of girls had iron status as prescribed for the healthy child. Most of the children suffer from iron deficiency diseases. Their immunity system is also poor as indicated from the activity study. Iron deficient children have very poor working skill. These children are dull and not responsive to any new activity as expected for the child youth. It is recommended that these children should be provided with the food supplemented with the iron reach sources[14-15].

The consumption of water-soluble vitamin C and accumulative vitamin A plays important role during the developmental stages of the life. It is stated that consumption of vitamin C through daily diet is essential for the prevention of many health-related diseases. The survey reveals that 7% of children suffer from vitamin C deficiency while 8% of the children have vitamin A deficiency. A proper diet containing these vitamins can overcome many complaints of these children. It is expected that the change in the diet pattern will help the child to grow more actively[15-16].

Activity pattern and healthy growth of child will be affected adversely in the case of insufficient intake of riboflavin, thiamin and niacin from the food. The data reveals that the parent generally ignores consumption of these nutrients. A detailed awareness program and counseling with the parent is most invited for the objective of this mission. It was found that more than 60% of boys and girls were in the category of moderate activity.

Activity pattern of boys and girls at home and school
A variety of activities can be planned for boys and girls. A survey reveals that boys are more active at school while girls are more active at home. Amongst the age group of 2-5 either boys or girls have similar activities of their playful age. They become more mischievous and express possessive nature at nursery and home. An extra energy and carbohydrate rich food is most essential at this age group. Poor consumption and protein deficient diet may result in to malnourishment. However between the age group 5-10 years they show changes in their likings and show difference in their activities at home and school. This is the vertical growth of their body with different internal and external changes in the organs. Such changes require large amount of energy and hence proper food intake and balanced diet plays an important role in their healthy growth. In the age group 10-15 the child grow maximum and to build their bony structure excess protein is mandatory in their diet. Hence activity with proper exercise is essential for this age group. The survey reveals that about 44% of boys are poorly fed not in tune with the RDA while 23% of boys show symptoms of obesity due to improper diet practices. Similarly 59% of the girls show signs of under nourish child due to improper diet without adequate vitamins and minerals intake while 8% girls were obese due to poor activities in their daily life.

Children are important segment of the Indian population. They contribute to the vital human potential and impart strength to the national economy and development. The members of society/community should come forward to change their food habits for improving the nutritional status of the future generation before they develop their own ideas and taste of the life.

Conclusively, it may be stated that malnutrition with respect to different nutrients in the daily diet of the children has serious repercussions on their development and national productivity with their best working abilities[17-18].

Summary:
This data shows definite relationship between food consumption pattern and its effect on healthy growth of children and their activity. A detailed awareness camp for the parent is recommended to improve the diet habits of the children. It is also recommended to include more aspects of the nutrition and food consumption pattern for the children of adolescent age group in their education. It is also expected to provide proper direction to health workers for framing future educative program for children.

Table 1 Zonal distribution of subjects

Zone	No. of Boys	No. of Girls	Total
North	23638	14522	38160
East	15883	8895	24778
South	6075	3214	9289
West	36643	20785	57428
Total	**82239**	**47416**	**129655**

Table 2 Anthropometric measurements of boys in the age group of 2-15 yrs.
(Total sample size = 82239)

Age group	Weight (Kg)	Height (cm)	TSF (mm)	MUAC (cm)
2-5	12.4 ± 9.8	89±6.7	7-10	21 - 24
5-8	26.7±4.6	109±8.3	7.5-8.6	22 - 26
8-11	30.2±9.5	121.7±3.4	8.5-9.0	23.6 - 24.6
11-13	43.2±8.3	132.6±6.2	9-12	24.1 - 26.6
13-15	45.5±9.9	144.2±1.4	10-14	23.1 - 27.6

Table 3 Anthropometric measurements of girls in the age group of 2-15 yrs. (Total sample size = 47416)

Age group	Weight (Kg)	Height (cm)	TSF (mm)	MUAC (cm)
2-5	11.4 ±8.7	79±4.7	6-9	19 – 21
5-8	23.1±3.6	99±8.5	6.5-7.6	20.7 - 24
8-11	28.4±8.5	112.3±3.4	8.1-8.8	21.6 – 22.7
11-13	36.2±7.3	127.2±8.2	9.4-10.2	22.1 - 23.6
13-15	41.5±4.9	131.2±1.1	10.6-12.4	23.6- 25.6

Table 4 Nutrient analyses of boys in the age group of 2-15 yrs. (Total sample size = 82239)

Nutrient/%	0-25	26-50	51-75	76-99	100
Energy	2.08	19.04	35.99	24.43	18.45
Protein	2.35	14.68	26.07	21.58	35.33
Fat	1.84	5.11	11.28	16.22	65.55
Calcium	3.85	8.54	15.10	17.32	55.19
Iron	27.22	49.98	16.78	4.13	1.94
Vitamin A	7.93	16.75	22.44	21.11	31.77
Thiamin (B_1)	1.98	7.52	19.07	22.34	49.08
Riboflavin (B_2)	7.43	19.07	25.90	20.05	27.56
Niacin	4.70	24.78	32.86	20.64	17.03
Vitamin C	7.69	8.93	7.38	8.91	67.09

Table 5 Nutrient analysis of girls in the age group of 2-15 yrs. (Total sample size = 47416)

Nutrient/%	0-25	26-50	51-75	76-99	100
Energy	1.69	15.03	34.81	26.85	21.62
Protein	2.26	15.02	27.72	21.47	33.52
Fat	1.60	4.26	9.95	14.86	69.32
Calcium	3.97	8.91	15.23	17.16	54.74
Iron	10.98	42.17	29.55	11.25	6.05
Vitamin A	8.14	17.55	23.75	20.67	29.90
Thiamin (B_1)	1.82	6.37	17.03	22.25	52.53
Riboflavin (B_2)	6.46	17.22	24.78	20.67	30.86
Niacin	3.66	22.27	32.46	22.24	19.37
Vitamin C	7.77	9.39	7.18	9.29	66.38

REFERENCES 1. Ghosh, A. (1987), Triad of sports: Recreation and health, World Health Forum, 2, 376. | 2. Devidas, R.P. (1988), Nutrition and performance of selected categories of people involved in certain activities, Proceedings of the Nutrition Society of India, 34, 35-37. | 3. Mujeeb-ur-Rahman and Visweswara Rao, K., (2002), Pattern of food consumption & nutrient adequacy- A case study of adults by religion, Ind.J.Nutr.Dietet., 39, 160. | 4. Gopalan, C. Rama Sastri, B.V. and Balasubramanian, S.C. (1994),"Nutritive value of Indian Foods", | 5. Allain, C. C, (1974), Clinical Chemistry, 20, 470-475. | 6. Lopex virefilla, M.R., (1977), Clinical Chemistry, 23, 982. | 7. Werner, M., Garbrelson, D.G., Eastman, G., (1981), Clinical Chemistry, 27, 268. | 8. Allain, C.C., (1974), Clinical Chemistry, 20, 470-5. | 9. Mascarenhas, M.R., Tershakovec, A.M., Steeler, N., (1999), Nutrition intervention in childhood for the preventation of chronic diseases in adulthood, Curr. Opln. Pediatr., 11, 598-604. | 10. Raheja, B.S., (1991), Dietary fats habits and susceptibility of Asian Indians to NIDDM and other sclerotic heart diseases, J. Diabet. Assoc., India, 31, 21-28. | 11. Gopalan C. (1989), "Stunting: Significance and implications for Public Health Policy. In: Nutrition, Health and National Development" A compilation of six lectures. NFI Publications, New Delhi | 12. Kachondham Y., Winichagoon P. and Tontisirin K. (1992), "Nutrition and Health in Thailand: Trends and actions", UN/ACCSCN country case study supported by UNICEF. | 13. Rangappa and Achaya (1974), "Indian Dairy products", 1st Edition, New Delhi. | 14. Eckizen A. and Deki M. (1999), "Reports of the central customs Lab. No.16.67", Kobe Customs Lab. Lkertaku, Kobe-Shi, Japan. | 15. Mahan K. and Sylvia Escott-Stump, (2000), "Food, nutrition and diet therapy" 1st Edition, W.B. Saunders Co., New York. | 16. Enas A. Enas, (1999) "From intervention to prevention of CAD", Proc. Nutr. Soc. India, 46,11-32. | 17. Tessi M.A., Aringoli E.E.,(2002), "Microbiological quality and safety of ready to eat food from a centralized school kitchen in Argentina" J. of Food Protection, 65(4), 636-42. | 18. Pearson D., (1991), "Composition and analysis of food" Longman Scientific & Technical publisher, 1st Ed. P.No.,7, 10, 13, 24,27. |